THE INCIDENCE OF MUSCULOSKELETAL DISORDERS AND STAKEHOLDER PERCEPTIONS OF WORK CHALLENGES IN SOUTH-EAST NIGERIAN QUARRY MINING INDUSTRY

BY

VICTOR AFAMEFUNA EGWUONWU

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Department of Human Kinetics and Ergonomics
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ABSTRACT

Musculoskeletal disorders (MSDs) are very common among industrial labourers, leading to sick leave absence, disability and low productivity at work. MSDs have multifactorial causes, thereby making it difficult to pinpoint the extent of the contributions of the various risks regarding the mechanism of its pathophysiology. Previously, attempts were made to study regional pain symptoms in varying occupational groups, disregarding the particularities of the different workplace situations. It is important to highlight, that quantifying physical exposure factors that contribute to MSDs occurrence using quantitative approach alone could be inadequate. It is therefore imperative to incorporate qualitative approach to unmask accompanying psychosocial stressors, which are mostly explanatory variables.

The study investigated the following: 12-month retrospective prevalence of MSDs, prospective incidence, risk factors and pattern of MSDs in a 6-month follow-up survey of selected quarry mineworkers, who reported MSDs complaints at the mine clinic. The study also determined the level of psychosocial stress associated with working in the mine by understanding stakeholders' perception of work challenges, and how it influenced recurrence of MSDs.

The study utilised a mixed method design with two phases: phase 1 was an initial baseline retrospective prevalence and a prospective cohort-control incidence survey. The Cultural and Psychosocial Influence on Disability (CUPID) questionnaire was translated into an Igbo-language version, cross-culturally adapted and utilized. The instrument was administered via oral interview and sought information on the following: demographic characteristics; pain in different anatomical sites and associated disability for tasks of daily living; as well as information on any change of job and reason during the study period, recent pain in different anatomical sites and associated disability for tasks of daily living; distress from common somatic symptoms; mental health status, sickness absence in the past 5-months for musculoskeletal pain. Phase 2 was a qualitative focus group discussion that engaged mine stakeholders on their perceptions of work challenges. Descriptive statistics of mean and standard deviation was utilised to analyse sociodemographic characteristics of participants. MSD incidence rates were estimated and the patterns of MSD incidence at different anatomical sites were also determined. The Cox proportional regression analyses were utilised to compare hazard ratios of MSD risks between the exposed cohorts and unexposed cohorts in the phase one incidence survey, alpha level was set at 0.05. Transcription, thematic and content analyses with the aid of Nvivo version 11 for windows was used to interpret stakeholders' perception of work challenges.

The incidence of MSD was 6.2 per 1000, with shoulder pain being the most reported complaint (40% prevalence). This was followed by back pain with the distribution of back pain presented as follows: upper back (20.37%), lower back (45.50%) and both (34.13%). All participants reported previous medical history of back, shoulder and neck pain. The relative risk ratio of mineworkers to MSDs was 4.57, which implies that the mineworkers were approximately 5 times more at risk of developing MSDs compared to the recruited unexposed cohorts. Meanwhile, wrist pain (43.58%) was the highest MSD complaints which lead miners to be absent from work, followed by knee and back with 35.42% and 21% respectively. Physical job risks, such as

working underground and squatting or kneeling at work were all significantly associated with MSDs recurrence in all six body parts (HR: 1.12-1.92, 95%CI). Similarly, time pressure to complete task, low decision latitude, poor job satisfaction, somatisation and mental disorder, job insecurity, poor incentive system (HR: 1.01-1.75, 95%CI) were perceived by stakeholders' and participants alike in the study to be significantly associated with MSDs incidence.

Quarrymen are exposed to high MSD risks associated with elevated psychosocial stress from their difficult work situations. The South Eastern Nigerian mine stakeholders believed that the high incidence of MSDs may have a substantial impact on health and productivity in the near future. Necessitating a clear need for the promotion of stakeholder's engagement concerning safe work policy implementation initiatives in the sector.

DEDICATION

*This dissertation is dedicated to my late immediate younger sister **Adaobi Nnene Egwuonwu**. I miss you so much sister for the fond memories and for inspiring me into choosing my present career.*

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CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Musculoskeletal disorders (MSDs) are painful inflammatory conditions affecting the musculoskeletal system, which comprise of bones, muscles, tendons, joints, nerves and blood vessels (Anderson et al., 2007; Bevan et al., 2009 & Hoy et al., 2014). The relatively high MSDs incidences in mineworkers' have become pervasive globally due to limited scope for preventing their incidence in most workplaces (Walker-bone et al., 2015). The World Health Organization (WHO) estimates that about 160 million people from the world's workforce suffer from work-related disorders such as musculoskeletal diseases and mental health problems with other workplace illnesses attributable to occupational hazards (WHO, 2016). The result is that MSDs are the largest global occupational health challenge responsible for over 30% of workplace injuries (Gerr et al., 2013 &Hoy et al., 2014).

Evidence from recent epidemiological studies on MSDs have revealed that these disorders have a multifactorial aetiology (Da costa and Vieira, 2010; Gerr et al., 2013; Coggon et al., 2013; & Marras, 2015). Despite numerous attempts to characterize and reduce risk factors of MSDs, they persist in workplaces and place a substantial burden on the employee and employer, which is difficult to quantify (Parkes and Carnell, 2005; Anderson et al., 2007; Gerr et al., 2013; &Coggon et al., 2018).The consequence of this persistence of MSDs among workers, despite the reduction in physical demands of work, due to increased mechanizarion, include long-term disability, increased healthcare cost, reduced quality of life, reduced productivity at work and high mortality rates (Marcfalene et al., 2000; Korpinean et al., 2013 & Hoy et al., 2014;).The burden of work-related MSDs losses is visible at both national and global economic levels, with associated productivity losses

accounting for approximately 4-5% of most countries nominal gross domestic product (GDP) (Takala, 2002; & Akinpelu et al., 2010).

MSDs and their associated effects have historically been thought to occur from 'traditional' risks factors (Barr et al., 2004; Lelis et al., 2012; & Gerr et al., 2013). 'Traditional' workplace risks can be broadly divided into physical risks, which include biological, bio-mechanical, chemical and radiological risks (Takala & Hämäläinen, 2009). Emerging workplace risks which include psychosocial risks, as well as exposure to a number of new and emerging chemicals (such as engineered nanomaterials) and processes and their impact on human health needs to be better understood (Li et al., 2011; US Department of Labour, 2015). Psychosocial factors, which include unfavourable work situations, poor remuneration, and unwarranted harassment by unit heads, employers, and superiors at workplaces, may also contribute to a rise in workers' psychosocial stresses level (Kortum & Leka, 2014 & Stephen et al., 2016). Elevated stress levels usually create tension and muscle fatigue that will ultimately increase the risk of MSDs or the exacerbation of existing MSDs in concert with 'traditional' risks (Nyantumbu, 2017). Additionally, poor health seeking behaviour or coping strategies of the sufferer, as well as poor matching of the employees' capabilities to the demand of the job may interact with other factors such as poor psychosocial stressors to mediate MSDs' incidence (Barr et al., 2004; Irmeli, 2010; Kortum, 2011; & Coggon et al., 2018). Overall, there is substantial evidence to suggest that poor working conditions, in general, can affect both a worker's experience of stress at work and family, as well as their psychological and physical health (Arunabha et al., 2012; & Abaraogu et al, 2015).

Part of understanding the psychosocial stressors in workplaces requires an understanding of the relationships and interactions between various stakeholders in the workplace, which in this case, is the Nigeria quarry mining context (Bongers et al., 2002). Coggon et al., (2012) and Schulte et al., (2012) in their separate studies

have argued that understanding the role of psychosocial risks aside occupational and other personal risk factors is necessary to understand the processes regarding persistence of MSDs disabilities at the workplace. Meanwhile, Schulte et al., (2012) and Coggon et al., (2012) both studied the association of occupational, personal and psychosocial risk factors with workers' health and safety but did not explore the possible role that stakeholders' interactions may have played in creating psychosocial stress, which in turn, may further contribute to increased MSD occurrence.

Recently, the changing economic context of work organisation in low to middle-income countries havealso created many challenges faced by workers in terms of occupational risks level in their workplaces (Kortum, 2011 & Stephens et al., 2016). The context of work organisation is recently driven by profit making and maximisation of available work resources, usually cheap around the lower income countries. This changing economic context of low to middle-income countries is explained by the shifting of occupational sectors such as the mining, manufacturing and services sectors from high income countries by multinational companies to less industrialized countries(National Research Council, 2001; Driessen et al., 2010; Lelis et al., 2012; Kang et al., 2014 & Vieira et al., 2015). The move is due to the availability of cheap labour, readily available for exploitation, as well as poor implementation of strict labour laws in the low income countries (British Safety Council, 2019). thereby growing the labour market in low to middle-income countries and thus creating new types of workplace hazards in addition to traditional ones (Gerr et al., 2013; Maldonado et al., 2013; &Vieira et al., 2015).

Additionally, evidence has emerged of a possible association between mental health, somatisation (symptom presentation due to psychosocial triggers), and complaints of MSD-related incapacities, despite the reduction in physical demands of work (mechanization of labour) in certain contexts (Coggon et al., 2018). Coggon et al.

(2013) stated that there was a need to conduct research to investigate the persistence of MSD symptoms and disabilities, despite interventions targeted at reducing the physical demands of task requirements in various occupational, yet culturally diverse environments. This was in response to the increased understanding and appreciation of how psychosocial and cultural factors, alongside other traditional workplace risk factors contribute to MSD development.

As a result, the Cultural and Psychosocial Influence on Disability (CUPID) tool was developed (Coggon et al. 2012). Surprisingly, the propensities of non-specific MSD complaints and disabilities could only be explained by culturally determined differences in pain perceptions and beliefs, which necessitatied the introduction of CUPID studies (Coggon et al. 2012; 2013 & 2018). The multinational CUPID studies reported international variation in the occurrence of disabling MSDs, which are driven largely by factors which predispose workers to developing musculoskeletal pain at multiple anatomical sites, rather than by risk factors specific to the area where the pain complaints were made. Presently, it has been established that there are culturally determined differences in perceptions of pain, and factors that are contributing to them, which could account for the persistence of MSDs despite several efforts to mitigate physical demands of work on working people (Coggon et al., 2013).

Genuine efforts by practitioners that have interest in safety health of workers to understand all the contributory factors of MSDs necessitate the calls for concerted action towards research that will identify workplace challenges faced by workers within a specific occupational group. This is especially important in occupational groups comprehensively linked to heavy manual labour, such as the mining sector with high tendency to report regional pain complaints. The situation becomes different when investigating regional pain symptoms from different occupational groups in a single study such as the case in the CUPID multinational study (Walker-

bone et al., 2005: & Hoy et al., 2014). Contextual dissimilarities might likely hamper definitive isolation of risk factors responsible for MSD occurrence. Evidence is also available suggesting that risk factors vary largely as a result of the particularities of various occupational situations (Stephens et al., 2016& Coggon et al., 2018) contrary to the reports of Coggon et al (2012; 2013 &2018). It is important to focus on one occupational group and understand their challenges in detail, rather than attempting to deal with a combination of various groups in one study. Previous attempts to merge occupational groups during studies have amounted to an underestimation of the actual contributory factors responsible for the varying workplace situations and contexts (Das et al., 2018). There is also evidence suggesting that different workplaces have particular psychosocial stressors that drive the incidence of MSDs in specific occupational groups, necessitating the exploration of a similar but context specific, culturally diverse work set-up to account for such variations.

Understanding the psychosocial stressors in workplaces requires an investigation of the relationships and interactions between various stakeholders in the context of that particular workplace (Bongers et al., 2002; Kivimaki, 2015 &Das et al., 2018). It firstly requires gathering information on the stakeholder's perspectives of the work context and content, as well as the challenges they face in a participatory manner (Jeyaratnam, 2002). Studies that have investigated the possible role of poor stakeholder relationships and interactions in the workplace aside somatic tendencies and cultural influences as a risk to MSD incidences are scarce. Previous studies by Kortum (2011) and Kivimaki et al., (2015) among other occupational groups aside mining in low to middle income countries quantified the direct and indirect consequences of elevated psychological stress. Poor interactions among stakeholders along the hierarchy in an organisation is associated with poor motivation to organizational goals, poor coping with work and increased risk of work-related injuries, somatisation (presentation of physical symptoms in response to

cultural and psychosocial triggers) and poor mental health (Pincus et al., 2002; Stansfield and Candy, 2006; & Vargas Prada et al., 2013).

Evidence from literature (Kortum, (2011) & Vargas Pradas et al., (2013) suggests that sustained endurance of structurally poor rapport within organisational hierarchy builds up psychological stress, and elevated psychosocial stress is believed to weaken immune responses which may, alongside other workplace challenges contribute to cumulative trauma injuries (Whysall, 2006; Lang et al., 2012; &Kivimaki et al., 2015). Consequently, reduced immune responses of individuals may weaken the ability to recover from repetitive strain injuries and exacerbates the development of MSDs (Park & Lee, 2009). There is need to obtain stakeholder's perspective on complex causalities of MSDs by investigating the organisational policies on social interactions as it affects MSDs and other hazards as a first line approach, to unravel its role in worker health (Marras, 2004). Psychosocial risks of MSDs in the workplace are greatly influenced by stakeholder's interest, (such as proper organisational welfare policy for employees' health and wellbeing) power dynamics and relationships that may exist within the context of work (Mitchel et al., 1997; Marstein, 2003; & Das et al., 2018). According to Dul et al. (2012) stakeholders, include actors (workers), influencers (government), decision makers (management/shareholders) and experts (supervisors) who can be directly or indirectly affected by the activities of an organisation.

1.2 Musculoskeletal Disorders Persistence among Nigerian Quarry Mineworkers

There was an obvious paucity of research in Nigeria that conducted follow up studies to investigate risk factors fueling the incessant repoting of MSDs among Nigerian quarry mineworkers. Despite the fact that previous research in the context of Nigerian quarry mines has revealed a high prevalence of MSDs among mineworkers. Evidence from literature suggests that such occurrence could be

attributed to undue physical demand as well as substantial psychosocial stress associated with mining jobs (Egwuonwu et al, 2013 & Sufiyan and Ogunleye, 2016). The undue physical and psychosocial stress predisposes miners to increased levels of occupational disabilities, resulting in repetive strain injury, which consequently develops into MSDs (Olusegun et al., 2009; Oguinyi, 2010; Egwuonwu et al, 2013; & Sufiyan and Ogunleye, 2016). The reports from Nigerian studies show that mineworkers have a prevalence rate of MSDs between 63.2 and 83.30% (95% CI), with low back pain being identified as the recurrent complaint of the miners (Egwuonwu et al, 2013; & Sufiyan and Ogunleye, 2016).

The Nigerian quarry miners are mostly employed through casual agreement and are generally exposed to heavy manual labour, job insecurity, poor working conditions, all of which have a potentially detrimental impact on their health and well-being (Ogbogu et al., 2009; Kortum, 2011; & Egwuonwu et al, 2013). Presently, in the context of Nigeria mining no studies had explored culturally determined causes of MSDs such as the tendency to somatise and adverse beliefs about MSDs pains. Previous studies have also focused solely on workers (actors) and may have ignored the role that poor social interactions between various stakeholders and inadequate organisational policy have in contributing to and perpetuating MSDs in this context. The consequences of poor stakeholder relationships in an organisational setting are unfavourable work conditions, which could influence the persistence of MSDs symptoms among Nigerian mineworkers (Marstein, 2003).

It is important to get the perspectives of all stakeholders around the factors that create psychosocial stress at work that may contribute to poor health and in particular MSDs. The present study was designed from the conviction that there is need to explore the physical and psychosocial risks in a context-specific study utilising a more robust research design than the CUPID protocol alone could offer.

Consequently, MSDs' incidence, risks, pattern of presentation, and the role of stakeholders in creating unfavourable work situations was studied with a parallel mixed method design.

The present study utilized a two-pronged approach: the first part involved a longitudinal follow-up design using the CUPID questionnaire which formed part of a quantitative ananlyses. This observational cohort study explored the influence of cultural and psychosocial variables in mediating MSD incidences among quarry mineworkers in Nigeria. The second part involved engagement with relevant quarry mining stakeholders, through the medium of focus groups that formed the qualitative part of the research. The whole idea of the second part was to unmask the possible role of stakeholder interactions within organisational hierarchy and to determine whether these interactions and perceptions were contributing to psychosocial stress and in turn, how this may have increased the risk of MSD development. The hypothesis is that poor stakeholder's interactions could create poor motivation to organisational goals of the miners, thereby lowering the mood of workers towards productivity and changing the perceptions and health beliefs relating to MSDs symptoms disabilities.

1.3: Aims and Objectives of the Study

Musculoskeletal disorders (MSD) are multifactorial in their origin and may be caused by physical demands of work, adverse working conditions, the environment, the organisational and sociocultural factors at play (Martimo 2010). Evidence supporting the role that genetic, environmental and sociocultural factors play in creating risk for work-related injuries is well known (Schulte et al., 2012). There is also substantial evidence suggesting that different workplaces have particular psychosocial stressors that drive the incidence of MSDs in specific occupational groups, necessitating the exploration of a similar but context-specific, and culturally diverse working

environment to account for such variations. There is need to understand various context-specific contributory factors to MSDs' incidence and recurrence among workers.

The understanding of MSD incidence and the possible mechanisms behind their development among workers is important to point out possible reasons why MSDs persist in workplaces. Several authors such as Holmstrom and Englholm, (2003), Village and Ostry, (2010) and Boshman et al., (2012) have also suggested that understanding workplace human interactions is needed to implement feasible and sustainable context-specific preventive measures for MSD risks (Realyvásquez et al., 2015). Research that focuses on understanding the occupational and individual risks faced by workers will further improve the understanding of workers' musculoskeletal injury risks in workplaces. An improved understanding of MSD risks will aid in the development and implementation of appropriate interventions (Maldonado et al., 2013).

Nevertheless, there is presently a lack of understanding of the contributory factors, beyond physical work factors in the Nigerian quarry mining context. The possibility of whether culturally determined, context-specific psychosocial factors impact MSDs' development and persistence among Nigerian quarry mineworkers is also not clear. Additionally, there is a poor knowledge of whether the culturally determined health beliefs of Nigerian mineworkers play a role in MSDs' incidence. This therefore necessitates gaining insights into the various stakeholders' perspectives regarding the influence of their relationships and interactions in relation to challenges they face at work. The poor knowledge of the role of culturally determined, context-specific factors and how they may be contributing to MSDs, may likely affect the future attempts at developing appropriate interventions in the mining sector.

Therefore, the focus of this study was two-fold:

1. To determine the incidence, risk and pattern of MSDs, as well as culturally determined factors driving MSDs' persistence among selected Nigerian quarry mineworkers using the CUPID questionnaires.

2. To determine the level of psychosocial stress associated with working in the mine by understanding how the interactions between the various quarry mining stakeholders' influences persistence of MSDs.

CHAPTER TWO

LITERATURE REVIEW

2.1: Musculoskeletal Disorders as a Disabling Occupational Hazard

Musculoskeletal disorders (MSDs) are defined as any disease or disorder that affect the structure or functioning of the musculoskeletal systems, which may be caused or aggravated by workplace exposure factors (Punnet et al., 2004 & Da costa and Viera, 2010). MSDs result primarily from voluntary muscle actions either due to overexertion or repeated exertions or both (Moore et al., 2008; &Ochionero et al., 2014). The term overexertion can be experienced during sudden lifting of a heavy object, or may arise from making the same motions repeatedly thereby straining the muscles or joints involved in the movements (Kang et al., 2014). MSDs may also be caused by repeated exposure to force, prolonged vibration or awkward posture and may be further accentuated during repeated overstretching of joints, ligaments and other soft tissues in confined spaces (Punnet et al., 2004). A direct link has been made between increased risk of work-related MSDs and frequent interactions between physical demands of work and elevated psychosocial stressors at the workplaces (Monnington et al*.,* 2002). Musculoskeletal disorders account for approximately one quarter of all workplace injuries globally and affect male and females almost equally (Das, 2018). The full extent of MSD burden is unknown globally, however, reference statistics for mean injury rates shows that for male workers the rate is 14.5 per 1000 per year in the mining sector (US Bureau of Labour Statistics, 2016). MSDs were responsible for the highest lost time from work in the Nigerian mining sector according to National Institute of Health and Safety, (2016), which costs almost one half of the compensation claims in the country for year 2015.

The most common MSDs are carpel tunnel syndrome, tendonitis, and muscle or tendon strain (Miranda et al., 2008& Irmeli, 2010). Meanwhile, possible symptoms of MSDs include, but are not limited to pain, tingling sensations, numbness, stiffness

and swelling (Coggon et al., 2012). Meanwhile, disabling symptoms (that affect function), known as syndromes, can develop due to repeated exposures to biomechanical loads, which ultimately affect physical functioning (Aptel et al., 2002). The most common examples include painful and swollen wrists as a result of compression and swelling of the median nerve in the wrist as found in sufferers of carpal tunnel syndrome and epicondylitis. The problem with MSD symptoms is their likelihood to persist and become chronically disabling to sufferers (Karsh et al., 2006; & Dias, 2014). Affected workers experience varying degrees of disability and sometimes may find it difficult to do certain tasks at work and home. The worker might take time off from work to recuperate or seek medical care while others may continue to work, without seeking leave (National Research Council, 1999; Ochionero et al., 2014; & Bao et al., 2015). There is also evidence that MSDs are the leading cause of occupational disability across working populations globally (Anderson et al., 2007; Palmer et al., 2008; Coggon et al. 2012; Bao et al., 2015; & Roquelaure, 2016). The rising health and compensation cost, as well as productivity lost time incurred as a result of MSDs globally continues to stimulate researchers' attention to investigate possible causes of their persistence among various occupational groups (Ochionero et al., 2014).

2.2: Aetiology of Musculoskeletal Disorders

Most conceptual models postulated to explain MSDs describe them as having a multifactorial aetiology and that MSDs are responsible for over half of allsick-absence from work, occupational morbidity and healthcare costs (Ochionero et al., 2014; Tawiah et al., 2015; & Stephen et al., 2016). Several studies in the past have emphasised the role that physical, biomechanical, psychosocial, organisational and cognitive exposure factors play in MSD incidence among workers (Punnet et al., 2008; Miranda et al., 2008; Irmeli, 2010 & Coggon et al., 2018). Studies have also shown the existence of culturally determined influences on MSD disability perception

and propensity of its pattern of occurrence (Coggon et al., 2018). This implies that nurture or the sociocultural environment where the individual inhabits may also introduce some element of variations overtime in the health beliefs, perceptions or adaptability of the sufferer towards pain or disabilities (Madan et al., 2008; da Coasta et al., 2010 &Solidaki, et al., 2013).

2.3: Musculoskeletal Disorders Risk and Risk Factors

Risks and risk factors are common concepts used in ergonomic literature. Risk includes a component of the likelihood and possible consequence of an event occurring and its severity (Maiti, 2008). Risk is often defined in the past tense looking back and deciding on how many injuries or trauma resulted from a given exposure (Steiner et al, 2004). At the extremes, injury risk can be viewed as follows:

1. Very low probability but extremely high consequence (e.g., multiple fatalities)
2. Higher probability but less severe consequence (e.g., a worker slipping and tripping).

Risk is also intuitively relative within and across work settings. Risk implies a probability for injury, and the chanceof an injury are a function of the level of risk and worker exposure time (Weston et al., 2016). It is possible for workers at a site not to have injuries for a period of time. The absence of injuries does not imply the absence of risk (Steiner et al, 2004). In the context of this study, risk factors are defined as actions or conditions that increase the likelihood of injury to the musculoskeletal system. MSD risks are context specific and vary based on particularities of occupational situation the individual worker is exposed to during job performance. The human musculoskeletal system has the ability to adapt to external demands of work overtime, which could explain the effect of acute and chronic risk factors to prevalence of MSDs among workers of high-demands jobs (Irmeli, 2010). Furthermore, findings from the studies of Van der molen et al. (2011) and Boshmann et al. (2012) showed that approximately 40% and 52% of both carpentery and

bricklaying workers respectively reported that they experienced occasional or frequent musculoskeletal complaints. This may be associated with job-specific requirements and variation in the susceptibility to MSDs among the different occupational groups. In the context of mining, the inherent risk factors are extensive. These are outlined in the following section.

2.4: Musculoskeletal Disorders in the Mining Sector

Mining is regularly portrayed as being extremely hazardous with challenging working conditions. There are three types of mining systems; open pit, onshore and underground mining. Irrespective of the nature of the operation, the way towards mineral extraction is dynamic and places a high physical demand on the workers (Scharf et al. 2001; & Tawiah et al., 2015). Early studies in the mining workplace suggest that mining tasks are continuously evolving (Steiner et al., 2004; Torma-Krajewski, et al., 2009). Technological innovations associated with globalisation and the changing processes of mineral exploration, have made it pertinent to continuously train manpower in the sector to adapt to the mining workplace (Unger et al., 2002). Dynamic work processes generally present health and safety risks which are usually difficult to characterize (Dias, 2014). Musculoskeletal disorders (MSDs) are part of health and safety risks that continue to affect mineworkers (Unger et al., 2002; Torma-Krajewski, et al., 2009; & Tawiah et al., 2015). These problems are becoming synonymous with the mining process and they pose serious challenges to the mining industry and may lead to reduced productivity and lost days from works due to increased number of sick leave by workers (Scharf et al. 2001; Steiner et al., 2004; &Ochionero et al., 2014).

There are several factors in the mining industry that contribute to MSDs. From an ***environmental perspective***, the roads and workplace area are usually uneven, muddy and wet with limited access around equipment and at times, there is poor visibility (Torma-Krajewski, et al., 2009; Dias, 2014; & Egwuonwu et al., 2019). The

poor access around equipment can lead to bouncing or jarring which is known to increase whole body vibration (Torma-Krajewski, et al., 2009). Cumulative exposure of the body to vibration may influence muscle action and resistance to fatigue (Torma-Krajewski, et al., 2009). There are other environmental hazards associated with the mining workplace; they include gas and dust pollution, high relative humidity, heat stress challenges, as well as falling debris from excavated earth surfaces common with open cast type mines (Scharf et al., 2001). For instance, gas and dust pollution can lead to poor visibility for the workers around the workstation, while heat stress may affect the nerve sensation, increase susceptibility to repetitive strain injuries by increasing the workers' cognitive workload, thereby increasing muscle resistance to fatigue (Steiner et al., 2004). The musculoskeletal system of the workers is regularly required to endure substantial performance limitations with sizeable axial torque on the spine as a result of unavoidable stretching and twisting of the trunk in confined spaces during task execution (Bhattacherjee et al., 2007; Dias, 2014& Ahmad et al., 2017). The workers are often working in static postures with little or no movement in a reasonable period of time, due to restricted workstations (Scharf et al. 2001; Aswegen, 2001; & Dias, 2014). The body parts that are in a static posture, with the inability to shift load from one fatigued muscle to another leads to an elevated risk of discomfort and MSDs, as the flow of blood through muscles to provide energy and remove waste depends on movement (Torma-Krajewski, et al, 2009; Ochionero et al., 2014; & Egwuonwu et al., 2019). Tasks that involve static postures can lead to discomfort, especially if combined with exposure to other risk factors such as repetitive movements for a prolonged period (Aswegen, 2001; Steiner et al., 2004; Torma-Krajewski, et al, 2009; & Egwuonwu et al., 2019)

The risks and hazards in the mining workplace include inappropriate equipment and vehicle design to fit the population, poor equipment maintenance culture and poor

work organisation that includes time pressures, high task demands, and absence of job rotation and long hours of work without rest or recovery (Torres et al., 1998; Aswegen, 2001; Torma-Krajewski, et al., 2009; & Egwuonwu et al., 2019). Mineworkers are most times required to adopt postures which usually expose the joint range of motions near the extreme positions. They adopt postures of kneeling, stooping, squatting or lying down for prolonged periods, the result of which is that the ligaments do not immediately return to their resting length afterwards (Steiner et al., 2004; Gallagher, 2008; Dias, 2014; & Egwuonwu et al., 2019). The task-related hazards of mining make it the most dangerous occupation generally due to high-level exposure of miners to MSD risks (Torma-Krajewski, et al, 2009 & Tawiah et al., 2015). An analysis of results from the National Occupational Health Survey of Steiner et al., (2004) and previous research from Torma-Krajewski, et al. (2009) and Egwuonwu et al. (2019) in their studies on US and Nigerian mines respectively, found that the magnitude of musculoskeletal overload and potential exposures for non-metal mining such as coal and quarry mining was greater than that of metal mining. In these studies, the three most common task-related demands that increase the risks of MSDs for mineworkers were as follows:

1. Bending forward, bending to the side, hyperextending or twisting the neck or back;
2. Unsupported abducted elbows, forearms resting on sharp edges, tossing motions at extremes of range of motion, working with elbows above shoulders
3. Lifting more than 22.7kg load unaided. At least 35% of mine workers were potentially exposed to each of these three overload conditions.

In an earlier study by Winn et al. (1996), who analysed workplace problems of miners in 24 different types of mining operations, the tasks were all associated with both metal and non-metal mining job performance. They all reported that potential exposures to task-related hazards were most likely for the following body parts:

neck, back, forearms, arms, shoulders, fingers and hands. Overall, the studies showed that the potential exposure to ergonomic hazards for metal/non-metal mining was high compared to non-mining occupations (Winn et al 1996; Weston et al., 2016).With respect to task demands in mining, task analyses and risk assessments conducted previously in selected Nigerian open pit mines reported that quarry workers perform their jobs in awkward positions as a result of confined spaces around the workstations, making standing upright or the ability to change position difficult (Egwuonwu et al., 2019). An Indian study by Ahmed et al. (2017) reported a 2-3-fold risk of developing MSDs among quarry mineworkers that was linked to the use of inadequately designed equipment and poor workstation due to the costly nature of a well-designed mine usually common in high-income countries. The findings of some of the studies described are summarized in Table 2.1.

Table 2.1: Risks, Prevalence and Body Spot of Musculoskeletal Disorders in Mineworkers

Study	Study design	Study group (Sample size)	Outcome measure	Prevalence (%)				
				Any	Back and Neck	Upper limb	Lower limb	Percentage
Ahmad & Alvi, 2017. Rajasthan state of Indian	Analytical cross-sectional study	218Mineworkers	12-months complaints of MSDs and socio-demographic and work-related characteristics (a)	81.2	Low back 61.5 Upper back 24.30 Neck 0.90	Shoulder 28.9 Elbows 12.8 Wrists/hands 3.20	Hips/thighs Knees Ankles/feet	0.90 39.4 3.20
Egwuonwu et al., 2013	Cross-sectional study	114 quarry mineworkers	12-months prevalence of MSDs	83.30	Low back 78.9 Upper back 8.8	Shoulder 36.6 Wrists 59.6	Hips/thighs Knees	8.8 4.7
Punnett et al., 2004 USA	Prospective cohort study	1324 workers from automotive plant	The cumulative incidence of new disorders and Psychosocial risk factors (b)	14.0	Low back Upper back Neck	Shoulder Elbows Wrists/hands	Hips/thighs Knees Ankles/feet	

Ozguleret al., 2004 In France,	Cohort study	598 workers experiencing shoulder pain (SP) and 337 workers without pain	New shoulder pain complaints due to exposures to repetitive work. In the past 6months (c)	6-month prevalence of shoulder MSD was 37%about 29% were men with risk of shoulder MSDs.		Shoulder 46.3		
Louw et al. 2007 in South Africa	Systematic review	27 epidemiological studies	Chronic nonspecific Low back pain (LBP) in the past 12months (d)	Adolescents 36 Adults 62	LBP 61.9			

A Pain, numbness, tingling aching, stiffness or burning

B Relevant symptom with relevant duration, frequency and intensity

C Ache, complaints or discomfort for at least a few hours

D Ache, complaints or discomfort almost every day in the past 12 months with presence of at least three months

Table 2.2: The Prevalenceof Musculoskeletal Disorders in Mineworkers and Their Body Site

Study	Study design	Study group (Sample size)	Outcome measure	Prevalence (%)				
				Any	Back and Neck	Upper limb	Lower limb	%
Darivemula et al., 2016 France	Cross-sectional study	among 146 vineyard workers	12-months lower extremity pain complaint was significantly associated with higher BMI.(a)	63.8	Low back 54.2 Upper back 28.70 Neck 12.90	Shoulder 18.4 Elbows 32.5 Wrists/hands 7.20	Hips/thighs Knees Ankles/feet	0.90 39.4 3.20
Custodio et al., 2016 Philippines	Cross-sectional study	221 Gold miners	Pain in the past 12 months (b)	72.3	Low back 56.1 Neck 52.0	Shoulder 21.4 Elbows 11.5 Wrists/hands 27.1	Hips/thighs Knees Ankles/feet	16.5 21.0 41.5
Bandyopadhyay et al., 2012 India	Cross-sectional study	among 125 construction workers	MSDs (not specified) in the past month (c)	65.32	Low back 68.2 Upper back 17.23 Neck 10.21	Shoulder 65 Elbows 60.21 Wrists/hands 22.16	Hips/thighs Knees Ankles/feet	3.4 22.4 10.2

A Pain, numbness, tingling aching, stiffness or burning
B Relevant symptom with relevant duration, frequency and intensity
C Ache, complaints or discomfort for at least a few hours
D Ache, complaints or discomfort for almost every day in the past 12 months or at least three months

2.5: Global Perspectives on Mining and Musculoskeletal Disorders

The studies reviewed are only those written in English that are pertinent to mineworkers and mining activity globally, since literature on the context was voluminous. Musculoskeletal disorders are one of the major causes of disability around the world and have contributed to a significant burden on productivity growth among miners in both the developed and developing world (Kunda et al., 2013). MSDs also significantly increase health-care cost in the context of mining globally with back pain being the most reported regional body parts affecting disability-adjusted-life years of mineworkers (Coehlo et al., 2011). For instance, several studies in over 10 countries reviewed during the course of the present thesis around the world have identified back and shoulder pain as the most common complaint of mineworkers with a likelihood of an increased risk of occurrence with ageing in the global population (Xu et al., 2012; Aghilinejad et al., 2016; Ahmed et al., 2017). Mining has been described repeatedly by most researchers as the most harmful occupations in terms of level of hazard faced by its workforce amongst major industrial sector (Joyce, 1998; Bio et al., 2007; & Kunda et al., 2013). Despite several efforts, towards reducing risks through safety interventions, the mining industry is still associated with higher rates of injuries compared with other industries (Maiti et al., 2004; Lee et al., 2005; Torma-Krajewski et al., 2009 & Xu et al., 2012).

Mineworkers in their everyday operations face a number of health-related risks, such as a high concentration of manual material handling of heavy equipment in confined spaces, with elevated exposure to musculoskeletal injuries (Bandyopadhyay et al., 2012). The risks faced by miners are categorized based on the type of mining methods that are broadly classified into open surface pit mining, placer surface mining, in-situ mining and underground mining. Occupational risk in underground

mining is much higher in other forms of surface mining (Maiti, 2003 & Torma-Krajewski et al., 2009). Underground mining involves drilling, charging and blasting to access and recover ore and mineworkers are required to perform heavy manual lifting and repeated tasks that oftentimes place them to endure substantial amount of risks usually in unavoidably confined workspace due to environmental constraints for mounting proper workstation (Egwuonwu et al., 2013 & Aghilinejad et al., 2016). Occupational risk is more pronounced in low-to-middle income countries like Nigeria and Ghana where tasks are mostly executed with heavy physical effort demanding repeated handling of tools, lifting heavy loads when compared to high income countries with high-level industrial mechanization (Bio et al., 2007; Xu et al., 2011; Nunes Alves de Sousa et al., 2015; Taiwaih et al., 2015; Custodio et al., 2016 & Egwuonwu et al., 2019). The prevalence rates reported by the various studies reviewed also differed in terms of the job type composition of the miners and variation in the degree of mechanization within the countries where the research were done. The studies from high income countries were as follows; Komljenovic et al., (2008) evaluated a 10-year MSD injury risk among US mineworkers and reported 53.71% rates for most mining activities. The study of Weston et al., (2016) observed that MSD prevalence were most frequently reported in workers with less than 5 years or more than 20 years of mining experience in US mineworkers. It was also remarked that sick-leave absence from work was greater for shoulder and knee MSDs and it was found to increase with the miner's age. Xu et al., (2012) among Chinese coalminers reported 64.9% MSDs prevalence rates, with a greater preponderance of injuries as the workers' age increases. Meanwhile, the study by Kizil & Joy, (2005) in Queensland Australia reported about 39.6% prevalence which showed that MSDs' occurrence was dependent on quarry workers' hands-on years

of experience which was also consistent with the reports of Xu et al., (2012) and Weston et al., (2016). All their studies found that workers with over 15 years on the job experience had fewer incidences of MSDs, which also peaks as ageing process catches up with the miners towards the age of 50 years and above.

The studies from India observed higher prevalence rates of between 61.43 to 82% (95 CI). The study by Bandyopadhyay et al., (2012) and Ahmed et al., (2017) also made remarkable observation linking specific risk factors with MSD rates. They both noted that miners MSDs were significantly linked to overexertion, repeated falls or trauma during task performances. The Iranian study by Aghilinejad et al., (2016) observed 64.2% MSD prevalence rate among Iranian mineworkers that study also showed that increased automation significantly reduced the number of employees as well as decreased incidence of MSDs. Several other studies in the sector had also associated increased MSDs in miners to maintenance and repair tasks, getting on or off equipment or machines, as well as walking or running while performing tasks (Herberger, 2013). The study by Coehlo et al., (2011) in Portugal also reported serious health hazards associated with living and working around the mines. The health and occupational hazards include inhalation of toxic waste, compromising cardiopulmonary well-being of the workers and inhabitants. It was also noted that poor cardiopulmonary well-being of miners has tendency to increase the MSDs injury rate which could be attributed to reduced immune response of the individuals to cumulative assault (Ochionero et al., 2014). Most studies in the U.S. mining sector consistently showed that MSDs could be responsible for more than 30% of all injuries reported by the workers. Currently, studies in sub-Saharan Africa that provided statistics on the extent of MSDs compared to other occupational injuries are difficult to find. The study by Kunda et al., (2015) in Zambia underground coalminers

observed 42.6% MSD prevalence rate among 202 recruited participants. Dias, (2014) among South African mineworkers found 47- 90% 95% CI prevalence rates across the different mine commodities (Coal, Gold and Platinum mines). Egwuonwu et al., (2013) reported prevalence rate of 83.4% among South-eastern Nigeria quarry miners and Tawiah et al., (2015) reported 85.5% prevalence of MSDs among Ghanaian goldminers. The few studies reviewed showed that countries or regional differences presented variations in prevalence rates of mineworkers' MSDs. The variation in the prevalence rates presented by the different studies observed, can be partly attributed to heterogeneity of workplace situations, as well as varying definitions in the studies regarding MSD, and this finding concurs with the findings of other reviews (Ahmed et al., 2017). More so, it was also noted that organizational policies and levels of mechanization could minimize the injury rates as they reduce the number of employees engaged in the sector (Moore et al., 2008 & Herberger, 2013). Some of the studies not reviewed are captured in Table 2.1 and 2.2 earlier presented in a summarized format.

2.6: Psychosocial Risks Factors of Musculoskeletal Disorders

There is evidence to support the fact that work organization and psychosocial risk factors play a role in the development of MSDs among workers (Carayon and Smith, 1994; Carayon et al., 1999; Dallner et al., 2000; & Stephens et al., 2016). Work organisation refers to the way in which work is structured, supervised (objective nature of work process) and processed (Cox & Griffiths, 2010). Psychosocial risk factors have been described as factors that potentially influence health that are associated with work/non-work environments, the job content or work tasks, relationships between people (stakeholders' interactions) and individual factors such

as age, beliefs, attitudes or personality traits (Dallner et al., 2000; & Cox & Griffiths, 2010).

Psychosocial stress is defined as an aversive element of work stress, resulting from the interaction between humans, their job content and context in which the work occurs. Job context entails work organization and management, environmental and organizational conditions and partly the employees' competencies and needs. The job context also entails any form of interaction that can prove to be hazardous to employees' health through their perceptions and experiences are termed psychosocial risks (Hagberg et al., 2001; Cox et al., 2002; Das et al., 2018; & Coggon et al., 2018). Previous research has shown that the long-term interaction of psychosocial risk factors, alongside other work and personal-related factors, will contribute to work-related stress, which in turn causes MSDs (Pincus et al., 2015). Stress is defined as the consequence of adverse work conditions which could be associated with poor physical and mental health (Cox et al., 2000; Leka, Griffiths & Cox, 2003; WHO, 2010). There is empirical evidence of the link between work organization, psychosocial work factors and MSD among labourers (Carayon et al., 1999; Hagberg et al., 2001; Kortum, 2011; Coggon et al., 2013 & Nyantumbu, 2017). The studies have been carefully summarized in table 2.3 for details.

Table 2.3 Literature Review of Physical and Psychosocial Risk Factors on Neck and Upper Limb Pain

Study	Study design	Study group (Sample size)	Outcome measure	Diagnostic criteria	Results	Comparison
Bigos, et al. 1991.USA	Longitudinal, prospective cohort study with 4-years follow-up.	3,020 aircraft employees	individual physical, and psychosocial, risk factors for reporting acute back pain at work	Minnesota Multiphasic Personality Inventory	Work perceptions and certain psychosocial responses were more predictive of subsequent MSDs report. Subjects who stated that they "hardly ever" enjoyed their job tasks were 2.5 times more likely to report a back injury than subjects who "almost always" enjoyed their job tasks.	Subjects in the highest risk group had 3.3 times the number of reports in the lowest risk group
Bhattacherjee A, et al. 2007. USA	cross-sectional survey	516 underground coal miners	relationships of job tasks and living conditions with	Self-administered questionnaire on MSDs	The tasks with significant relative risks were: use of vibrating tools, pneumatic tools, bent trunk, awkward	Mining tasks and living conditions strongly increases MSDs

			MSDs complaints		work posture, heat, standing about and walking, job tasks for trunk and upper/lower limbs, pain caused by work, and muscular tiredness.	reports.
Bio et al, 2007 Ghana	cross sectional study	280 male underground gold miners	12-months prevalence of low back pain	Structured questionnaire administered through interviews	Prevalence of LBP was 67%. Increase in age was significantly associated with LBP Heavy physical work (77%), was identified as a major cause of LBP	Prevalence of LBP was highest among workers performing engineering (82%) duties
Bongers et al. 2002. Netherland	systematic review	36 epidemiological studies	review on the role of psychosocial factors on incidence of MSD	Methodological quality of all studies was assessed and levels of evidence were apriori defined.	The large majority of the studies reported an association between at least one work-related psychosocial factor and adverse upper extremity problems (UEP).	High job stress and non-work-related stress reactions are consistently associated with UEP

Devereux et al., 2004 UK.	Three-year prospective Cohort study	8000 workers, in 20 companies, across 11 industrial sectors	Physical and psychological risk factors at work increases MSD incidences	work stress and work-related musculoskeletal disorders	MSDs' incidences results from increase physical and mental stressors in the workplace	
(Van Den Heuvel et al., 2005) Netherland	Cohort study	34 participating companies in the Netherland's: employees with >1 year experience	Questionnaires on exposure as well as video observation	Adapted version of the Nordic questionnaire	3-year cumulative incidence rate of neck/upper limb symptoms (32%), neck/shoulder symptoms (24%) and elbow/wrist/hand symptom (15%)	High job demands Neck/shoulder symptoms Elbow/wrist/hand symptom Low social support of co-workers Elbow/wrist/hand symptom
Madan, et al. 2008 UK	cross-sectional survey	574 workers across six groups	MSDs health beliefs and expectations	Cultural differences for knowledge of	knowledge of repetitive strain injuries was 80 UK to 1	Manual workers 95% CI 5.4-59.1 Office workers

				repetitive strain injuries	Indian	95% CI 5.7-73.1
Da Costa, et al, 2010.	systematic review of recent longitudinal studies	1,761 non-duplicated articles were identified and screened, and 63 studies were reviewed	The search strategies combined terms for musculoskeletal disorders, work, and risk factors. Only case-control or cohort studies were included in the review.	The work-related MSDs risk factors were identified and organized based on the affected body part, type of risks (biomechanical, psychosocial, or individual) and level of evidence.	Identified risk factors with strong evidence includes: heavy physical work, smoking, high body mass index, high psychosocial work demands, and the presence of co-morbidities.	The most common reported risk factors with at least reasonable evidence for causing WMSD include excessive repetition, awkward postures, and heavy lifting.

2.7: Identification of Risk Factors Associated with Mining Operations

To identify risk/exposure factors of MSDs in a job involves consultation of stakeholders, who are made up of the employers, employees, customers of the end product of the operation, as well as the general public whose interest is most often represented by community leaders where the mine is situated and finally, the regulators of the sector (Werner et al., 2005). The individuals are seen as having stake in the activities of the sector where the organisation is operating (Vink et al., 2006). The elements that will indicate risk factors of ill health in the job, starts from identifying the presence of such ill health or disease among the workers, which is linked to demands of the work (Smedley et al., 2003). Manifestation of such disease or ill health usually leads to incapacitation of the workers from performing the job (Van Rijn et al., 2009). The whole process begins with fatigue associated task performance, which can be identified by evaluating the physical demands of the job on the workers (Palmer et al., 2007). The demands of task such as heavy lifting during manual tasks, due to high energy requirement of the job may lead to muscle fatigue associated with consistent interactions between force exertion and high repetition resulting in tissue inflammation and damage (Barbe et al., 2013). Muscle strain most times usually heals within a week with regular recovery bouts, MSDs will only develop in the absence of sufficient rest between bouts of muscle loading (Van Rijn et al., 2009). The workers may initially complain of difficulty performing the manual component of the task and discomfort (Palmer et al., 2007). The secondary risk factors include; organisational design deficits, work family conflicts, poor quality of work-life, poor interpersonal relationship between the various stakeholders during organizational interactions (Kortum, 2011 & Das et al., 2018).

2.8: Review of Related Studies in Literature

The study by Coggon, (2005) revealed that psychological factors play significant role in the occurrence of lower back pain (LBP), with a trend showing culturally determined differences in health beliefs and expectations about disability. The adverse beliefs about pain resulting from variations associated with nurture accounting for the large international disparity in MSDs prevalence. The study by Coggon et al. (2012) based on these wide variations in health beliefs and expectations about disability, proposed the Cultural and Psychosocial Influences in Disability study protocol (CUPID) and developed two questionnaires; the CUPID baseline and follow-up questionnaires to test the hypothesis in 18 countries. The studies by Coggon et al., (2013) compared prevalence of disabling low back pain (DLBP) and disabling wrist /hand pain (DWHP) among groups of workers performing similar physical activities in different cultural environments, and explored possible reasons behind the differences observed. The study was a cross-sectional survey conducted in 18 countries, using standardized (CUPID) questionnaires to unmask pain that interfered with everyday activities, as well as exposure to possible risk factors in 12,426 participants across 47 different occupational groups, mostly nurses and office workers. The study found that the 1-month prevalence DLBP in nurses ranged from 9.6% to 42.6%, and that of DWHP in office workers was between 2.2% to 31.6%. Coggon and his colleagues observed wide variations in disability rates at different anatomical sites and the commonest complaints being DLBP and DWHP for nurses and office workers respectively. The study revealed that there were wide variations in perceptions about occupational physical activities, psychosocial aspects of work, adverse health beliefs about MSDs prognosis and somatising tendencies across the different countries and occupational groups. Their study also found an 8-

fold difference in MSD prevalence rates which could be explained by environmental influences on participants' attitudes towards exposure factors, such as individual and socioeconomic risks faced by the various workers (Coggon et al., 2013a).

In a related longitudinal study among Iranian nurses and office workers, Vargas-Prada et al., (2013) aimed to determine possible predictors of LBP, with the findings demonstrating that age, adverse health beliefs about the work-relatedness of LBP, periodic changes in job content, somatising tendencies, poor mental health and time pressures at work, were the most common LBP predictors. Additionally, Coggon et al., (2013 b) explored definitions for multisite pain and compared its associations with risk factors for the different patterns of MSDs in 12410 adults from 47 occupational groups in 18 countries obtained during the CUPID study. They found evidence to support the fact that participants may have classified pain at multiple anatomical sites by the number of affected sites. This means that the extensive feeling of pain as a result of multiple MSDs' incidence introduces wide variations in perception especially with regard to associations with risk factors compared to pain that is limited to only one or few anatomical sites. The implication is that pain at one anatomical site may also have the propensity to drive pain at other anatomical sites with a different predisposing factor (Coggon et al., 2018). Furthermore, experiences of previous pain could act as a psychological trigger for an adverse perception about recent recurrent pain. In recent South African studies by Dias (2014) and Nyantumbu (2017), both conducted follow-up studies to examine incidence and prevalence of MSDs. Their findings showed that various socio-cultural factors were significantly associated with MSDs' occurrence among mineworkers, nurses and office workers respectively. The separate studies reported very high range of MSDs prevalence variations across the selected occupational groups from 54 to 94% and the highest

prevalence group was the mineworkers. Both studies found LBP to be the most persistent site for pain experienced across the different occupational groups. Their studies also supported the findings of Vargas-Prada et al., (2013) in that adverse health beliefs about the work-relatedness of LBP, periodic changes about job content, somatising tendencies, poor mental health and time pressures at work were the most common predictors of LBP.

The study by Coggon et al. (2018) explored further the wide international variations in DLBP, in 11710 participants from 45 different occupational groups in 18 countries and hypothesised that the drivers of the variations were not associated with risk factors specific to the spine rather the risk factors that predispose generally to MSDs may be cumulatively responsible. The meaning is that wider propensities of DLBP were linked to the number of other anatomical sites that had been previously reported to have MSDs in the past 12-months prior to baseline, making the workers more susceptible to somatise of LBP (Coggon et al., 2018). The findings from all of the reviewed studies implicated several physical, biomechanical and psychosocial variables as major contributors to MSDs in the different occupational groups studied without emphasis on the role of workplace context.

2.9: The Influence of Job Insecurity on Workers' Health and Wellbeing

Mental disorders such as depression associated with job insecurity may be a contributory factor to MSDs among workers (Aliyu & Shehu, 2007). It is reported that sustained endurance of structural occupational challenges particular to specific workplaces could contribute to the development of psychological disorders (Tennant, 2001). This assertion also agrees with general life event stress, which has linked poor socioeconomic determinants to increased suicidal tendencies in the general

working population (Pincus et al., 2013). Previous research has also found that long term exposure to work-related stress increases the risk of burnout, cardiovascular diseases and actual coordination during task performance (Schulte, 2006&Das et al., 2018). The combined impact of job insecurity and effort-reward imbalance has been associated with poorer physical and mental health among groups of casual workers (Stansfeld & Candy, 2006). Studies in the United Kingdom have also indicated a potential link between work-related stress and musculoskeletal disorders, which is known as the two leading occupational health problems of workplaces (Devereux et al., 2004 & Kortum, 2011). The study by Park & Lee (2009) in the Republic of Korea reported an increase in work-related MSDs associated with psychosocial risks, awkward working postures and repetitive movements, mostly mediated through poor health-seeking behaviours of sufferers. There is evidence also to suggest that economic challenges in middle-income countries such as repeated re-organizing, and downsizing of workforce causing job insecurity, has become very common and is related to poor health outcomes among workers (Theorell et al., 2003; Westerlund et al., 2004; & Ferri et al., 2007). Therefore, workers exposed to chronic job insecurity are more likely to report poor physical and mental health as compared to those with secure jobs (Ferrie et al., 2002; & Park & Lee, 2009). The implication is that poor physical and psychological health of workers have continued to interact with rising inequalities to suppress their recovery capabilities from repetitive strain injuries, thereby leading to high MSD complaint (Kivimaki et al., 2015).

2.10: The Influence of Elevated Psychosocial Stress on MSDs' Development

Palmer et al. (2005) in a United Kingdom study among 1,958,000 workers reported suffering from an illness that was caused or made worse by their current or past work. Musculoskeletal disorders accounted for about 52% of the total work-related

illness, while 21% reported that psychosocial stress (stress, depression or anxiety) with other ill-health such as stroke and other non-communicable diseases accounting for 27% of the remaining complaints of the workers. Similarly, a total of 523,000 new cases of work-related illness that were reported during the longitudinal survey period, showed that the two types of disorder accounted for 73% of cases (37% were related to stress, depression or anxiety, and 36% were related to MSDs). The implication is that MSDs and psychosocial stress had the highest incidence rate among the UK workforce. The development motivated practitioners of health and safety of workers globally to seek for a possible link between psychosocial stress and MSDs, both in terms of common risk factors and the extent to which the conditions themselves are mutually related (Palmer et al., 2005).

The International Labour Organisation (ILO) in (2005) reported that stress was both a health condition and an outcome measure with stress and musculoskeletal disorders being the most common work-related ill-health among working population globally. ILO is recommending the establishment of cooperative clusters in the world of work so as to assuage the rising challenges of unemployment and underemployment, job insecurity, widening inequalities and psychological violence (ILO, 2015). The Health and Safety Executive's Management Standards have linked elevated psychosocial stress to the following factors: high workload, job design exceeding an individual's capacity, poor task design or poor physical environment (Kivimaki et al., 2002), low decision latitude/employee discretion over tasks, poor organisational incentives, poor human interactions (example; bullying, harassment) and role ambiguity as well as poor management of periodic changes in work processes (Pincus et al., 2002 & Lang et al., 2012).

These psychosocial risks factors interact with work context factors or work task demands, such as physiological demands of tasks, task repetition, low decision latitude, job dissatisfaction, poor role clarity or social support at work to mediate MSDs' incidence (Wadall, 2000; National Research Council and Institute of Medicine, 2001; & Devereux,2004). Studies have also revealed that lower back pain (LBP), and psychosocial risk factors are particularly associated with the individuals' trait (Coggon et al., 2018). Individuals' trait contextually represents pain beliefs or somatisation that have been identified to predict the persistence of disability, thereby adjusting the perception and progression of acute episodes into chronic cases (Coggon et al., 2018). There is evidence in recent literature to suggest that both MSDs and psychosocial stress share common risk factors associated with the onset of the disorders (Stephen et al., 2016). For instance, high perceived job stress has been consistently associated with upper extremity problems (Arnow et al. 2006), and a significantly higher proportion of individuals with major depressive disorder (MDD) have been found to report disabling chronic low back pain than those without MDD (41% of those with MDD versus 10% of those without MDD (Feyer et al, 2000). Additionally, prospective epidemiological studies by Feyer et al. (2000) and Arnow et al. (2006) have provided evidence for a predictive relationship between symptoms of psychological strain and LBP. Similarly, Waghorn & Lloyd (2006) have identified psychological distress as the only pre-existing influence on new episodes of LBP other than a previous history of LBP.

There is evidence to suggest that the specific routes by which psychological stress/strain might accentuate the occurrence of MSDs could be due to musculoskeletal discomfort through the physiological and biological systems, affecting internal tolerance of the individual or their soft tissues (Lundberg, 2002).

This is to say that psychological stress and/or strain may induce physiological stress and muscle tension, which may result in adverse changes in immune system response, or even changes in adrenaline or noradrenaline (Theorell, 1996; Lundberg, 2002; & Kortum, 2011). The muscles are physiologically adapted to resist sudden onset of stress by reflex tension contraction and it is called guarding against injury and pain, which is normal on acute cases of stress.

However, during cumulative chronic stress syndromes, the muscles reflexively goes into a more or less constant state of guardedness leading sustained release of adrenalin (Tsigos et al., 2016). The physiological response triggers other reactions of the body especially promotion of stress-related disorders such as migraine and chronic musculoskeletal pain of the low back, shoulders, neck and upper extremities (Chrousos, 2009). Studies have also suggested that increased levels of psychological stress may cause individuals to perform tasks differently (for example working under tension and fatigue), leading to elevated biomechanical loading of the working muscles (Marras, 2004; Candice, 2006; & Egwuonwu et al., 2019). There is also the possibility that poor psychosocial environment may increase symptom reporting, or variations in the experience of pain, impairment or disability, through different behavioural and cognitive responses (National Research Council and Institute of Medicine, 2001; & Coggon et al., 2018).

2.11: The Challenges of Mining and Quarrying in Nigeria

Mining and quarrying are the processes of extraction of naturally occurring stone or minerals such as coal, ores, crude petroleum and natural gas from the earth. Mining is one of the oldest economic activities of early mankind (Dolley, 2007). It can be traced to clay extraction, and later other metals for the production of cosmetics,

crude implements and utensils (Murphy, 2009). In Nigeria, extraction records show that organised exploration activities did not commence until 1903, when the British Secretary of State for Colonies conducted mineral surveys of the Southern and Northern Protectorates (Nwibo et al. 2012). The Nigerian mining sector is an emerging economic alternative to the nation's dependency on oil and gas to drive the economy, which was born out of the economic diversification policy suggestion of International Monetary Fund (IMF) to countries in order to enhance macroeconomic indices (World Investment Report, 2015). Before 2004, the sector was mostly run by artisan and small-scale mining operators due to long term neglect by the government as a result of oil boom (Oginyi, 2010). The mining sector currently contributes just 1% with approximately USD 1.4billion to Nigeria's nominal GDP (National Bureau Of Statistics, 2015). It also accounts for about 0.3% of national employment and 0.02% of export goods (Nigerian gross domestic report Q3, 2017).

In Nigeria, there are about 500 mining locations comprising of about 140 quarry mines, 80 kaolin mines and 20 coal mines (National Bureau Of Statistics, 2017). Nigeria has significant coal and iron ore reserves as well as gold deposits, uranium, tantalum and rare earth element (REE) showings throughout the country. Uranium is found in 6 of the 36 states in the country. Quarry mining which is the largest mining activity in the Nigerian context continues to be plagued by lots of uncertainties due to the absence of sustainable policy framework associated with weak regulatory institutions and lack of proactive cultivation of relationships among stakeholders (Olusegun et al., 2009). The socioeconomic challenges of the mining context faced by actors are characterized by multiple combination of factors, including health, environment and poor policies.

2.11.1: Quarry Mining Context in Nigeria

The increased demands of rock extracts in Nigeria due to recent attempts by the federal government to resolve cumulative infrastructural deficit have resulted in flourishing quarry-mining operations (Sufiyan and Ogunleye, 2012 & Vingard, 2013). Mining companies have increased recruitment of both skilled and unskilled workers with a bid to meet up with supply of their customers, so as to provide improved economic returns for shareholders (NBS, 2015). The interactions among various stakeholders during mining operations may have contributed indirectly to some occupational challenges faced by labourers engaged in the sector (Coelho et al., 2011). Nigerian quarry mining operations have been previously described as an undesirable work, with adverse working conditions (Onwe, 2014). It is particularly so because of the large informal employment arrangements utilized in engaging quarry miners, as well as the countless environmental risk factors that continue to be prevalent in quarry mining in Nigeria (Adiuku-Brown, 2001; Bose, 2004 &Onwe, 2014). The environmental impacts include flooding of the open pit mines, during rainy season, usually left un-dredged, due to high-cost and intensity of rain in the tropical rainforest where most mines are located (Ugbogu et al., 2009). Air pollution, heat stress and rough landscape/terrain make work physically challenging and also contribute to rapid wear and tear of personnel protective equipment (Tawaih et al., 2015). Despite these challenges, there are little or no health insurance policy coverage for the quarry miners, casualization of workforce and poor remuneration (Bose, 2004 & Onwe, 2014). The study by Egwuonwu et al. (2013) is presently the only research report available to describe MSDs among Nigerian quarry miners. The study reported that mineworkers had a 12-months prevalence of 83.45% of MSDs with lower back pain accounting for the highest complaints of the miners. The

Nigerian Institute of Safety and Health (2016) allocated $9 million US dollars as compensation claims in the country for year 2015, due to MSDs accruing from quarry mining occupational hazard. The significant cost of MSDs is a serious concern to shareholders and other stakeholders, which justifies the need to determine the role of stakeholders on MSDs challenge in the sector.

2.12: Studies on Musculoskeletal Disorders in Nigeria

Musculoskeletal disorders of workers vary widely globally, depending among other things on the geographical location, the type of occupational situations and the patterns of work (Kortum, 2011). In Nigeria, MSDs account for approximately 5.6% of years living with disability, which is higher than the global figure for years adjusted for disability (Aliyu and Shehu, 2006 & Louw, 2007). Previous studies in Nigeria have shown that quarry mining occupation is the most hazardous occupation in Nigeria with various forms of mishaps. These include traumatic injuries from stone cuts 68.9%, respiratory symptoms 52.3%, eye irritations 14.9%; MSDs accounting for about 11.3% (Sufiya and Ogunleye, 2012; Olusegun et al., 2009; &Aliyu and Shehu, 2006). The estimated one-year MSDs' incidence presently among developed countries is reported to be accounting for two-thirds of work-related MSDs ranging from 14 to 58 % (Aptel et al., 2002; Anderson et al., 2007; Yu et al., 2012; Da costa and Viera, 2010; & Reddy et al., 2017).

Similarly, lifetime prevalence estimates for workers in Nigerian workplaces varied from 45% to 86%, whilst those for developed countries ranged from 26 - 60% (Akinpelu et al., 2010; Abou-ElWafa et al., 2012; Vingard, 2013 & Nunes et al., 2015). Between 2006 and 2018, it was reported that, on the average, approximately 450,000 work-related occupational mishaps were reported annually with more than two thirds of fatalities occurring in industrial sectors and about a further half of the

numbers reported in the mines (Asuzu, 2006; Oginyi, 2010; & Vingard, 2013). However, there is still a paucity of data on number of workers with occupational incidence of MSDs due to lack of statistics arising from household survey in Nigeria (Onwujekwe et al., 2015).

2.13: Influence of Stakeholders on Organisational Performance and Employees' Wellbeing

Modern stakeholder theory could be traced to Freeman's seminal work: "Strategic Management: A stakeholder Approach" (1984) (Shankman, 1999). According to Freeman, the word "stakeholder" was used for the first time in 1963 in an internal memorandum at the Stanford Research Institute (SRI); when the much quoted SRI definition of stakeholders was reported to be: "those groups without whose support the organization would cease to exist" (Donaldson and Preston 1995: 25; Mitchel et al., 1997). Meanwhile, stakeholders have also been classified earlier as "four parties to any business in order of their importance": "customers, employees, community, and stockholders" (Hummels, 1998; 1403). It is also believed that if the appropriate needs and interests of the first three groups were looked after effectively, the company's stakeholders would benefit in the long run (Marstein, 2003). Freeman did not originally appear to portray the stakeholder concept from a broader philosophical or ethical basis. He has later pointed out that the term "stakeholder" actually was meant to generalize the notion of stockholder as the only group to whom management needed to be responsive (Freeman 1994). Freeman was of the opinion that the modern organization is affected by a large set of forces. At minimum, these forces comprise stockholders, customers, employees, suppliers and management which summarily are referred to as the primary stakeholders. Characteristic of these groups of stakeholders is that they are vital to the survival and success of the

organization (Marstein, 2003). Freeman also enlarged the list of stakeholders with other possible secondary stakeholders, such as the local community, the media, the courts, the government, special interest groups, the general public, and society (Kakabadse et al., 2005). From this observation, Freeman (Freeman 1994) derives his contention from the belief that “the responsibility of management is to take into account the different views and interests of any group or individual who can affect or is affected by the achievement of an organization’s purpose” (Kakabadse et al., 2005).

There is evidence to suggest that systematic managerial attention to stakeholders’ interests is necessary for a firm’s success (Marstein, 2003). Within the conceptual confines of stakeholder theory, it is important to have a clear definition of the term stakeholder as it applies to the context of an industry. In industries, a stakeholder is “any group or individual who can affect or is affected by the achievement of the industries’ objective” (Marstein, 2003: 85). By this definition, management choice is a function of the various categories of stakeholder’s influences. Thus, in a generic sense of the stakeholder concerns, organizations are obligated to address a set of stakeholder expectations (Kakabadse et al., 2005). The fundamental assumption of the stakeholder model, however, is that the ultimate objective of organizational decisions is associated with productivity output of the industry. Industries view their stakeholders as part of an environment that must be managed in order to assure revenue, employee’s health and wellbeing, profits and ultimately returns to shareholders (Hansen, 2001). Attention to stakeholders’ concerns may thus help a firm avoid decisions that might prompt stakeholders to undermine its objectives. This possibility arises because it is the stakeholder that control resources needed to facilitate the implementation of corporate decisions. In short, stakeholder

management is a means to an end (Berman et al. 1999). Stakeholder management is a means to effective organisational communication and productivity performance index (Roux, 2014).

2.13.1: Organizational Communication and Culture

Organizational communication refers to how industries communicate in their internal environment with their employees and other stakeholders (clients, customers, vendors, suppliers, media, and general public) outside its environment (Borca and Baesu, 2014). It is stated that good communication skills improve the organizational performance (Roux, 2014) and that an efficient communication at the workplace is significant for the success or failure of an organization (Mitrofan and Bulborea, 2013). Effective stakeholder engagement within an organisation tends to motivate employees and other stakeholders to work cooperatively and more efficiently (Realyvasquez et al., 2015). However, poor stakeholder engagement will likely contribute to poor performance and poor wellbeing of organisational stakeholders (Luthans, 2005). The analysis is that for a firm to maintain corporate sustainability and growth it needs to adequately engage stakeholders to proffer solutions to their concerns in the firm's activities (Banerjee, 2000 & Banerjee, 2003).

2.13.2: Stakeholders' Interaction and Relationships in the Workplaces

Stakeholders are groups or individuals that have legitimate claim on a firm (Mitchell et al. 1997). They interact with the firm and bear some forms of risk as a result of their investment of capital; human or financial resources in a firm (Marstein 2003). Stakeholders' interactions in the present study implies the relationship that exists among the various groups or individuals with interest in the mining activities within the locality of the firm (Marstein 2003). It is established that organisational decisions

(positive or negative) are influenced by stakeholders' pressure (Mitchell et al. 1997). There is also evidence to support the concept of differentiated compliance with competing constituent interest of the various stakeholder groups due to power dynamics and level of stake the groups may have on the firm (Bao et al. 2016).

There is also evidence to support the concept of differentiated compliance with competing constituent interest of the various stakeholder groups due to power dynamics and level of stake the groups may have on the firm (Evan and Freeman, 2005; 102). Based on Freeman's (2010) stakeholder theory, it is compulsory for every firm to be accountable to others, believed to have interest (stake) or affected by the firm's activities. The differentiated compliance as a result of competing interests of stakeholders could be explained by the stakeholder theory for a profit making organisation. Most profit making firms have their emphasis on growing the firm's profit, and little interest on corporate social responsibilities (Freeman et al. 2010; & Skouloudis et al., 2013). The idea is that the firm leans more towards shareholders' interest and pay little attention to social stakeholders such as actors and community interest so as to maximise profit (Bao et al. 2016 & Roquelaure, 2016). For instance, management of the firms, most times are interested in profits from productivity sales. The customers are more concerned with the firms' supply and value chain, the government and community leaders may be interested in the firm paying more royalty from its mining activities than concern with workers' health risks (Marstein 2003; Roquelaure, 2016). The effect of poor stakeholder's relationship in organisational interaction are unfavourable work conditions, which could influence the persistence of MSDs symptoms among workers (Torp et al., 2001).

There could be increased time pressure at work – leading to low job decision latitude, which may consequently affect the mineworkers' health such as elevation of work-related psychosocial stress, leading to chronic fatigue syndromes and MSDs. There could also be lack of organisational will and decisions to comply with competing constituent interest of other stakeholders aside mineworkers (Bao et al. 2016; Roquelaure 2016).

2.14: Identification and Mapping of Stakeholders

Developing systematic approaches for stakeholder identification and mapping often appears to have been accorded relatively little attention in literature, making their engagement problematic (Mathur et al., 2007). Effective stakeholder's engagement requires that the conflicting interest of the various stakeholders are represented in the context specific and participatory interpretation of their core values for any desirable course of action in conducting project (Rowe and Shepherd, 2002). The implication is that early identification of relevant stakeholders is crucial to achieve effective stakeholder's engagement so as to avoid inequitable outcomes in the project (McAdam et al., 2005).

Studies have shown that there are two distinct approaches to stakeholder involvement in focus group discussion project, which is broadly classified as – consumerist and democratic (Ridley and Jones, 2002). The democratic involvement is most efficient especially where there are no clear conflict of interest guiding the research. The process stipulates that mapping out the levels of concerns of the different stakeholders in relation to power dynamics existing within stakeholder hierarchy is inevitable in determining the choice of engagement techniques at each stage of the focus group discussion. (Doelle and Sinclair, 2006). Secondly,

identifying levels of influence within stakeholder hierarchy involved in the focus group as well as communication strategies to deploy is a prerequisite to manage potential conflicts (Doelle and Sinclair, 2006). Effective communication strategy is either oral or written depending on the nature of relationship existing within the target audience. Additionally, to manage potential conflicts of interest requires that an appraisal of the relationships (cordial or hostile) between the categories of stakeholders is conducted using pre-workshops (Mathur et al., 2007). See Figure 2.1 below for a schematic visualisation of the process.

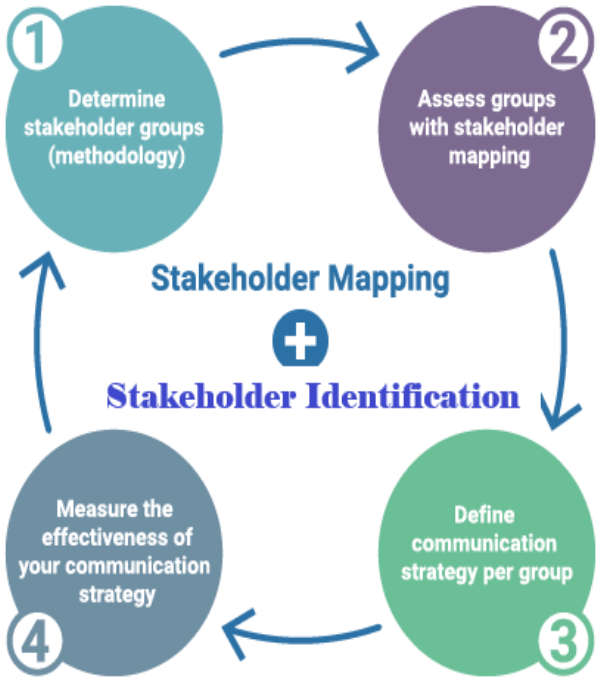


Figure 2.1: Schematic diagram of Stakeholder Identification and Mapping (Adapted from, Borealis (2018) and Published by Sarah Busque In The Article 4 Step guide to a good Stakeholder Engagement)

2.15: Stakeholder Analysis

The state of science publication by Dul et al., (2012) had earlier analysed stakeholders needed in the discipline of human factor according to International Ergonomics Association (IEA) position statement in Grahamstown, South Africa (2010). Stakeholders were categorized into two broad category (a) Main, dominant or primary stakeholders and (b) Secondary or non-dominant stakeholders.

Primary stakeholders: The main stakeholders are sub-divided into the following; system actors, system experts, system decision makers, and system product users.

Secondary or non-dominant stakeholders: Meanwhile the non-dominant stakeholders are sub-divided into the following; system influencers, shareholders, government inspectors, community leaders and labour union executives. The main stakeholders have been described as those directly involved in work performance in the mines, which excludes system product users or customers and sales agents. Meanwhile the non-dominant stakeholders included every other stakeholder except the main stakeholders (Jansen, 2005).

2.16: Complex Interactions within Components of Biopsychosocial Model Mediating Psychosocial Stress and Musculoskeletal Disorders

The multidimensional biopsychosocial model of work-related musculoskeletal disorders postulates theoretical underpinnings which is centred on the following organizational variables, organizational communication and culture, which is determined by the economic and socio-political environments of the firm (Roquelaure, 2016). The robustness of the firm's organizational communication and culture defines its performance indicators. Similarly, the firm's management practices also influence the work organisation or stakeholders' relationship and interactions. That is to say that the relationship between the various stakeholders depends on the

working conditions faced by the workers. Existence of good working relationship is defined by a positive interaction between stakeholders of the firm (Jansen, 2005). The determinants of positive or negative interactions between the firm's stakeholders have a causal link to biomechanical and psychosocial factors of MSDs as described in figure 2.2 (Roquelaure, 2016). The biomechanical risk factors are associated with the physical and cognitive demands of work. There is need for a balance between the imposed workload with available resources such as capabilities of actors and decision makers to deal with work performance constraints (Roquelaure, 2016). More so, psychosocial risks associated with working conditions, is determined by the level of stress and the individual characteristics of actors and decision makers to cope with work stress. The consequences of mismatch in the various variable put forward in biopsychosocial model is the causal link to MSDs rate in workplaces, which interferes with health and well-being of the dominant stakeholders as well as the firms' productivity performance indices (Dul et al., 2012 and Roquelaure, 2016). However, sub-optimal performance of dominant stakeholders has direct effect on shareholders' stake (non-dominant stakeholders) of the firm (Jansen, 2005).

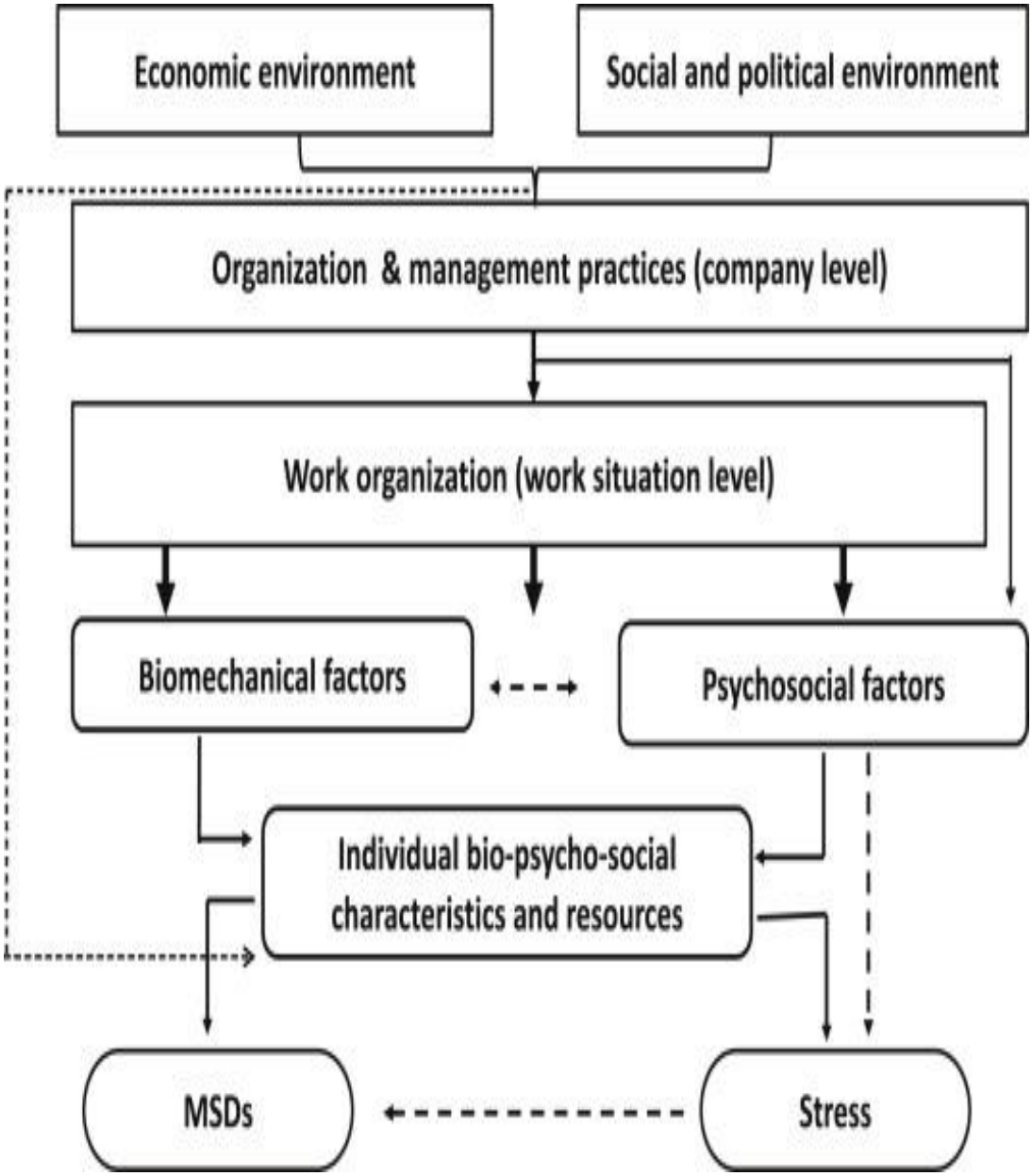


Figure 2.2: Multidimensional biopsychosocial model of work-related MSDs (Adapted from Roquelaure, (2016) and published by Science Direct Elsevier Press)

CHAPTER THREE
MATERIALS AND METHODS

3.1: Introduction

Presently, emphasis has been on visible' threats to workers' health caused by their physical working environment, neglecting organisational policy and practices influencing stakeholders' interactions. It is known that interactions between physical and psychosocial risk factors predispose workers to musculoskeletal disorders. However, the role of poor stakeholders' interactions as means of mitigating psychosocial stress is yet to be explored in the Nigerian quarry mining context. In this chapter, a description of the study setting and the study population will be provided. Furthermore, the tools used to assess musculoskeletal disorders (MSDs) and the risk factors for MSDs, quality control methods employed, data management and analyses will be presented.

3.2: Study Design

The study was a parallel mixed method design with two distinct phases (1 & 2), outlined briefly below and graphically represented in Figure 3.1. The first phase focused on the determination of MSD incidence among quarry miners in two sites with a 6-month follow-up survey period, which was compared with an age-matched control group. The second phase involved focus group discussion sessions using a semi structured interview with quarry mine stakeholders from two selected mines that aimed to gain insight into stakeholders' perspectives on the role of their interactions during work related activities regarding MSDs' incidence.

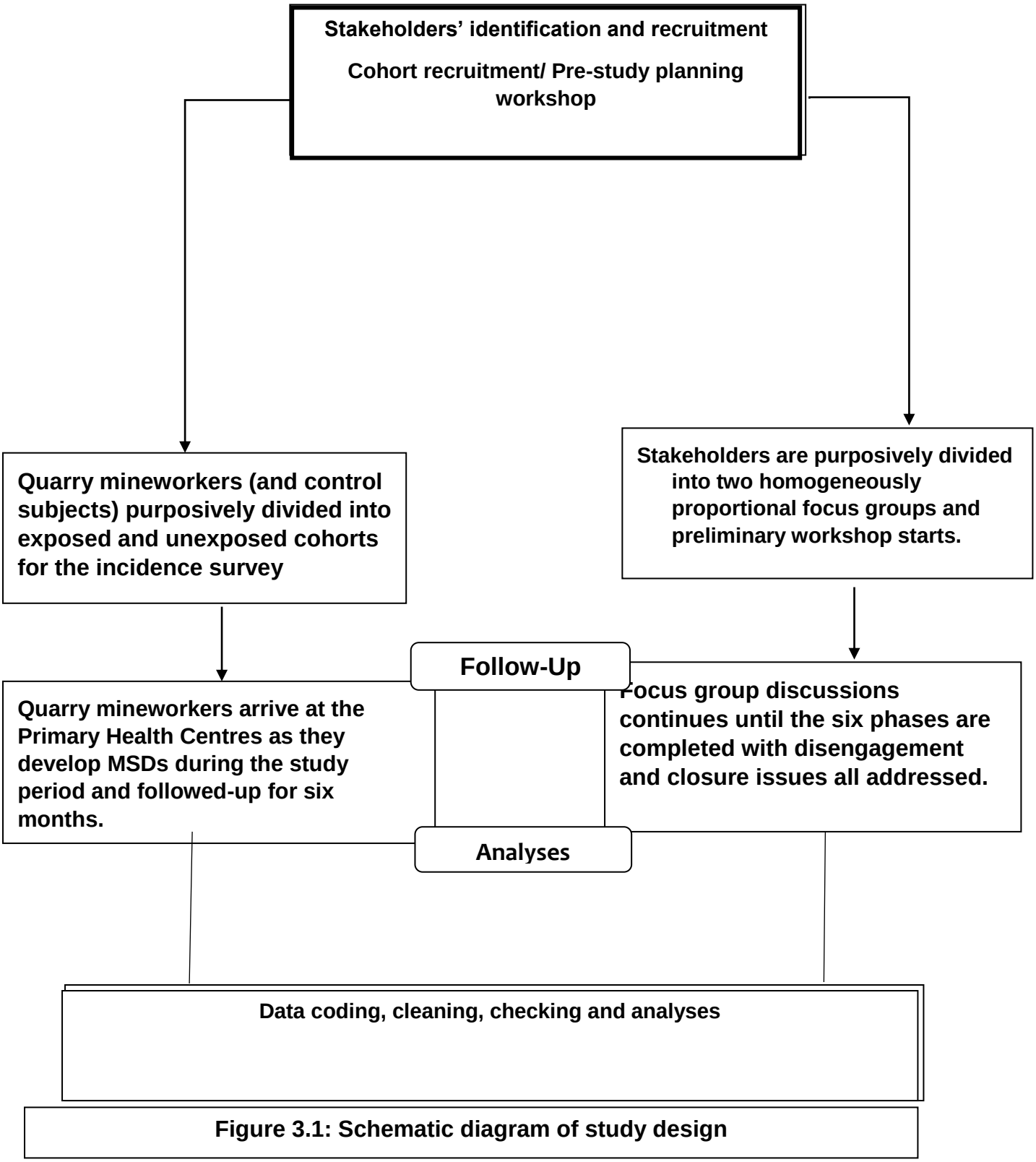


Figure 3.1: Schematic diagram of study design

The phase one or incidence survey was commenced by preliminary sampling of study participants at baseline to ensure that subjects were all free from MSDs. This process was tagged ‘cohort and stakeholder identification phase’ in the schematic diagram (Figure 3.1). Subsequently, the incidence survey commenced as mineworkers continue with work until they arrive at the nearby Primary Health Centre for medical complaints of back, wrist/hand, shoulder, knee and neck pains during the six-month study period. A six-month follow-up was conducted on every participant that reported symptom(s) of MSDs (Figure 3.1). The Phase 2 study began two months after the commencement of the incidence survey and lasted for five months with a two weeks break following each focus group discussion. There was a total of ten engagements with stakeholders. The data from both phases was integrated to enable synergistic utilization of robust evidence for identifying risk factors of diseases (MSDs) in the mine workplace (Wisdom and Creswell, 2013).

3.3.1: Pre-Study Planning and Overview of Previous Pilot Study

A pilot study was conducted during early commencement of the PhD study (precisely July 2015) in the same mines identified for the main study. It was necessary as a preliminary study to conduct ergonomic task and activity analyses of the different mining jobs from several work shifts. The task analyses showed that mining jobs required the workers involved to perform the following physical activities: overhead reaching, bending and waist twisting to carry heavy load and manual material handling, working underground in squatting and kneeling postures as well as pushing and pulling with hands above shoulder level when operating equipment. The task analyses were aimed at determining the job description of the study participants as well as description of typical physical activities associated with mining tasks. The details of the task description could be found in (Table 3.1).

Table 3.1: The Physical Activities of Mineworkers with a Musculoskeletal Disorder (MSD)

Description of drilling tasks	**Physical activities description**
Production drilling and conventional mining (jumbo drill and long-hole drill) (n = 65): horizontal drilling straight into the rock face and drilling straight down into the rock floor	Overhead reaching Bending and waist twisting while lifting load. Shovelling, barring and working in tunnels kneeling or squatting, repeated bending and straightening of the elbow, working underground
Description of blasting tasks	**Physical activities description**
Rock blasting and manual bolting (n = 65)—drilling to install explosives and charging explosives to disintegrate rocks into sizeable pieces of stones for transportation, excavator and jackhammer operation.	Overhead reaching Bending and waist twisting during load carriage. Shovelling, barring, working in tunnels kneeling or squatting repeated bending and straightening of the elbow, use of vibratory tools.
Description of crushing tasks	**Physical activities description**
Crusher machine operation (n = 65)—manual breaking and sorting of stones in the crusher and changing of crusher belts for dimension stone cutting into sizes.	Overhead reaching, bending and waist twisting during load carrying. The use of vibratory tools and working above ground. Climbing up or down staircase
Description of other tasks	**Physical activities description**
Production ore transportation (load-haul-dump vehicle) (n = 51)—operating a long- haul dump mining vehicle that removes excavated ore and debris. General services mining support jobs, including welding, pipe installation, vehicle and machine maintenance duties.	Climbing up or down staircase as well as pushing and pulling with hands above shoulder level, when operating equipment. Some element of squatting, repeated bending and straightening of the elbow, use of vibratory tools

3.3.2: Pre-Study Planning and Mine Selection

As part of the planning phase of the overall study, a workshop was held in collaboration with the Nigerian Federal Ministry of Mines and Steel Development on work-related injuries in mining generally. The workshop was relevant for the establishment of relationships, to propose the study and also for the identification of stakeholders. The industry shareholder, customer and sales agent representatives, mineworkers, labour union representatives, managerial staff of two selected Crushed Rock Quarries mines in Ishiagu Ebonyi State, South Eastern Nigeria. Health compliance inspectors from the mines and steel ministries with mine clinic workers were all in attendance. The workshop was held during the mining stakeholders' biennial council congress to elect their new leaders in the South-East zonal headquarters in Enugu, Nigeria.

The workshop was conducted to deliberate on the work-related MSDs in the mining context and on the practical aspects of the study design. Additional areas of focus during the workshops included MSDs diagnostic criteria for classifying incidences, selection of suitable control participants, the role of stakeholder interactions regarding incidence of MSDs, psychosocial influences important in the industry and confounding risks likely to interfere with data collection and analyses. The definition of what the diagnostic criterion is was necessary to exclude complaints arising from acute traumatic injury and comorbidities of MSDs. The two mines were selected using convenience sampling, on an invitation response basis for participation in the study. Additionally, the mines were also considered from the cluster of mines for providing an in-house retainer-ship medical service to miners as well as the existence of active and recognized labour union activity. The absence of in-house retainer-ship medical services was due to limited resources available to mine

owners, making it impossible to consider cluster or stratified sampling technique for mine selection. The researcher was also employed as an industrial training staff member for both mines two months before the commencement of the study. The researcher earlier conducted previous studies in the same mines during the pilot study, which also aided in maintaining a very good rapport with the key stakeholders.

3.3.3: Study Settings

The two selected mines were Crushed Rock and Setraco Quarries located in Ishiagu community, Ivo local government area of Ebonyi State, South-Eastern, Nigeria. The mine clusters situated in this community, totalling about 12 were first established on the 13th May, 1976 to carry out quarry and stone mining exploration in Nigerian. The first to arrive the host community was a conglomerate known as Crushed Rock Quarries, Ishiagu, which is a Nigerian-German outfit that specialized in exploration, stone drilling, excavation and supply of crushed granite aggregates, the sizes of which range from 0 - 50mm and above depending on customer's requirements.

Meanwhile, Setraco Quarries is a subsidiary of Setraco Construction Company. It is a Nigerian indigenous company involved in mining and other solid mineral raw materials produced for its own construction company needs. The mines are located on the western border of the town which shares boundary with a neighbouring village in Akwa-Ibom state South-South Nigeria with the largest off-shore oil exploration in the country. The land mass of the mines covers over 400 hectares of hilly land comprised mostly of heavy granite rock and kaolin formations with few community dwellers east of the mines. The mines are open-pit types with the largest population of mine workers/stakeholders in south-eastern Nigeria. They are over 500-800 meters in depth and are accessible via double lane rocky drive way into each of the

pit underground. The exploration/excavation during the rainy season is expensive due to cost of water drainage, since the open pits usually serves as underwater storage from all flood descending into the pit, from surrounding hills. The mines are usually very hot during the summer months with limited atmospheric air due to massive deforestation around the area.

3.4: Phase 1 Musculoskeletal Disorders Incidence Survey

The phase 1 was an observational longitudinal cohort incidence survey with an initial retrospective inquiry of MSDs history of all recruited participants with a 6-month's prospective follow-up design. The study involved two geographic cohorts categorized as the exposed group (mineworkers) and proportionately sampled unexposed group (age and sex matched College of Education students) residing in the community where the selected mine clusters were located. The control group participants were adjudged to be sedentary based on responses to the physical activity and sedentary behaviour assessment questionnaire (PASBAQ) categorizing them as occupationally inactive (see Appendix VI for details of the results). The control participants were selected if they were sedentary based on spending less than 30 minutes per week in moderate-to-vigorous physical activity. The choice of physically inactive control participants is to rule out the possibility of the control cohort performing activities that are as physically demanding as mining activity, which may expose them to similar risk factors and risk of injury or MSD development (Portney & Watkins, 2013).

The rationale for the 6-months instead of a 12-month follow up was to minimize drop out of participants due to longer duration of the study which may arise from boredom minimizing loss to follow-up and consequently bias of data collected (Olson, 2001). Previous similar studies such as that of Anderson et al., (2007) and Boshman et al.,

(2012) both conducted a 12-month follow-up among general working population and construction workers respectively. Researchers are generally advised in prospective cohort studies to maintain a strong rapport and intensive contact with participants, considering that studies which adopt this design are particularly prone to attrition (Portney & Watkins, 2013). Moreover, the reduction in length of follow up time does not significantly affect outcomes in a prospective cohort design for exposure sample presenting with acute cases (Vandenbroucke et al., 2007).

3.5: Data Collection Tools: Questionnaires and Outline

3. 5.1: Cultural and Psychosocial Influence on Disability Questionnaires (CUPID)

The CUPID questionnaires were developed originally for an international study conducted in 18 countries excluding Nigeria (Coggon et al., 2012). The psychometric properties of the instrument were also previously determined in a study by Coggon et al., (2013). The CUPID baseline questionnaire had six domains with fifty-one items that sought information on demographic characteristics of participants; educational level, height, smoking habits, current occupation, pain in different anatomical regions and associated disability for activities of daily living; awareness of others with MSDs, adverse belief concerning MSDs; physical risk factors, occupation, service record in current occupation and a profile of typical risks associated with the occupation. Lastly, questions to determine distress from common somatic symptoms, mental health and sickness absence from work in the past 12 months due to MSDs were also recorded to determine psychosocial risks' factors. Tribal identity was used as a surrogate for ethnicity or culture. In Nigeria, cultural differences are associated with tribal differences.

The follow-up questionnaire is a 25-item instrument that sought information about any change of job and the reasons; recent pain in different anatomical regions and associated disability that affected tasks of daily living; distress from common somatic symptoms; mental health and sickness absence in the past 6months for musculoskeletal and other reasons. The follow-up questionnaire was the same as the baseline except for the first and fifth domains. The difference in the follow-up questionnaire was that it had additional information to establish MSD status of the control cohort. The questions in the fifth domain were similar to that of the baseline except on the question aimed at inquiring whether the control had presented with an MSD within the study period and which region of the body had been affected. Due to the fact that the CUPID has previously not been utilized in the Nigerian context. Prior to the present study, forward and backward translations of the instrument from Igbo to English languages were performed with experts' help and attached as Appendix IV.

3.5.2: Cross-cultural Adaptation and Translation of CUPID Questionnaires

The questionnaires were validated and cross-culturally adapted from English to Igbo-language for the purpose of the study. The translation from English language to Igbo language and back translation was performed by language experts from Nnamdi Azikiwe University, Department of Linguistics in Nigeria. The cross-cultural validation and adaptation of questionnaires was necessary to avoid systematic bias arising from instrument misinterpretation during data collection from participants that are different from the originating countries of the questionnaires. The misinterpretation may arise due to effects of differences in word interpretation and language (Ferrari et al, 2010; Coggon et al., 2012).

Following the translation, the validation of the instruments was tested in a pilot study among construction workers to ensure that cultural gaps and sensitivity were adjusted to avoid rendering the instrument inapplicable in the Nigerian context. 30 participants were recruited purposively among construction workers and pilot tested to determine concurrent validity. The translated version of the instrument was administered to participants using oral interview method after they signed an informed consent. The selected participants were given odd and even numbers using the table of random numbers. All even number participants completed the English version first before the Igbo version while all odd number participants completed the Igbo version first before the English version and an interview of thirty minutes was allowed between the administration of the English and Igbo versions.

The Igbo version of the CUPIDQ was validated against the English version of CUPIDQ by correlating the scores from the two versions. The results of the cross-cultural validation and adaption of CUPID questionnaires indicated that test-retest reliability was excellent (ICC = 0.99), while the Cronbach's alpha coefficient was high (0.953) for all items on the instrument. There was a significantly strong correlation ($r = 0.872$; $p = 0.001$) between the scores obtained on the English and Igbo versions of the CUPID questionnaires signifying excellent construct validity. Details of the results are attached as Appendix XI. The translated questionnaires were utilized during data collection. Interestingly the participants belonged to the three major tribes in Nigeria, namely; Igbo, Hausa, and Yoruba. Despite belonging to the different tribes the mineworkers all speak and understand Igbo language which coincidentally was the indigenous language of the host community where the mine was located. For every incidence report of MSDs, the researchers would follow-up when the mineworkers return for check-ups. The sick leave absence given to

participant at the doctor's discretion based on MSD diagnosis while receiving medical attention at health centre were also recorded to compute sickness absence data for participants.

3. 5.3: Ethical Clearance and Pre-Planning Workshops

Ethical clearance was obtained from Rhodes University Ethics Committee and Nnamdi Azikiwe University Teaching Hospital Ethical Review Committee and is both attached as Appendix I & II. Mineworkers were involved in both phases of the study, although few of them were sampled as part of the mining stakeholders in phase 2 study. The principal researcher made a pledge of confidentiality and assurances of freedom to withdraw from the study at any point in time to participants. The participants had the opportunity to sign a written informed consent form before enrolment into the study. The principal researcher in a second workshop introduced the selected stakeholders on phase 2 of the study and its relevance.

A seminar to train two research nurses attached to the mine clinics was conducted by the researcher with the help of two facilitators to train the research nurses on the mode of examination to confirm diagnosis of MSDs and instrument administration for phase one of the study (incidence study). The training was aimed at standardising MSD examination and diagnostic procedure so as to minimize inter and intra observer variations. The research nurse's assessment and data collection outcomes were compared using four subjects and the results were found to be in agreement. However, inter and intra observer reliability could not be tested due to the small sample size used for the test. The instrument administration of participants was by oral interview upon confirmation of MSD diagnosis, with MSDs associated with acute trauma excluded from the study. The follow-up examination is scheduled for every

participant that reported MSD complaints for 6-months on a 2-month interval basis for three consecutive appointments and the follow-up instruments were administered.

3.5.4: Study Population and Participants' Selection

The study population included all eligible mineworkers totalling about 1064 employed in the selected mines during the study period (September/ 3/ 2017 to 30/August/ 2018). Mineworkers (exposed cohorts for MSD incidence survey) were defined as mine staff working underground, on the surface or involved in both mining jobs. Following recruitment, a total of two hundred and forty-seven miners gave their informed consent to partake in the incidence survey. Additionally, about 247 age-matched control group (unexposed) participants were recruited from the same community, who also gave their consent to participate. The control cohorts were both students and staff from a nearby College of Education. The age matching was done by approaching the admissions and personnel unit of the institution and contacting participants using the institutional register to recruit controls with similar dates of birth or at-least not more or less than five years gap to the average age of the miners. The control group was necessary to isolate and investigate possible work-related risk factors of the MSDs. The outcome distribution of the exposed group (mineworkers) was compared with unexposed group to determine the difference in the incidence of MSDs and to make causal inferences.

3.5.5: Data Collection and Quality Control at the Incidence Survey

All consenting miners and the control group participants in Phase one study consulted the clinic for initial assessment to ensure that they were free of any acute or chronic case of MSDs during routine fitness screening for miners in the quarry mines. The baseline retrospective 12- month prevalence of MSDs was obtained prior to the incidence survey from selected participants (Miners) using the CUPID baseline questionnaires. The prospective cohort study required that both the exposed and unexposed group were confirmed free from MSDs at onset of the study (Wisdom and Creswell, 2013). Consequently, in the event that any recruited participants report to the mine health centre on account of MSD complaint.

The two trained research assistants (nurses) administered the CUPID questionnaires during the incidence survey, upon diagnosis of MSDs for the participants (cohorts) at the health centre. The participants diagnosed with MSD symptoms were given check-up appointments and required to report back for follow-up on a two-monthly basis for six months to check for possible repeat incidence and to isolate any potential causative factors, pattern of injury presentation and frequency of occurrence was recorded. Several repeat contacts were made with each participant that was diagnosed with MSDs by the principal researcher to minimise attrition and to encourage them to complete the 6-month follow-up. Additionally, the level of compliance and the frequency of participants drop out during the study period was also recorded from start to finish. The principal researcher was involved full time in workshops, seminars, quality control during the incidence survey.

3.5.5:1: Participants' Response Rate

The response rate of the mineworkers and the control cohorts was 100% both at baseline and follow-up for the incidence survey. The researcher allowed flexible time by making several contacts with each participant. Additionally, the principal researcher was employed as a staff of the mine 2 months prior to commencement of the study, which made it possible for a very strong rapport between the researcher and participants to be established during the survey.

3.5.5.2: Sampling Technique for the Incidence Survey

The consecutive non-probability sampling technique was employed to recruit volunteer participants from the cohort of mineworkers and identified stakeholders. The consecutive recruitment was necessary due to the fact that MSD cases are expected to be reported naturally as they occur. The consecutive sampling involves recruiting participants in real time as they volunteer to participate in the study until the required number is achieved (Sedgwick, 2004).

3.5.5.3: Sampling Size Calculation for Phase One Study

The difference in proportion formula for prospective cohort studies was used to estimate the sample size. The detail of the calculation was attached as Appendix VIII

3.6: Phase One Data Analysis Outline

Descriptive statistics of percentages, means, and standard deviations were used to summarize all demographic variables and associated risk factors of MSDs. MSD complaints at specific sites was grouped into anatomical regions for descriptive purposes. The anatomical regions were: upper limb (which included wrist, elbow, shoulder, neck, lower limb (which included hip, knee and ankle) and back (which include upper back and lower back). Each anatomical region was analysed

separately because it is likely to have different determinants associated with the outcome, especially with respect to physical exposure. The pattern of occurrence of MSD across the various anatomical sites was also determined using percentages. MSDs' repeated complaints at more than one site were also included in the analysis for the regional MSDs presented as both prospective and retrospective findings.

The baseline 12- month prevalence of MSDs was calculated for the past twelve months prior to the incidence survey. The 6-month incidence rate of the MSD was estimated by the number of cases recorded in the last six months divided by the population of recruited participants. The incidence risk ratio was determined using the relative risk ratio to compare the difference in MSDs' incidence of mineworkers and the control participants. The incidence is expressed in two ways in cohort studies: cumulative incidence (which is a proportion called risk) and incidence density called rate (person-time rate which is calculated by taking the number of events and dividing them by the person-time at risk). The ratio between two cumulative incidences (risk in exposed divided by risk in unexposed) gives the relative risk (or risk ratio). While the ratio between two incidence densities (rate in the exposed divided by rate in the unexposed) gives the incidence rate ratio (IRR or rate ratio). The survival analysis plot was constructed to determine the hazard ratio and to compare the difference between the exposed and unexposed cohorts.

The proportional hazard analysis was done using Cox Proportional Hazard Regression Model to determine the association between dichotomized perceived physical and psychosocial risks of participants MSD. The hazard analysis was performed for each of the body regions. The partially adjusted hazard ratios were obtained for each potential risk factor, adjusting for age and job categories for the body region in question. Then the multivariate model within each domain of risk

factors was constructed, with p value of less than 0.10 included in the final multivariate model.

When there were high correlations between variables, the one with the highest point estimate in the partially adjusted model was utilised. Test for interaction between all risks factor was done if they were considered to be significant for instance, interaction between job demands, decision latitude, and social support. There were no interaction terms that contributed to the final model (P value of less than 0.10). The MSD complaints at the two mines and across the various job categories were also tested using the Cox (Proportional) Hazard Regression Model constructed with partially adjusted associations between psychosocial and physical risk factors for the onset of regional musculoskeletal complaints, with adjustment made for age and Job designation. The two mines were treated as a unit since every cultural, geographical location and organisational policies belonged to the same company. The use of proportional hazard analysis was necessary to compare risks between the exposed and control cohorts since the groups were with diverse exposure levels as well as to take care of the level of association introduced by variable dichotomization (Boshman et al., 2012).

3.7: Phase Two Data Collection Outline

3.7.1: Mine Stakeholder Identification and Engagement

Phase two of the overall study involved the formation of focus groups during which stakeholders were engaged utilising a semi-structured interview approach with repeat interview sessions. The discussion was repeated for ten separate occasions to ensure that the participants were in tune with the questions and saturation point of information was reached. The stakeholders' engagement was necessary to gather information and share stakeholders' perspectives regarding factors very likely to

elevate mineworkers' psychosocial stress and by extension MSD risks. The focus group participants (Phase two study) were 30 participants recruited using the people and participation approach proposed by the INVOLVE (2005) guidelines. The guidelines stipulate three sets of rules to avoid bias, which are the use of generic lists of stakeholders made available by the Nigerian Federal Ministry of Mines and Steel Development; asking sets of questions (who runs the firm, who has unique knowledge of the project, who represents the interest of non-participants affected by the projects) and the snowballing technique. The snowballing technique entails the identification of other relevant groups of stakeholders from information provided by previously identified stakeholder or group. The stakeholder identification and mapping was performed at the pre-planning workshop conducted in conjunction with the Nigerian Ministry of Mines and Steel Development. The mine stakeholders were identified as follows: primary and secondary stakeholders from generic lists provided by the Nigeria mining cadastre office that overseas regulation and licensing of mines in the country details of the classification was provided at the last section of the literature review.

The list comprised of representative mine stakeholders categorized as follows:
(1) Crushers, (2) Drillers, (3) Blasters, (4) Heavy equipment operators, (5) Truck drivers, (6) Auto-mechanics, (7) Auto-electricians, (8) Unit supervisors, (9) Operation and Administrative managers and (10) Site engineers (11) Health and environmental impact compliance inspectors, (12) Mineworker's union executives, (13) Mine medical staff, (14) Sales agent and (15) Community leaders. Each of the fifteen units (groups of stakeholder) delegated two representatives to make up the 30 participants from both mines to make up the two homogenous groups that comprised the focus groups. The homogenous groups were matched stakeholders divided into two

classes of fifteen participants, each recruited consecutively from primary and secondary stakeholders from the two separate mines. The matching was necessary to minimize conflict of interest and to accommodate free speech within stakeholder hierarchy, which may arise from power dynamics within the groups (Stewart and Shamdasani, 2014). According to Isiugo-Abanihe and Obono (2000), participants are more relaxed among others of the same background or experience. The managerial cadres and unit supervisors from the first mine were mixed with mineworkers from the other mines and vice versa to allow freedom of speech and avoid victimisation after the sessions. The focus group discussion (FGD) study involved stakeholders' grouping or mapping (assigning participants into neutral groups) and engagement in the focus group discussion sessions. The stakeholders were asked to respond to questions regarding organisational culture and communication, likely to contribute to poor interactions within stakeholder hierarchy. The questions are as follows:

3.8: Structured Interview Questions for Focus Group Sessions

The following questions were asked of the focus group participants (stakeholders):

Stakeholders understanding of the term psychosocial risk factors as a possible cause of musculoskeletal disorders.

Stakeholder's understanding of the term Job Control. Stakeholder's perception of their workload.

Stakeholder's health seeking behaviour during MSDs' occurrence.

Stakeholder's perception of availability of safety and best practice training.

Stakeholder's perception of job security as it affects relationships in the workplace.

Stakeholder's perception of work-family responsibilities and interrole conflicts and its contribution to hindering efficiency in work performance.

Stakeholder's perception of work time management or work-rest ratios as a relationship problem.

Stakeholder's perception of Job satisfaction and Incentive system and how it affects interactions with various units within the Nigerian mining sector.

Stakeholder's perception of co-worker and supervisor support and how it affects interactions with various units within the Nigerian mining sector.

This part of the study adopted five phases to conduct the focus group discussion inquiry, based on recommendation by Lincoln and Guba (2003). Phase one comprised of the preliminary field work where the researcher obtained preparatory information and identified information that needed in depth exploration in the main data collection session. Phase two, the investigator obtained permission from the mine authorities and engagement of the appropriate stakeholders, as well as obtained individual consent from focus group participants.

Phase three comprised of "focus exploration" of the phenomenon being studied. It involved an intense period of data collection, data recording and preliminary data analyses. In this phase, the facilitator was concentrating on learning from the participants in-depth the major themes that from the responses of the FGD participants. In the fourth phase of the inquiry (repeat sessions), the researcher arranged to leave the field, addressing issues of disengagement and closure. In the fifth and final phase of the qualitative inquiry, field notes were transcribed, the final report was written and participants were consulted to cross-check the reports for clarity and further corrections was done in conjunction with the FGD participants. The provisional report was given to the participants for scrutiny, to confirm that the report had captured the data as constructed by them, or to correct, amend/extend it.

3.9: Procedures and Data Collection

The FGD participants were transported to the workshop arena to and fro and given lunch during the focus group discussions on different locations and separate dates. The focus group discussion was conducted in the local language (Igbo) spoken by the facilitator and all the participants; hence a translator was not required. The focus group discussions were held in neutral settings and conducted in a permissive and non-judgmental atmosphere as determined by input from all stakeholders.

The venue was quiet and spacious enough to comfortably accommodate all 15 participants and facilitators at a time. The seating arrangement was setup to allow for eye-to-eye contact between the facilitator, the note taker and the participants. The semi-circular seating formation was adopted during the discussions. This provided a means of observing and recording the non-verbal communications of the participants, which aided clearer understanding of participant's non-verbal response. The non-verbal responses are usually by virtue of eye-to-eye contact which provides insight and help the individual share and compare their perspective of the topic or discuss freely. The observation of the following non-verbal dispositions within the group could be used to judge the body language: participants' attention span, leaning forward, identification of spontaneous aggressive interjections, expression of indifference towards a particular respondent by participants and hesitant participants must be observed by the primary moderator. The focus group moderator had a sound ability to manage dynamics (constraint and bias) and stimulate flexible discussion as a group and emphasis must not be on an individual basis. The facilitator (Moderator) ensured equal participation of all group members in the discussions. The sessions were tape-recorded using Olympus mini digital voice recorder model X CD 300 for subsequent verification, transcription and analyses.

This allows for verbatim analysis and also allowed the facilitator to engage with the group to obtain diverse views. Participants were allowed to respond to one another's comments.

3.10: Phase Two Data Analyses Outline

The information obtained from the focus group discussions usually involves two basic approaches, namely: thematic and content analyses (Morgan, 2000). The thematic analysis relies on summary or verbatim reports extracted from recorded data employing reiterative reading to identify, analyse, and report data by searching for regular themes or patterns from the data (Graneheim and Lundman, 2004). Meanwhile the content analyses typically produce numerical description of the data in table format (Lincoln and Guba, 2003). The two approaches were adopted since they complemented the results to provide a more accurate and reliable themes and subthemes regarding stakeholder interactions. In summary, the analysis of data from the FGDs involves the transcription of views and opinions that emerged after verification through the group process. The recorded raw data during focus group discussions was firstly de-identified for confidentiality purposes. The audio data was transcribed into text and refined until the relevant information was learned and scrutinized by all the participants in the focus group discussion. The Igbo-version of the audio records were translated into English by an expert translator and recorded by language experts from Nnamdi Azikiwe University, Department of Linguistics in Nigeria.

Three independent reviewers from three disciplines: psychology, occupational health, and anthropology were contracted to independently translate the participants' perspectives on the subject of discussion into summarized meaningful expressions. The condensed meaning units from the three independent reviewers were compared

and differences in interpretations were discussed to reach consensus. The condensed meaning units were translated into codes and reference was frequently made to the transcript and audio tapes to ensure the themes reflected actual data instead of researcher's interpretation (Graneheim and Lundman, 2004). The codes were structured into themes using the biopsychosocial model of pain disability as a theoretical framework to compare the finding from the FGD with biopsychophysical variables on the model. The themes or codes that did not fit into the biopsychosocial model of pain disability were acknowledged as separate. The final transcription from audio to text was done from the final transcript to complete content analysis. The Nvivo software version 13 was used to manage thematic data analyses, and construction of conceptual framework of transcripts. The utilisation of expert was mostly for content analysis and to analyse the themes generated by the software during thematic analysis.

CHAPTER FOUR
RESULTS

4.1: Introduction

This chapter describes the physical characteristics of participants, description of miners regarding their exposure to risk factors associated with MSDs with both retrospective and prospective data being presented. The 12-month prevalence and 6-month incidence of MSDs and identification of possible risk factors linked to the development of MSDs were also presented both as retrospective and prospective data. Past medical history and pattern of 12-month retrospective prevalence of MSD (anatomical presentations) at the two selected Nigerian quarry mines and the disability pattern of 6-months prospective incidence of MSDs were presented. Psychosocial and other characteristics of the 128 cases that reported MSDs symptoms at the primary healthcare clinics covering the selected mines are also presented. The results of focus group discussion were qualitatively analysed and presented both as direct quotation and in a tabular form. The mean ages of recruited participants in phase one study was 29.43 ± 14.52, and 28.37 ± 11.23 for exposed and unexposed cohorts respectively. Meanwhile the BMI (Kg/m^2) of recruited participants were 26.9 ± 4.89, and 29.4 ± 5.36 for exposed and unexposed cohorts respectively. The current smoking status of miners and control participants were 75 (30.36%) and 105 (42.51%) respectively. The majority of the miners had more than 5 years' experience 124 (50.20%). Finally, the past medical history of MSD during pre-engagement of participants were 187 (75.71) and 127 (51.41) for the exposed and unexposed cohorts respectively. The study recruited miners with less than one-year work experience, in other to establish the latency period of MSDs.

4.2: Phase One

4.2.1: Characteristics of Miners and Unexposed Cohorts

The response rate at baseline was 100% with the analysis censored for loss to follow-up. The age range of participants was 20-59 years and the BMI for the exposed and control cohorts were 26.9 ± 4.8 & 29.4 ± 5.36 respectively. A total of 148 miners (59.91%) had no formal education and while 62 (25.10%) attended primary school, and 37 (14.97%) completed post primary education. Meanwhile, all the control cohorts had a minimum qualification of secondary education. See table 1.

4.2.2: Daily Physically Demanding Tasks of the Mineworkers (N=247) from the Baseline CUPID Questionnaires Survey

More than two third of the mineworkers (95% CI: 76-90.50%) described lifting weight, repetitive task, working underground, kneeling or squatting, working above shoulder levelat work to likely contribute to their musculoskeletal complaints (Table 4.2). Additionally, more than half (58.3 and 65.8%) reported that working in awkward postures and working above shoulder level couldbe likely contributing to the cause of their musculoskeletal disorders respectively.

Table 4.1. Characteristics of Participants in the 6-month Follow-Up Incidence Study (N=494)

Physical Variable	**Mineworkers (Exposed Cohort)** **Mean ± SD**	**Range (percentage)**	**Control Group (Unexposed Cohort)** **Mean ± SD**	**Range (percentage)**
Age (years)	29.43 ± 14.52	20.00-59.00	28.37 ± 11.23	20.00-54.00
BMI(Kg/m^2) **Normal** **Overweight** **Obese**	26.9 ± 4.89 18.5 ± 2.69 27.9 ± 2.89 31.6 ± 5.29	16.00 – 34.00 16.00 – 22.00 25.00 – 30.00 31.00 – 35.00	29.4 ± 5.36 18.8 ± 3.21 28.7 ± 3.01 32.3 ± 5.29	18.00 – 35.00 17.00 – 24.00 25.00 – 30.00 31.00 – 35.00
Social Variable	**Description**	**Number of people (percentage)**	**Description Unexposed grp**	**Number of people (%) Unexposed grp**
Handedness	Right Left	224 (90.68) 16 (6.47)	Right Left	213 (86.23) 34 (13.76)
Education	No education Primary school Secondary or more	148 (59.91) 62 (25.10) 37 (14.97)	Not Applicable	Not Applicable
Smoking status	Non-smoker Ex-smoker Current-smoker	146 (59.10) 94 (38.05) 75 (30.36)	Non-smoker Ex-smoker Current-smoker	116 (46.96) 26 (10.52) 105 (42.51)
Ethnicity (All participants understood Igbo)	Igbo Hausa Yoruba	46 (18.62) 82 (33.20) 119 (48.17)	Igbo Hausa Yoruba	101 (40.89) 94 (38.05) 52 (21.05)
Job designation	Blasters Crushers Drillers Others	65 (26.32) 65 (26.32) 65 (26.32) 51 (20.64)	Not Applicable	Not Applicable
Years of experience	Less than 1 year 1-5 years More than 5 years	28 (11.33) 94 (38.05) 124 (50.20)	Not Applicable	Not Applicable
Past history of MSD pre-recruitment.	Yes No	187 (75.71) 60 (24.29)	Yes No	127 (51.41) 120 (48.59)

Table 4.2: Daily Physical Demanding Tasks of the Mineworkers (N=247) from the Baseline CUPID Questionnaires Survey

Physically demanding activities of mining Job	N	% Percentage	Missing values
Lifting weight during work			
Yes	201	82.72	4
No	42	17.28	
Total	243	100	
Repetition			
Yes	214	86.64	0
No	33	13.36	
Total	247	100	
Awkward posture during work			
Yes	143	58.30	0
No	103	41.70	
Total	247	100	
Working above shoulder			
Yes	162	65.85	1
No	84	34.15	
Total	246	100	
Working underground			
Yes	187	76.95	4
No	56	23.05	
Total	243	100	
Kneeling or squatting at work			
Yes	213	87.30	3
No	31	12.70	
Total	244	100	

4.3.1: Baseline Psychosocial Aspect of work description of the Mineworkers

More than two thirds of the mineworkers (95 CI: 74-78.30%) described time pressure at work, decision latitude, job satisfaction, poor incentives, could likely predispose them to musculoskeletal complaints (Table 4.3). Meanwhile, more than half are of the miners are of the opinion that co-workers/supervisor support, and job security, may be indirectly mediating the occurrence of their previous musculoskeletal complaints.

Table 4.3: Baseline Psychosocial work challenges of Mineworkers (N=247)

Psychosocial Job Risks	N	%	Missing values
Time pressure at work			
High	181	74.48	4
Low	62	25.52	
Total	243	100	
Decision latitude			
High	194	78.54	0
Low	53	21.46	
Total	247	100	
Co-workers/Supervisor support	165	68.46	3
High	76	31.54	
Low	241	100	
Total			
Job Satisfaction			
Yes	185	75.51	2
No	60	24.49	
Total	245	100	
Job security			
High	163	66.80	6
Low	81	33.20	
Total	244	100	
Poor Incentives			
High	192	78.14	0
Low	55	21.86	
Total	247	100	

4.4.1: Miners 'Adverse Belief about Pain and Mental Disorders Status

The nocebo effect of mental disorders and adverse health beliefs and expectation about MSDs was hypothesised to explain the chronicity of its symptoms in the workplace among workers, despite attempts to curtail excessive mechanical stress exposure during work performance. About 65.18% of mineworkers reported that they had adverse belief about their previous experience of back pain see Table 4.4.

Meanwhile, the following percentages; 63.64%, 59.02%, 58.92%, 55.56% and 46.56% of miners also reported that they had adverse belief about pain in the following anatomical sites: shoulder pain, elbow pain, neck pain and knee pain respectively (Table 4.4). The miners' adverse belief about previous back pain was the highest, followed by shoulder with 63.64%, and lastly knee pain had 46.56%. Additionally, mental disorder status more than half of miners was between poor to intermediate mental disorders status as was determined at baseline during cross-examination. Meanwhile, 45.75% of the mineworkers reported that they were not suffering from mental disorders status. 13.36% of mineworkers also reported that they had poor mental health, which was one of the psychosocial aspect of their job.

Table 4.4: Baseline Mineworkers Adverse perceptions of Pain and Mental Disorders Status (N=247)

Baseline adverse belief about pain and mental disorders	N	%	Missing values
Adverse belief about pain[d]			
Back pain			
Yes	161	65.18	0
No	86	30.76	
Total	247	100	
Shoulder pain			
Yes			
No	154	63.64	5
Total	88	36.36	
	242	100	
Elbow pain			
Yes	144	59.02	3
No	100	40.98	
Total	244	100	
Wrist pain			
Yes	135	55.56	4
No	108	44.44	
Total	243	100	
Knee pain			
Yes	115	46.56	0
No	132	53.44	
Total	247	100	
Neck pain			
Yes	142	58.92	6
No	99	41.08	
Total	241	100	
Mental disorders[e]			
Good	113	45.75	5
Intermediate	96	38.86	
Poor	33	13.36	
Total	242	100	

d Adverse belief that regional MSDs is caused by work
e Classified into three levels corresponding to approximate thirds of the observed distribution of scores about mental disorders belief

4.5.1: Baseline Individual Psychosomatic Characteristics of Nigerian Mineworkers

The percentages of miners that believed that their previous occurrence of musculoskeletal pain deserved compensation and those who had financial distress prior to their previous report of MSDs were 61.82% and 60.66%, respectively. More than two thirds of the workers (75%) had somatic symptoms or were working in fear, and believed that their fear or symptoms were caused by work and previous experience of MSDs (Table 4.5)

4.6.1: 12-MonthMedical History and Pattern of Musculoskeletal Disorder among Mineworkers at Selected Mines Prior to the Study

The baseline regional musculoskeletal complaints from the CUPID instruments (12months prior to the study) showed right dominance across upper and lower limb regions. Meanwhile the miners at baseline reported their past medical history pattern with the following distribution: back pain were as follows; upper back, 20.37%, lower back 45.50%, and both: 34.13%. All participants reported previous medical history of back, shoulder, and neck pains, while wrist pain constituted about 47.06% of past medical history, followed closely by elbow pain 42.74% and lastly knee pain with about 17.83%(Table 4.6).

Table 4.5: Individual Psychosomatic Characteristics of Mineworkers (N=247)

Individual psychological characteristic	**N**	%	**Missing values**
Financial difficulties[a]			
Yes	145	60.66	8
No	94	39.34	
Total	239	100	
Deserve compensation[b]			
Yes	149	61.82	6
No	93	38.18	
Total	241	100	
Working with Fright/Somatic symptom[c]			3
Yes	183	75.00	
No	61	25.00	
Total	244	100	

a Being in financial difficulties-slight or big problem

b People with musculoskeletal pain deserve compensation

c Being in a frightening situation and number of at least moderately distressing somatic symptoms in the past seven days.

Table 4.6: Medical History and Pattern (Frequency, %) of Musculoskeletal Disorders among Mineworkers at Selected Mines

Variables of Interest	Presentation pattern over the past 12-months	Past medical history report of participants (frequency, %)
Back pain	Upper back: 34(20.37) Lower back:76(45.50) Both: 57(34.13)	247 (100%) All participants reported previous medical history of back pain
Shoulder pain	Right:132(68.75) Left: 41(21.35) Both: 19(9.90)	247 (100%) All participants reported previous medical history of shoulder pain
Elbow pain	Right: 74(59.67) Left: 39(31.45) Both: 11(8.88)	53(42.74)
Wrist pain	Right: 105(68.63) Left:27(17.65) Both: 21(13.72)	72(47.06)
Knee pain	Right: 82(52.21) Left: 62(39.49) Both: 13(8.29)	28(17.83)
Neck pain	Not applicable	247 (100%) All participants reported previous medical history of neck pain

4.7.1: Occurrence (Prospective baseline report) and Recurrence of MSDs Complaints among Nigerian Mineworkers in a 6-months' Follow-up:

One hundred and twenty-eight miners reported to the health care facilities with complaints of body regional MSDs pain at one time or the other. The participants were all followed-up for 6-months. There were 130 cases of back pain from the 124 miners that reported at the primary healthcare centre in the 6-months period. The total number of recurrence was 5 cases of back pain at one point or the other during the 6-months follow-up period. The baseline report (12 –months prevalence including the 6-month follow-up period) for back pain was 184. The implication is that during the survey, participants were asked to report their history of back pain both at baseline and follow-up. See table 4.7 for details. A total of 74 participants during the first month of the study reported previous twelve months' history of back pain (Table 4.7 for details). Previous history of back pain during the 1-2 months' follow-up period, while 39 and 65 stood for the number of participants that reported previous history of back pain at 3-4 months and 5-6 months respectively.

4.8.1: Musculoskeletal Symptom Duration of Mineworkers' Retrospective Report at Baseline and during Follow-Up Presentation at Primary Health Clinic

The MSD pain symptoms duration varied for the various anatomical sites among selected mineworkers. The majority of the MSD prevalence report at baseline lasted for 1-7 days which was categorized as the subacute case across the 6 body regions. Meanwhile about one third of the participants indicated during follow-up incidence of regional musculoskeletal complaints that there MSD symptoms, lasted for 1-2 weeks. About a quarter of miners during baseline and follow-up respectively, reported that their symptoms at various anatomical sites lasted for more than 2-weeks indicating substantial tendency of symptom persistence (Table 4.8).

Table 4.7: Occurrence (Retrospective report at baseline) and Recurrence of Musculoskeletal Complaints among Nigerian Mineworkers: Incidence Survey with a 6-month Follow-up between 1st March 2018 to 30 August 2018.

Body Region	Baseline 12months prevalence (N=247),percentage and 95% CI	Recurrent 1-2months Incidence (N=128), percentage and 95% CI	Recurrent 3-4months Incidence (N=128), percentage and 95% CI	Recurrent 5-6months Incidence (N=128), percentage and 95% CI
Back pain	184 **74** (56.5 - 79.2)	32 **26** (21.4 – 31.8)	49 **39** (24.3 – 52.1)	81 **65** (58.6 – 78.9)
Shoulder pain	192 **78** (75.8 - 92.4)	22 **17** (12.7 – 22.2)	27 **21** (7.5 – 42.2)	93 **75** (73.6 – 91.4)
Elbow pain	124 **50** (42.0 - 62.4)	16 **13** (8.8 – 16.5)	21 **17** (12.8 – 36.3)	51 **41** (31.2 – 54.4)
Wrist pain	153 **62** (36.9 - 79.8)	25 **20** (5.8 – 43.8)	36 **29** (15.7 – 44.1)	78 **63** (39.8 – 82.3)
Knee pain	157 **63** (35.7 - 84.3)	9 **7** (3.4 – 9.6)	12 **9** (5.5 – 12.1)	29 **23** (17.9 – 56.5)
Neck pain	167 **67** (57.3 - 84.4)	31 **25** (19.5 – 29.4)	35 **28** (21.4 – 31.8)	69 **55** (29.8 – 73.2)

The figures not bolded and bolded example 32 (**26**) as found in the table represents the number of participants that reported back pain and other regional pain, while the bolded stands for those that reported back pain alone during the follow-up periods.

Table 4.8: Musculoskeletal Symptom Duration of Mineworkers at Baseline and Presentation in the Primary Health Clinic during Follow-up

Variables	**Baseline (N 247)** **Back and Shoulder** n (%)		**Neck** n (%)	**Wrist** n (%)	**Knee** n (%)	**Elbow** n (%)
1-7 days	71(42.51)	80(32.52)	81(44.02)	69(45.09)	72(45.85)	61(49.19)
1-2 weeks	35(20.95)	41(21.35)	34(18.47)	31(20.26)	35(22.29)	24(19.35)
More than 2weeks	33(19.76)	39(20.31)	32(17.39)	29(18.95)	22(14.01)	22(17.77)
Unknown	28(16.76)	91(36.99)	37(20.10)	24(15.68)	28(17.83)	17(13.70)
Variables	**Follow-up (N 128 participants that reported symptom and followed-up)**					
1-7 days	77(60.62)	50(39.06)	90(70.31)	74(58.26)	31(26.27)	49(38.28)
1-2 weeks	10(7.87)	9(7.03)	13(10.15)	18(14.17)	Nil	4(3.12)
More than 2weeks	11(8.66)	8(6.25)	6(4.68)	1(0.78)	Nil	4(3.12)
Unknown	28(22.04)	61(47.65)	14(10.93)	34(26.77)	87(73.73)	71(55.46)

Table 4.9: Musculoskeletal disorders' disability durationof Mineworkers' Baseline retrospective report, and Follow-up Incidence Survey

Variables	Baseline (N 247) Back and Shoulder n (%)		Neck n (%)	Wrist n (%)	Knee n (%)	Elbow n (%)
1-5 days	65(26.31)	117(47.36)	92(37.24)	96(38.86)	67(27.12)	71(28.74)
6-30 days	61(24.69)	54(21.86)	53(21.45)	31(12.55)	55(22.26)	38(15.38)
More than 30 days	41(16.59)	21(8.50)	39(15.78)	26(10.52)	35(15.04)	15(6.07)
No disability	80(32.38)	55(22.26)	63(25.50)	94(38.05)	90(36.43)	123(49.79)
Variables	**Follow-up (N 128 participants reported symptom and were followed-up)**					
1-5 days	70(54.68)	52(40.62)	90(70.31)	4(50.00)	29(22.66)	49(38.28)
6-30 days	10(7.81)	9(7.03)	12(9.37)	18(14.06)	Nil	6(4.68)
More than 30 days	11(8.59)	8(6.25)	6(4.68)	6(4.68)	Nil	6(4.68)

4.9.1: Musculoskeletal Disorders' Disability Duration (Frequency %) of Baseline Presentation at Primary Health Clinic during Follow-Up

The musculoskeletal complaints of MSD disability duration varied for the various anatomical sites among selected mineworkers. The body part with the highest disability duration, was the shoulder, followed by the wrist, neck, elbow, knee and back with the lowest duration. However, the majority of the disability complaints lasted for 1-5 days across the 6 body regions. Back had the highest disability duration with 6- to more than 30days (25-16%) of the participants' symptoms. Onset of acute neck MSDs was the highest compared to other body parts with about 70%

followed by the back; however, there was more subacute and chronic persistence of wrist disability duration during follow-up incidence of body regions (Table 4.9).

4.10.1: Musculoskeletal Disorders' Disability Pattern (Frequency %) at Work and during Daily Activities

The regional musculoskeletal complaints that had the highest impact on miners' work abilities were wrist pain (43.58%), followed by back and knee pain with (21 and 35.42%) respectively. Meanwhile, shoulder, neck and elbow pain appeared did not lead to any form of absenteeism from work due to disability. The activities of daily living that were affected by regional musculoskeletal complaints were house chores, walking and climbing staircases and opening taps (Table 4.10).

4.11.1: Incidence Risk Rate of Musculoskeletal Disorders of Exposed and Unexposed Cohorts:

The relative risk ratio of mineworkers was 4.57. This simply implies that the mineworkers are 4.57 times at risk of developing MSDs compared to other unexposed individuals (Table 4.11).

4.12.1: Musculoskeletal Disorders Incidence Survival Proportions during 181 Days Incidence Survey

The hazard ratio 4.41 (3.192-6.094 95 CI) with P value of =0.001 also indicated about four times likelihood of the exposed compared to the unexposed cohorts developing a musculoskeletal disorder ((Figure 4.1).

Table 4.10: MSDs' Disability Pattern (Frequency, %) of Mineworkers at Work and Daily Activities (Cumulative Incidence Report 401/6months) during Follow-Up N=128

Variables of Interest	Impact of MSDs on disability ratings. Frequency (%)	Impact of MSDs on activities of daily living	Total absence from work due to body parts MSDs. Frequency (%)
Back pain	Difficulty: 110(65.87) Impossible: 57(34.13) Total: 167	Getting dressed: Nil Nail cutting: Difficult House chores: Difficult	Absent from work due to disability: 12(21.05)
Shoulder pain	Difficulty: 159(82.81) Impossible: 33(17.18) Total: 192	Getting dressed: Nil Bathing and Combing hair: Nil House chores: Difficult	Absent from work due to disability: Nil
Elbow pain	Difficulty: 68(54.84) Impossible: 56(45.16) Total: 124	Getting dressed: Nil Opening taps: Difficult House chores: Difficult	Absent from work due to disability: Nil
Wrist pain	Difficulty: 114(74.50) Impossible: 39(25.50) Total: 153	Getting dressed: Nil Opening taps: Difficult House chores: Difficult Writing and door handling: Nil	Absent from work due to disability: 17(43.58)
Knee pain	Difficulty: 144(91.71) Impossible: 13(8.29) Total: 157	Getting dressed: Nil Walking and climbing stairs: Difficult House chores: Difficult	Absent from work due to disability: 13 (35.42)
Neck pain	Difficulty: 126(68.48) Impossible: 58(31.52) Total: 184	Getting dressed: House chores: Difficult	Absent from work due to disability: Nil

Table 4.11: Incidence risk rate of musculoskeletal disorders of exposed and unexposed cohorts at the selected study location (N= 247). LBP – Low back pain; NP – Neck pain SP – Shoulder pain; KP – Knee pain; EP – Elbow pain; WP – Wrist pain

Physical Variable	Incidence rate of miners	Incidence rate of unexposed group
Incidence per 1000-6mths	6.2	0.9
Incidence rate ratio of LBP	167/247	18/247
Incidence of rate ratio NP	184/247	15/247
Incidence of SP	192/247	12/247
Incidence of rate ratio EP	124/247	15/247
Incidence of rate ratio WP	153/247	19/247
Incidence of rate ratio KP	157/247	16/247
Incidence density	401/1064	95/1064
Relative Risk	0.38	0.09
Relative Risk Ratio	4.57	

4.12.2: Musculoskeletal Disorders' Incidence Survey of body Parts in6-month Follow-up between 4 September 2017 to 30 August 2018.

The presentation of incidence of musculoskeletal disorders by body parts shows that miners had more shoulder MSDs, followed by lower back MSDs. The presentation was slightly different in the unexposed compared to the mineworkers in the control participants, wrist pain and neck pain (3% each) constituted the highest percentage of MSDs, followed by back pain compared to shoulder and back pain among miners (Figure 4.2).

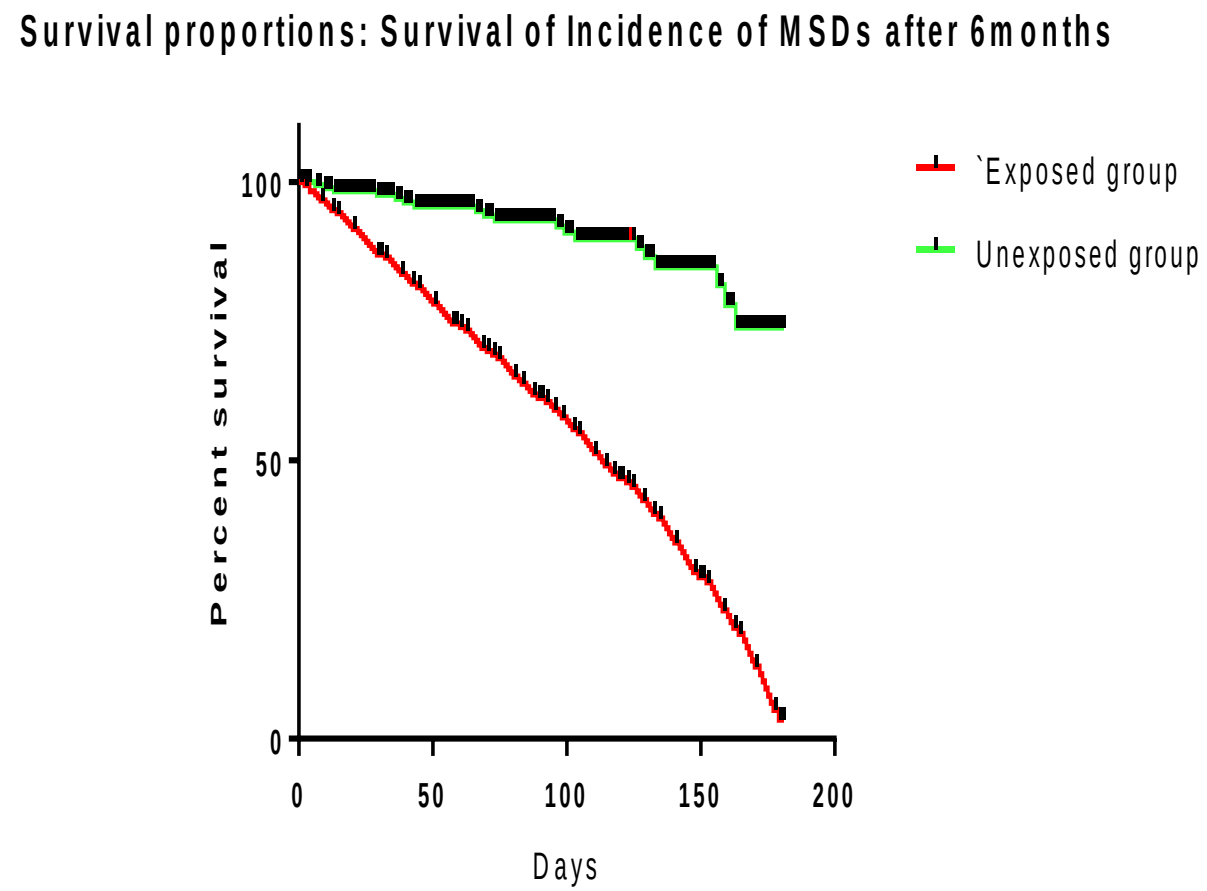


Figure 4.1: Survival Analysis comparison plot during 181-days follow-up study

P<0.0001	Df= 1
HR= 4.41(3.192-6.094)	Intercept:0.226(0.164-0.313)

4.12.3: Incidence of MSDs of mineworkers' body parts by Job designation

The blasters had the highest incidence with a relative risk ratio of 2.15 per 1000-6months of musculoskeletal disorders followed by crushers with a relative risk ratio of 1.5 and drillers had a relative risk ratio of 1.42, while the others, that comprised, auto-maintenance workers, drivers and heavy duty machine operators had the least incidence with a relative risk ratio of 1.25 (Figure 4.3).

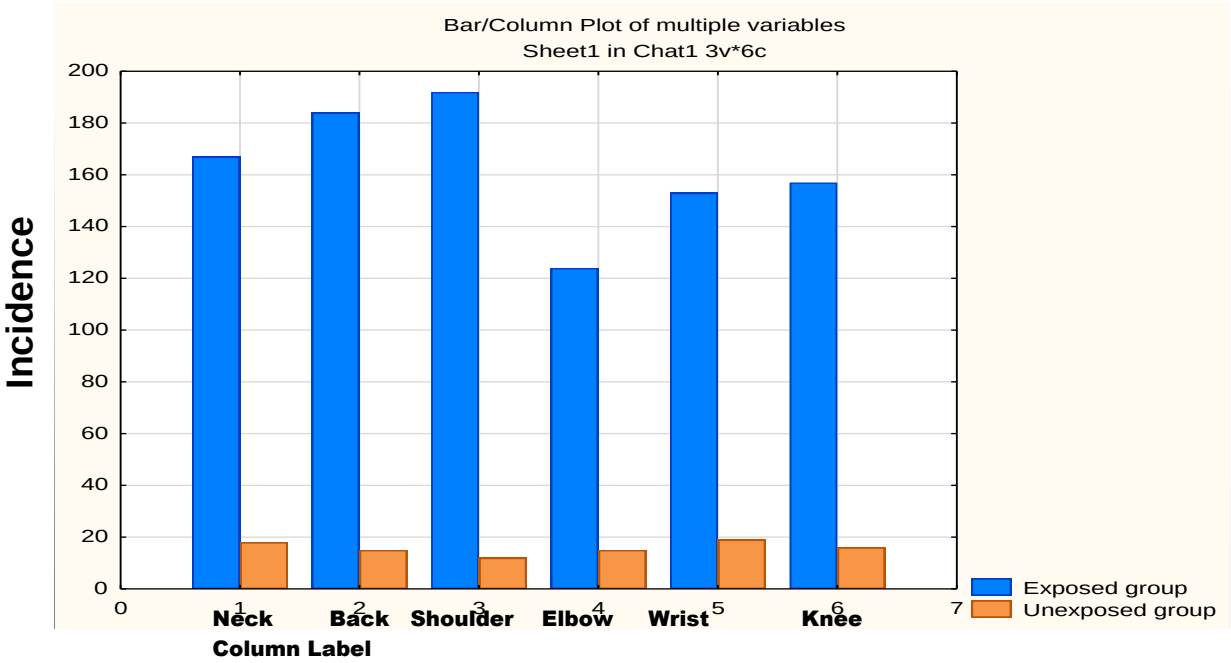
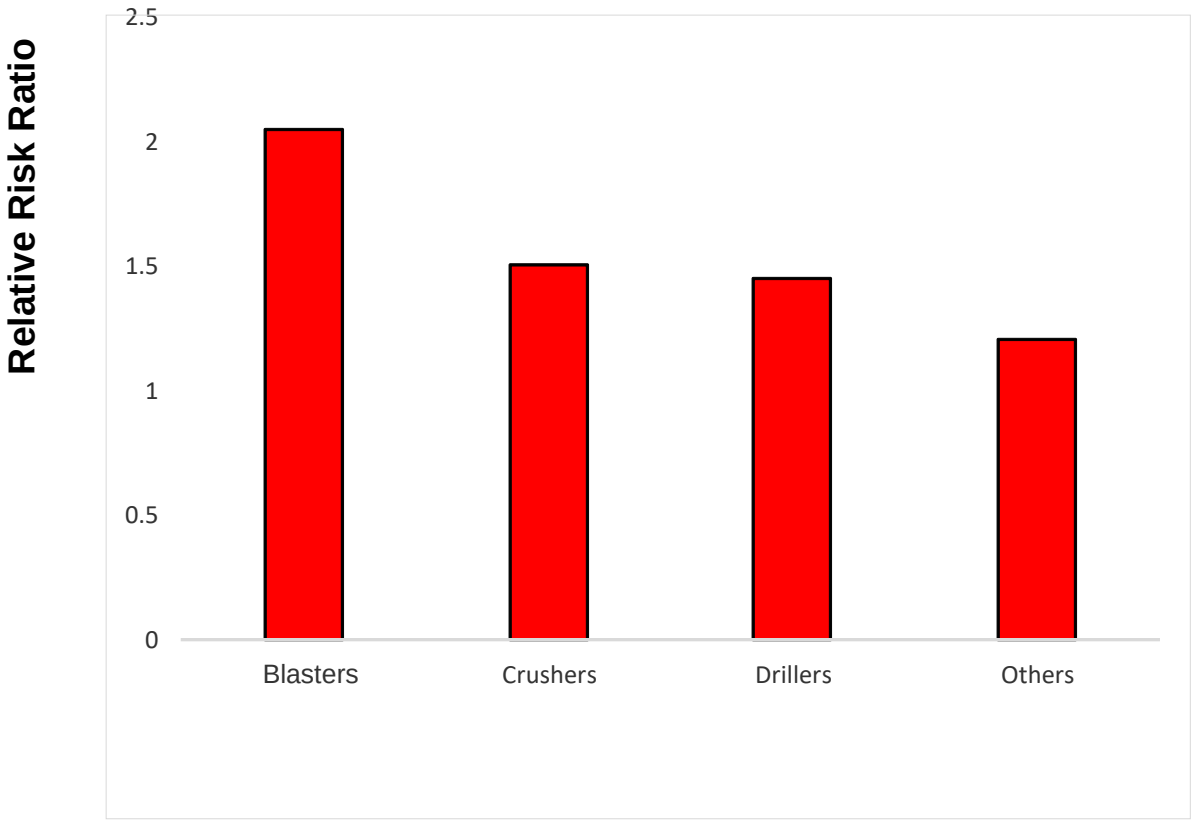


Figure 4.2: Incidences of Neck pain, Back pain, Shoulder pain, Elbow pain, Wrist pain and Knee pain



Others comprised of auto-maintenance workers, drivers and heavy duty machine operators

Figure 4.3: RELATIVE RISK RATIO of MSDs' incidence by Job Designation of Mineworkers'

4.12.4: Psychosocial Risks Associated with Incidences of Regional Musculoskeletal Complaints

The cox (proportional) hazard regression model constructed with partially adjusted associations shows the association between psychosocial risk factors and the onset of regional musculoskeletal complaints, with adjustments for age and Job designation, (which implies that age and job designation were treated as effect modifiers in the final model). Time pressure at work, decision latitude, job satisfaction, working with fear, reporting a mental disorder, poor work incentives were significantly associated with MSD occurrence in almost all 6 body parts and psychosocial risks (HR 1.63 [95% CI: 0.86–2.43]), respectively (Table 4.12). Years of working experience was significantly associated with an exposure-response pattern with all 6 psychosocial outcomes above (HR 1.75 [95% CI 0.78–1.96]) respectively. This implies that as the years of working experience increases, the risk also increases. For instance, mineworkers with 1-5 years' experience had about 30–60% elevated risk, while those with more than 5 years working experience reported 50–100% elevated risk of MSDs. Meanwhile, co-workers support, job security and adverse belief about pain were not associated with MSDs in almost all 6 outcomes (HR 0.86 [95% CI 0.82–0.99) respectively.

Table 4.12: Psychosocial Risks for Presenting with Incidences of Musculoskeletal Complaints among Mineworkers at Selected Mines, Fully and Partially Adjusted* Model N=247 1= Complete Response

Variables	Participants response	Back pain	Shoulder pain	Wrist pain	Elbow pain	Neck pain	Knee pain
				Hazard ratio (95% Confidence Interval)			
Time pressure							
High	**181**	**1.61(0.93-1.72)**	**1.50(0.91-1.68)**	**1.27(0.92-1.06)**	**1.44(0.91-1.18)**	**1.63(0.93-1.20)**	**1.19(0.92-1.25)**
Low							
Decision latitude*							
High	**193**	**1.01(0.88-1.15)**	**1.06(0.90-1.28)**	**1.02(0.88-1.57)**	**1.33(0.90-1.17)**	**1.04(0.89-1.16)**	**1.07(0.94-1.21)**
Low							
Co-workers support	**165**	**0.99(0.86-1.13)**	**0.98(0.84-1.16)**	**0.98(0.88-1.12)**	**0.97(0.85-1.11)**	**0.85(0.91-1.28)**	**0.95(0.87-1.13)**
High							
Low							
Job Satisfaction*							
High	**185**	**1.04(0.85-1.27)**	**1.03(0.85-1.22)**	**1.07(0.83-1.29)**	**1.06(0.88-1.28)**	**1.09(0.93-1.32)**	**1.109(0.913-1.34)**
Low							
Job security							
High	**163**	**0.93(0.83-1.04)**	**1.18(0.82-1.07)**	**0.90(0.83-1.045)**	**0.94(0.85-1.05)**	**0.93(0.83-1.042)**	**0.95(0.85-1.065)**
Low							
Working with Fright*							
Yes	**183**	**1.07(0.79-1.47)**	**1.10(0.77-1.59)**	**1.14(0.82-1.54)**	**1.09(0.76-1.41)**	**1.07(0.788-1.46)**	**1.72(0.78-1.46)**
No							
Mental disorder							
Yes	**167**	**1.16(0.80-1.51)**	**1.34(0.94-1.92)**	**1.11(0.81-1.55)**	**1.09(0.72-1.38)**	**1.12(0.86-1.58)**	**1.35(0.75-1.41)**
No							
Adverse pain belief *							
Yes	**161**	**0.84(0.83-1.04)**	**0.93(0.83-0.97)**	**0.92(0.84-1.16)**	**0.84(0.83-1.18)**	**0.92(0.84-1.14)**	**0.94(0.86-1.12)**
No							
Incentives*							
High	**192**	**2.03(0.85, 3.12)**	**2.42(1.98, 4.36)**	**1.35 (1.21, 1.57)**	**2.14 (1.39, 4.13)**	**2.23 (0.86, 3.4)**	**1.21 (1.44, 1.26)**
Low							

Adjusted for age and Job designation. *stands for explanatory variables that adjusted for shoulder pain in partial/full model

The bolded colouration represents significant associations on the formatted tables, while the light sections represent non-significant associations.

Table 4.13: Physical risk factors for presenting with new onset of musculoskeletal complaints among mineworkers at selected mines, partially adjusted* N=247 1= complete response (Full model)

Variables of Interest	Participants response	Back Pain	Shoulder pain	Wrist pain	Elbow pain	Neck pain	Knee pain
		Hazard ratio (95% Confidence Interval)					
Lifting during task*							
High	201	1.31(0.63-1.44)	1.30(0.69-1.46)	1.41(0.69-1.47)	1.31(0.69-1.47)	1.51(0.64-1.73)	1.15(0.689-1.466)
Low							
Repetition*							
High	214	1.92(1.62-2.16)	1.56(1.42-2.26)	1.95(1.62-2.46)	1.15(1.43-2.12)	1.13(1.02-2.10)	1.27(1.12-2.30)
Low							
Awkward posture							
No	143	0.86(0.59-1.46)	0.87(0.51-1.48)	0.87(0.51-1.45)	0.86(0.50-1.46)	0.86(0.59-1.46)	0.86(0.51-0.47)
Yes							
Working above shoulder*							
No	162	0.88(0.78-1.06)	2.09(1.78-2.48)	0.89(0.78-1.07)	0.88(0.78-1.00)	1.88(1.75-1.97)	0.88(0.78-1.06)
Yes							
Working underground							
No	187	1.18(0.81-1.68)	1.16(0.81-1.65)	1.16(0.80-1.64)	1.16(0.80-1.68)	1.19(0.81-.66)	1.17(0.81-1.68)
Yes							
Squatting at work *							
No	213	1.12(0.75-1.67)	1.12(0.75-1.67)	1.12(0.75-1.67)	1.12(0.75-1.67)	1.11(0.74-.67)	1.23(0.75-1.67)
Yes							

Adjusted for age and Job designation. *stands for explanatory variables that adjusted for shoulder pain in partial/full model.
The bolded colouration represents significant associations on the formatted tables, while the light sections represent non-significant association

4.12.5: Physical Risk Factors and New Onset of Severe Regional Musculoskeletal Pain: Full Model and Partially Adjusted* Multivariate Association

Physical risk factors, such as lifting weight during task, repetitive tasks, working underground, and kneeling or squatting at work were all significantly associated with MSDs' occurrence in almost all 6 body parts outcomes (1.56 95% CI: 0.56–1.67). However, working above shoulder was only marginally associated with shoulder and neck pain, but was not significantly associated with the other four body parts. Awkward posture during task was not significantly associated with MSDs (0.86 95% CI: 0.56–0.67) occurrence in almost all 6 body parts outcomes. (Tables 4.13).

4.14: Phase Two: Result Presentation

4.14.1: Introduction

This exploratory research examines the understanding and perceptions of stakeholders of psychosocial risks and work-related stress influencing the persistence/ recurrence of MSDs in the Nigerian quarry mining workplace despite previous attempts to mitigate mechanical stress due to occupational activities. The Nigerian quarry mine stakeholders as mapped during the stakeholders' analyses are presented in table 4.14 below.

Table 4.14 Stakeholders role description at the mines and demographics – N = 30

Stakeholder name	Description and demographics (Mean age 43.8±2.6 years)
Crushers	Mineworkers operate the crusher machine utilized in breaking the granite into different sizes. Two of the crushers selected, participated in the focus group.
Drillers	Mineworkers operate the driller machine utilized in boring holes into the solid rocks to insert explosives utilized in rock disintegration. Two of the drillers selected, participated in the focus group.
Blasters	Mineworkers that insert and detonates explosive for rock disintegration. Two of the blasters selected, participated in the focus group.
Truck Drivers	Mineworkers that operate the dumpers utilized in transporting disintegrated rocks from the underground pit to the crusher machines. Two of the truck drivers selected, participated in the focus group.
Auto-mechanic Technician	Maintenance workers that repair and services engine mechanical faults in all forms of equipment utilized in the mines. Two selected auto-mechanic technician, participated in the focus group.
Auto-electrical technician	Maintenance workers that repair and services electrical engine components faults in all forms of equipment utilized in the mines. Two selected auto-electrical technician, participated in the focus group.
Unit Supervisors	Maintenance supervisors and mining operation supervisors that oversea unit operations. Each unit supervisors was selected from the two mines to participate in the focus group.
Operation Managers	Maintenance manager and mining operation manager in charge of operational decision making in the mines. Each unit manager was selected from the two mines to participate in the focus group.
Safety managers	Safety manager are in charge of safety compliance by all workers in the mines. Each safety manager was selected from the two mines to participate in the focus group.
Mine inspectors	Mine inspectors are government agents in charge of environmental safety compliance in the mines. Two inspectors were selected from The Environmental Safety and Regulatory Agency to participate in the focus group.
Union executives	Mineworker's union leaders that oversea and protect workers' interest in the mine. Each mine union president was selected from the two mines to participate in the focus group.
Excavator operators	Excavator operators and operators of heavy duty machines such as excavator. Two selected Excavator operators participated in the focus group.
Community representatives	Each mine host community president-general was selected from the two mines to participate in the focus group.
Shareholders	Each local mine shareholder was selected from the two mines to participate in the focus group.
Sales representatives	Each local mine sales agent was selected from the two mines to participate in the focus group.

Table 4.15: Themes and Descriptors Emanating from Stakeholders' Responses during Focus group discussion (FGD) in Chronological Order

Key questions and Theme	Responses to question and Descriptor (Theme Identifier)	Quotation
Key questions: Do you understand the term psychosocial risk factors being a possible cause of musculoskeletal disorders? **Theme: Awareness of psychosocial risk at the level of work organisational management practices.** **Key questions: What do you understand by the term Job Control from your own understanding?**	Generalized lack of awareness of psychosocial risks and its role in MSDs. Psychological distress, financial constraint, mistakes and errors leading to fatigue and long-term overexertion leading to psychological distress and work related disability. The contribution of workers in deciding task schedule, wage rates, work duration, task allotment, work routine, leave and shift schedule. Burdensome, intensive, mental overload, heavy workload leading to work-family interrole conflicts, workload made worse by	**Truck driver**: "*I can imagine this happening to people at the long-term especially when they overexert themselves regularly for too long and become stressed out but it may not necessarily be the main cause of the disorders which I feel is more physical"* **Crusher operator**: *Lack of concentration to coordinate specific task and poor hands on specialization due to poor job control. The problem of having different working rhythms, usually becomes more difficult over the years, that it makes me fall sick and bored coming to work*. Driller: "*During the last harmattan season my brain was in overdrive for about 40 minutes after I arrived home, and then my*

Theme: Work organisation at the level of the firms' socio-political environment **Key questions:** **How do you perceive the workload in the mines?** **Theme** **Work organisation at the level of the work situation**	weather, poor work relationship, unfavourable organizational structure and poor positive work attitude. High workload creates stress and ill-health Low decision latitude/ authority concerning work poor work shift design, Poor work shift management and regulatory framework. Lack of motivation. Lack of decision on, task allotment and work routine	*wife started her own problem, before I later calmed down. If you feel motivated in the workplace you will have no reason to feel tired, especially when you are experienced in what you do, it does not matter even if you feel pain, it will not stop you from working*." **Blaster**: *"The problem of having different working rhythms over the course of a few days, usually becomes more difficult over the years, that it makes me fall sick and bored coming to work".*
Key questions: How do you feel about your work shift control? **What do you feel about your work as regard time pressure at work?**	Presence of substantial time pressure to complete tasks, made worse by unfavourable organizational structure and previous ill-health. Seasonal time pressure at work due to poor planning. Substantial time pressure to complete tasks leading to	**Driller:** *It is really high especially during the raining season when a lot of workers have opted out of work to attend to their private farming. The management will be mounting pressure on some of us who are not indigenous, that have no farm to cultivate,*

What do you feel about your work time management or work-rest ratios? **Theme** **Work schedule**	work stress. Work-rest ratios are affected by challenges of commuting to work.	*due to lack of alternative arrangement to replace drop-out workers.* ***Supervisor**: We do the same work with fewer colleagues", "work pressure, preventing functioning well in your job. Sometimes you are posted to a unit more workers are there doing practically nothing in a unit, because the task posting is not coordinated and it becomes a misfit between job and persons.*
Key questions: What do you do when you feel pain while working do you *continue to work even if you have some pain?* **Do you receive training on new skills at work, safety and best practices on improved ways of task execution?** **Theme** **Workplace safety and hazards**	Poor health seeking behaviour, Poor sick leave incentives. Working with pain due to social and financial constraint, lifestyle, and self-efficacy beliefs. Lack of training on new skills at work, safety and best practices on improved ways of task execution due to poor financial provisions. Poor compliance on use of personal protective equipment	**Operation Manager:** *I have told them severally to take sick leave but because of their lifestyle of "money is everything" they will refuse because they believe the sick allowance is small compare to daily wages.*

4.14.1: Thematic Analyses of Stakeholders' Perception Regarding Work Context and Content of Quarry Mining

4.14.1.1. Awareness of Psychosocial Risk in Organisation of Work and Management Practices

Prior to the study the mineworkers demonstrated lack of awareness of the association between psychosocial risk factors and MSDs' incidences. They felt MSDs were mostly caused or aggravated by physical overexertion. However, some seemed to believe that long-term expression of psychosocial risk factors may predispose them to MSDs.

A mineworker's description of his awareness of psychosocial Risks

"*I can imagine this happening to people at the long-term especially when someone overexerts himself regularly for too long and becomes stressed out but it may not necessarily be the main cause of the disorders, which I feel is more physical".* The discussions eventually stimulated reflection on most participants, whose previous unawareness was replaced with new insights. This made one of the discussants (Auto-electrician) makes this remark about the consequence of time pressure at work which he believed could trigger work-related disorders. *"I had arthritis sometime and my unit supervisor continued to mount pressure on a tasks of crusher machine maintenance task. Do you know that as soon as I completed that job, I broke down into a full blown sickness? I believe that was a combination of my previous ill-health with a physically demanding job and working in an adjusted job with poor motivation".* By poor motivation, I mean the necessary support needed to encourage employees at work to stay safe and healthy, while performing various assigned duties to earn the necessary payment as well as to drive organisational goals.

The participants mentioned several descriptors of work organisational practices; poor motivation, time pressure at work compounded by previous ill-health, financial constraints, work stress, work-

family and societal responsibilities, interrole conflicts, long-term overexertion leading to psychological stress, and high mental demand. The discussants believed that the following factors interact with each other to create a mismatch between the jobs people perform and the capabilities of the people who perform them. The challenges of poor motivation and negative emotions and poor commitment to organisational goals with an inability to change the situation acting as a form of low job resources. An excerpt from a Driller explains poor commitment to organisational goals *"I believe a lot of workers share my views on this matter, we are not satisfied with several organisational policy as regard the incentive systems and that have affected the way we feel about our work, and there is no motivation at all".* Meanwhile one of the safety officers had this to say "*We don't have a positive working environment and I think that is affecting the way we perceived our workload. If we know each other well. If the working relationship is good and we try to help each other in our day-to-day work the workload will not be a problem because everyone will be motivated*".

Some participants lamented that the challenges of poor positive work attitude or motivation, unfavourable organizational structure and poor relationship with co-worker constitute poor coping strategy to high workload thereby causing easy fatigability of mineworkers. "*What we are saying is that no matter the workload if you feel motivated in the workplace you will have no reason to feel tired, especially when you are experienced in what you do. But when the motivation is not there and you are not happy with workplace, any little perturbation will cause sickness for you because you will get tired easily and it is affecting your performance or output*". The report of a quarry crusher operator his perception of his workload challenges. The workers also referred to positive work environment as a determinant of their perception of workload.

The participants also shared the view that their workload exceeded their capacity to work, resulting in poor well-being and problems with work functioning. This was captured in a quotation from a Jack hammer operator: *"I have a very intensive job, leading to a lot of mental overload; I don't even have the tendency to take a break from work when it suits me. I am not sure how long I can do this. Because it is causing me a lot of work-related stress.* The main theme was described by a number of sub-themes or descriptors. Work organization was a main theme including job control and decision latitude, workload and demands, work design. Lack of job control and low decision latitude were understood as psychosocial risks by stakeholders at the end of the FGDs.

4.14.2. Work Schedule and Management

Another main theme identified is the problematic work schedule. The subthemes or descriptors included the hours worked, time pressure, work-rest ratio, and work shift design challenges (task allotment). The workers also suggested that improper task allotment, lack of formalization of and role specialization in the workplace were descriptors of the main theme that tasks resulted in misfit and work stress which was perceived by stakeholders to be associated with overexertion and consequently injury occurrence. A mine inspector had this to say; "*If you place an incompetent person in a unit you are* ***overworking*** *others because the person is inefficient and useless*." The union leaders also expressed concern over work scheduling during mining operations due to poor participatory policy decision on work shift design. One union member wrote *"What we see here is every Saturday, the supervisors come with a shift roaster and tell you that you are working in the pit next week they can send you to maintenance another week, even the supervisor is sent anywhere if you talk they will threaten to sack you. The unions have no say in anything because they have bought them over"*

4.14.3. Socio-economic Conditions of the Quarry Mine

Besides poor work organisation, some participants mentioned a combination of work-family and societal responsibilities and interrole conflicts as a source of work related stress and a possible mediator of MSD incidence. The work-family interrole conflict is a descriptor of socio-economic conditions of the miners. It was also understood as a form of psychosocial risk which may predispose them to MSDs. This was an excerpt from a Driller pointing at interrole conflict as determinant of psychosocial risk of injury occurrence; "*I believe the combination of having to push yourself to the limit at work and something going on at home" or "unfavourable work situations combined with a busy private life will hinder performance absolutely with little job demand one gets tired and work injuries definitely comes afterwards*." There is the challenge of power dynamics raised during the focus group discussions between other stakeholders and the mineworker's which may be responsible for the nonchalant attitude towards welfare of mineworker's. This may be attributed to previous mistrust between them and the mineworker's especially regarding flexible sick-leave and job control in the workplace. An excerpt from an Operation manger "*I pay a lot of attention to workers' body languageand I try to follow them closely. For instance, I ask them about complaints if somebody holds their hands to their back. I consider myself observant and pick up on many clues. The workers feel I am monitoring them that way so, I try to give them free hand. As per the issue of task postings, if I allow them to choose where they get to work they will end up devising means of being lazy at my work and my output will suffer*". It was also noted during the discussion that workers may also be under financial constraints which may be forcing them to work with injuries and refusing to take sick leave and this may predispose them to chronic MSDs cases. This is because persistence of cumulative strain injury and re-injury weakens an individual's ability to recover after an acute episode, thereby tending towards chronic injury and persistence of symptoms (WHO, 2010). It was also noted during the focus group interaction by stakeholders that mineworkers believed that they were not satisfied with their Job, due to poor organisational policy, specifically around poor incentive and promotion systems. They have the

notion that there is an improper social support system in place in the organization. The supervisors and other mineworkers believed that their job security leaves a lot to be desired, with the workers describing this aspect of their work as having to deal with the incessant risk of being fired, an absence of health insurance cover, the casualization of employment, inadequate pension arrangement, and the absence of annual leave arrangement. An auto-mechanic expressed the following in this regard "*The problem is among ourselves they have spies and if you talk against the manager they will go and gossip to him to find favour from them. He is here, ask him! I believe this is the best place to say our minds, because our welfare is never discussed at all and how we feel about the work we do is not important to them. All they do is mount pressure on you to keep working. If you fail to abide by their instruction and work you are suspended if you are on probation twice, you get fired and replaced".*

4.14.4. Social Relationships and Interactions at Work

The problem of interpersonal relationships is cardinal to good productivity output in any firm. The theme regarding social workplace interactions and relationships was linked by stakeholders to presence of low social support systems. The mineworkers expressed displeasure with the challenges of poor stakeholders' relationships which promotes bullying by supervisors, co-workers' rivalry, and a propagation of a 'divide and conquer' policy of the management. The absence of participatory decision making process regarding organisational culture and communication was reported by stakeholders to be responsible for the poor interpersonal relationship existing within inter and intra organisational personnel. One supervisor said: *"The situation here is bad you don't talk to these Chinese people, when it was Germans it was better we normally have meetings, now they use divide and rule on us and we fight among ourselves all the time. No meeting except union meeting once in a month. If you complain to the Inspectors they do nothing, instead they tell you to bring petition through your union in writing, the union is another sell out, to management. "*

The Mineworkers also share the conviction that there is a link between psychosocial and physical risks and that such an interaction of both factors will impact negatively on workers' health and wellbeing. This a quotation by an excavator operator *"Highly physically demanding tasks creates tension and psychological stress, which begets serious mental demand and tension while you are performing work, which in the long-term you get fatigued easily and that can cause muscles soreness".* Mineworkers, due to poor working conditions, have resorted to drug abuse and which have lead some into depression, anxiety and emotional problems, and general mental disorders associated with drug addiction. "*The managerial staffs in our units mount a lot of pressure on a daily basis on mineworkers. Meanwhile shareholders care less about staff welfare, instead they are much keener about productivity and profit margin. It is really getting out of hand, making it impossible for me to function well anymore. The alternative solutions workers resort to is drug addiction increasing their tendency to suicidal motives." It was an account of the unit supervisors in both mines.* The poor working conditions are compounded by poor organisational incentive systems which have increased the psychological stressors faced by the miners. The miners do shift work, faced with high expectation, with less pay to take home and to a large extent are faced with harassment and burnout. The miners, in a bid to cope with the myriad of problems, such as psychological stress, resorted to self-help and drug addiction.

4.14.5: Safety and Hazards at Workplace

The themeworkplace safety and hazards had the following descriptors; Poor health seeking behaviour, and sick leave incentives, in an organisation impacts negatively on workers' health and well-being. The implication is that the workers might likely perform their work tasks with pain, which will in turn affect productivity output as well impose greater workload on other co-workers. To this effect, an operational manager said "*I have told them regularly to take sick leave but because of their lifestyle of money is everything they will refuse because they believe the sick allowance is small compared to their daily wages."*

Quotation (Operation manager): "*I pay a lot of attention to workers' body languageand I try to follow them closely and, for instance, ask about complaints if somebody holds their hands to their back. I consider myself observant and pick up on many things. For me, this is one important way of prevention. The workers feel I am monitoring them that way so, I try to give them free hand, but the will never seek for medical attention so as to avoid being sent on sick-leave since it will reduce their pay."*

Poor social support, will likely lower workers self-efficacy beliefs in an organisation and that will likely increase hazard or risk bearing levels across the various stakeholders as the case may be. The influencers will have a lot of regulatory work to do in the sector, because hazard level will likely rise, the decision makers will bear the burden of poor productivity output arising as a result of poor health of actors (workers). The workers will face higher risk of losing their earning capabilities and that will mean serious financial constraints for these categories of stakeholders.

"I suppose all of us are casual workers we have no pension arrangement in place no health cover, the pay is inadequate, I feel strongly that most of us will retire with physical disability and become useless as we lose our earning capacity." An excerpt from a unit supervisor

Lack of training on new skills at work, will affect safety and best practices, in an organisation because workers will adopt the wrong approach to perform their job tasks and this could aggravate the health risks faced by the mineworkers. Stakeholders must be trained on improved ways of mining operation to minimize the risk level in the firm. Quotation from a Safety officer: *"The workers will not even listen to you when you say they should embark on training, to learn how to observe safety measures at work, because as soon as you don't clock in your wage for that day is gone. So how do you even expect that workers will think of safety training at the first place. The social support system has drastically fallen short of standard, from what it used to be previously. For instance, we are entitled to milk because of dust irritation now nobody is given that anymore when you ask the operation manager will say no money".*

The colossal poor financial provisions by the firms to sponsor workers on safety and hazard prevention as well as, poor compliance on use of personal protective equipment by workers will elevate the hazard levels in the firm. *"I am the safety officer in this mine and I have a lot of complaints to make about being redundant. We use to do training before when the Germans are in-charge of the mines such as training about back injury prevention techniques during 6-month basic work safety training some of us that are old benefited. Since the Chinese took over the management of the mines, the stories have changed they will say no money to throw around. The new staff that joined the mines have no such training except if your supervisor is kind enough, you will be taught on the job which may be highly inadequate."*

4.14.6: The Effect of Work Content on Psychosocial Risks Associated with MSDs

The work content variables were categorized as follows: workload, work pace, decision latitudes or job control, time managements (working hours and rest break schedules), and shift scheduling systems. Mineworkers believe that their working conditions had a lot of physical strain associated with poor shift scheduling, poor job control, and time managements leading to high stressful working conditions. A Crusher operator commented: *"We have developed a lack of commitment to the firm's goal and changes in personal attitudes in response to issues at work that we employees could not influence".* Meanwhile the managerial staff are insensitived to the plight of other workers due to poor regulatory frameworks by established government statutory agencies to implement preventive policies. Additionally, the concerns of non-dominant stakeholders, such as community leaders and inspectors as well as sales representatives, was more of productivity output to increase revenue creation and less concern to main stakeholder's well-being. *"The situation here is bad you don't talk to this Chinese people, when it was Germans the welfare system at that time was better. We normally have meetings, now all you hear is go and work so that you can earn your money. They keep reminding you how it is important that the community and government agencies are settled financially through royalty and corporate tax. Secondly you will hear things like I have supply deadline for my customers from the managers, please continue to work".*

*(*Quotation from Chinese mine engineers). The issues raised highight community leaders and government regulators' insensitivity to main stakeholder's well-being, a situation which could be blamed on poor implementation of regulatory policies on employee's health and safety by the government statutory agencies. Quotation from a Community leader: *"There are established laws to checkmate labour exploitations from the records, but implementation of the regulatory frameworks was found to be very weak in the Nigerian quarry mine sector context*", which is also fueling labour exploitation in the Nigerian quarry mining sector. That is to say the problem of poor implementation of welfare policies was established since the Chinese management took control of the mines. The poor welfare policies of the mine administrators are seen by the miners to be acting as a barrier to their committement to organisational goals.

4.14.7: The Effect of Work Context on Psychosocial Risks Associated with MSDs

Work Context: The work context variables were categorized as follows: Job satisfaction, incentive systems, organisational culture and communication (participation in decisions concerning work and clarity of firm's goals), work family conflicts, physical design of workplace, interpersonal relationships or interactions between co-workers or groups of stakeholders and employment conditions (status). Main stakeholders generally believed that there are poor interpersonal relationships and harassment between the hierarchies. The miners are accusing the managerial staff and unit supervisors, while managerial staff and unit supervisors are accusing external stakeholders, such as during community leader's demand for corporate social responsibilities. They all feel that there may be an uneasy calm between them and the host community leaders which may be regarded as a clear psychosocial risk of MSDs among miners.

CHAPTER FIVE

DISCUSSION

5.1: Introduction

The present study employed a parallel mixed method research design in two mines conveniently selected to investigate musculoskeletal disorders incidence among Nigerian Mineworkers and to understand stakeholder perceptions around the challenges of work and how their interactions may present various psychosocial risks. The study was in two phases: Phase 1 investigated the exposure effect relationship between MSD pain in the back, neck, shoulders, elbows, wrists, and knees, and its potential work and non-work risk factors in selected Nigerian mineworkers. Phase 2 was a qualitative exploration of psychosocial risks, in a focus group discussion with stakeholders to generate their perceptions around the challenges of work and to understand how the role of their interactions at the workplace, influence the persistence of MSDs' occurrence. The perceptions of stakeholders on work challenges and interpersonal relationships and interactions was conceived as a possible psychosocial risk factor and built into the qualitative aspect of the study to interrogate participants on their perception regarding organisational design of work content and context. There is evidence suggesting the likelihood of negative impact on worker's health of poorly designed work content and context, especially in a long-term situation (Kortum, 2011). Most psychosocial risks associated with work/task performance were explanatory variables which may not be exhaustively assessed with the quantitative approach alone. Generally, there was a need to unmask the challenges of work and interactions between miners and other stakeholders in the Nigerian quarry mine context with a view to unravel how they pose as possible risks to the health and well-being of miners.

5.2: Prevalence of Musculoskeletal Disorders by Body Distribution of Nigerian Quarry Mineworkers

The 12-month retrospective prevalence of mineworkers by body parts distribution at baseline prior to the study was estimated with shoulder having the highest frequency of occurrence. The shoulder MSDs were followed sequentially by back pain, neck pain, knee pain, wrist, and elbow pain. The report of the present study was slightly different from the report of an Indian study among quarry mineworkers by Ahmad & Alvi, (2017) who reported lower back followed by knee and shoulder as the most prevalent areas affected by MSDs, despite having similar sample size. The differences could be explained by variations in occupational and environmental context of the two studies. Shoulder complaints were the highest in the current study with 192 cases both for isolated site specific shoulder pain report and in concurrent report of shoulder pain and other body parts. However, 78 cases of isolated site specific shoulder pain were reported by mineworkers representing 31.57% prevalence at baseline. Back pain had a total of 184 recurrent cases and about 74 (29.95%) isolated site specific cases, while neck pain also had 167 and 67 recurrent and isolated site specific retrospective case reports respectively. It was unexpected that knee pain had 157 and 63 (25.50%) recurrent and isolated case reports respectively, which is a very significant figure compared to what is known from previous studies. Additionally, wrist pain and elbow pain had 153 and 62, 124 recurrent and 50 isolated site specific retrospective case reports respectively. Evidence from Coggon et al. (2018) shows that MSDs complaints appear to be driven largely by unidentified factors predisposing workers to report of pain at multiple anatomical sites. Therefore, it was now important that recurrent and isolated anatomical site-specific reports were investigated to avoid underestimating the prevalence rates of MSDs. The findings of the present study showed that there were more recurrent cases of MSDs' occurrence than isolated site specific MSDs reports, which is an indication of chronicity (persistence) (see table 4.7 for details).

The prevalence report pattern was similar to the previous study by Dias (2014) that observed between 17 to 30% for MSDs at the neck, wrist, and elbow of South African mineworkers.

However, the present study reported shoulder pain as the highest MSDs complaint unlike lower back pain that was observed to be highest in the study by Win et al. (1996), Dias, (2014) and Tawiah et al., (2015) among mineworkers. The difference in the report could be associated with differences in the mine commodities, studied in the previous studies which are mostly coal, Gold and Platinum mines, compared to the present study among Nigerian quarry miners. The differences could be explained by variation in workplace exposure factors. Additionally, the present study found a reported prevalence of 25.50% of knee pain which corresponds with the findings by Dias (2014) in her research on platinum mineworkers that work underground with narrow seams. The confined spaces common with platinum mines are to the result of the difficulty miner's face in excavating platinum, exposing the workers to excessive kneeling postures. Similarly, the high prevalence of lower limb MSDs reported among Nigerian mineworkers could also be as a result of the uneven terrain filled with stones that these workers are faced with, which may result in slip, trip and fall accidents at the course of mining operations in the quarry mine pits.

Despite the controversial nature of the pathophysiology of MSDs, available evidence suggests that the high rate of MSDs among miners is due to gradual but repeated exposure to low-level forces exerted on contracting muscles during task performance (Aras, 1994; Armstrong, 1999; Hamberg et al., 2006 and Seitz et al., 2011). The most affected body parts among the Nigerian Mineworkers from both prevalence and recurrent incidence reports was shoulder pain, followed by back pain, while elbow pain was the least reported body part. Most importantly, delineating the distribution of MSDs in terms of body parts affected was critical to provide insights into the level of repetitive strain and its impact that results from the physiological demand of mining tasks performance on mineworkers. Highlighting the most affected body parts distribution was necessary to pinpoint the aspect of the task that quarry miners do which may be more problematic. The relative risk ratio of the various quarry tasks was an indication of physical demand of the different categories of mining jobs. For instance, loading and sorting of stones in the crushers machine, operation of heavy equipment's such as jack hammer, driller and excavator joysticks requires that quarry

mineworkers regularly lift heavy loads, as well as twist and rotate their back and neck repeatedly. This will cumulatively strain the rotator cuff muscles as well as the weak neck stabilisers such as trapezius muscles. (Appendix VIII).

There is also a suggestion from a recent multinational study by Coggon et al, (2018) stating that predisposing factors to MSDs pain at different anatomical sites may be largely responsible for the tendency to drive disabling pain at other body parts. The implication is that development of pain at multiple sites is driven by a previous pain and the sufferers somatising tendencies. The validation of this argument may be beyond the scope of the present study since clustered cohorts will be required to establish such a causal link for evidence of such propensity of pain on one body part with risks factors associated with pain generally. The persistence of MSDs could also be explained by physical risks propensities such as task repetition and repetitive movements. This implies that workers exposed to similar physical risks propensities and similar task set-up with varying occupational work demands such as tailors, construction workers and long distance drivers, may be faced with such propensity of pain at a particular body part (Anderson et al., 2007; Boschman et al., 2012; Coggon et al., 2013 & Driscoll et al., 2014). Simply put the distribution of MSDs across different body parts may be mediated by the workplace factors in which workers are employed. The implication is that workers involved with prolonged standing may present with more back pain than arm pain and vice versa depending on occupational situations. The interpretation of the present findings, placing shoulder pain and back pain above other body parts may be accounted for by exposure of the miners to heavy manual task repetitions with prolonged standing as revealed by Egwuonwu et al. (2019) in a previous task analyses of Nigerian quarry mineworkers. Finally, the non-work risk factors such as time pressure at work and elevated muscle activation may also account for why the workers reported more pain in the shoulder, followed by the back, in the present study (Hughes et al, 2007 and Yung, 2011).

5.3: Incidence Estimates of Musculoskeletal Disorders of Quarry Mineworkers

The estimated incidence of MSDs was 6.4 per 1000 for the 6months period (reported in Table 3 page). The annual incidence when extrapolated suggests an annual incidence of 128/ 1000 which was considered high for quarry mineworkers in any population compared to the report of high incidence of MSD was also observed in a previous study by Dias (2014) who investigated the incidence of MSDs among South African Coal mineworkers in a case-control survey with an incidence of 6.2% per 1000 cases. Additionally, a 5 years' prospective incidence survey of a US mine by Torma-Krajewski, et al. (2009) reported an average incidence rate for non-fatal days lost (NFDL) to injuries as 1.32 injuries per 1000 employees. The findings were small compared to 6.2 per 1000 mineworkers which may be largely attributed to heavy mechanisation (in America) compared to predominately manual tasks operation in the context of Nigeria. The high incidence reports may also be connected to the strenuous nature of mining tasks which was reported in a previously published field evaluation pilot study of task requirements of mining job in the same population (Egwuonwu et al., 2018). Mineworkers are faced with similar challenges especially in middle-income countries like Nigeria and South Africa.

Furthermore, the differences in incidence estimates rates findings of the presents and that of previous studies in high income countries may also be linked to differences in socioeconomic, sociocultural and individual characteristics of the study populations. Available evidence from literature shows that poor nutritional status associated with poor socioeconomic status results in weak immunity and delays the recovery from repetitive strain injuries and MSDs (Laflamme et al., 2009). The socioeconomic status of an individual, apart from educational and individual resources is social determinants of injury occurrence (WHO, 2010).

The relative survival rate of developing musculoskeletal disorders between the exposed and unexposed cohorts in the present study was explored using the Kaplan-Meier survival curve. The choice of Kaplan Meier analyses is to enable the taking into account the time of starting from a

defined point to the occurrence of a given event, for example MSDs' occurrence in workers free from MSDs *ab initio* which is marked as survival time. The hazard ratio indicated that Mineworkers were 4.5 times more likely at risk of developing musculoskeletal disorders than the unexposed cohorts. It is an indication of a causal link between MSDs' incidence and the propensity of miners to body pain relative to workplace exposure factors faced by the miners. The findings of Gerr et al. (2014) in their studies among construction workers reported about 5.4 times per 1000 per year incidence of MSDs associated with hand activities in the exposed cohorts compared to unexposed cohorts. This is higher than the present study and could be attributed to methodological differences in conducting the studies

5.4: Incidences Estimates of MSDs Distribution by Job Designation

The MSD incidences of mineworkers by job designation were 2.1, 1.5, 1.47, and 1.2 per 1000 for the 6months period for Blasters, Crushers, Drillers, and Others respectively. Despite the fact that the mineworkers were almost evenly distributed into 4 different job categories (65 each for Blasters, Crushers, Drillers, and, while other miners were 51) their musculoskeletal incidences, as presented above, followed an exposure-response pattern. The blasters had the highest incidence of MSDs, which may be explained by prolonged adoption of twisted posture in confined spaces with the frightening nature of the explosion during blasting operations and lifting of heavy explosive installer machine needed for installation of explosive at the bedrock, during blasting tasks. The majority of the task by blasters are performed below the ground level with no formal workstations. The findings of the present study agree with the report of Carrillo-Castrillo et al., (2016) which distributed MSDs relative risk estimate among Andalusian manufacturing workers based on an exposure-response pattern. There is also a possibility that the nature of air inhaled by blasters may be contaminated since most times during rainy season there is an accumulation of stagnant water down the open mine pits below ground level (Harris, 2003). Previous studies have also reported the likelihood of carbon monoxide inhalation by rock blasters in underground mines from ammonium nitrates explosives utilised to disintegrate rocks (Bakke et al., 2001; Harris, 2003; and

Zawardoski-Malota, 2015). Ammonium nitrates explosives are oxidising agents and deplete limited atmospheric oxygen found underground. In any case, poor oxygen may lead to fatigue and that may mediate high report of MSDs.

However, this is beyond the scope of the present study, since that will require laboratory analyses to ascertain the nature of air inhaled by these workers. The reality is that most of the Blasters, Crushers and Drillers may have a high incidence as observed in the present study due to the physical and environmental risk factors associated with each particular category of mining operations. The crushers are repeatedly involved in sorting and pressing of the crusher machine control bottom requiring hand raising above shoulder and twisting of the spine beyond 90 degrees. Drillers repeatedly adopt prolonged standing and are exposed to vibration during lifting of heavy drilling machine needed for manual bolting during the installation of explosives at the bedrock. The strenuous nature of this mining tasks generally demands long hours of standing from the workers, and other biomechanical and psychosocial risks associated with the performance of its tasks could be responsible for the high MSDs report found in the Nigerian quarry mineworkers.

5.5: Mining Work-Related Tasks: Perception of Mineworkers on Causes and Prevention of MSDs

The mineworkers were asked about their experience of the difficulty level associated with physical working conditions of mining jobs that may make them vulnerable to MSDs. More than a third of mineworkers reported that working in prolonged kneeling or squatting, working repetitively, incessant lifting of weights above 25kg during mining jobs respectively (87.30, 86.64, 82.72, and 76.95%) were the most difficult physical aspects of their work. Meanwhile, over half of mineworkers also reported that their work involved a lot of lifting movements of the arms above shoulder (65.85%) and that they were required to work in an awkward posture during a task performance (58.30%) in an average working day. Further analyses, revealed that working with arms above shoulder was only significantly associated with shoulder pain (95% CI; 1.78-2.48) and

neck pain (95% CI; 1.75-1.97). The majority of the mining operations, such as operating drills or the rock crushing machine and sorting of stones in a crusher demands that mineworkers overstretch their upper limbs above shoulder level to perform one task or the other. This may explain the significant association of working above shoulder with shoulder and neck pain found in the present study.

Interestingly, responses of miners to working in awkward posture during mining tasks were not significantly associated with MSDs' incidence. The finding that physical work conditions were significantly associated with miners MSDs complaints supports previous studies by Fredricsson et al., (2001), Boschman et al., (2012), and Dias (2012) in which the authors reported that poor physical conditions of work invariably predisposes workers to MSDs. The high incidence of MSDs observed among quarry miners could be reflective of cumulative impact of prolonged adoption of awkward posture, poor or no workstation utilised by mineworkers during task performance and heavy repetitive nature of most mining jobs (Egwuonwu et al., 2018). The combined effects of muscle strain and prolonged work-time in poorly adopted posture while performing tasks were previously found to account for MSDs in various working populations (Lykov et al., 2015; Coggon et al., 2013 and Mourão et al., 2010). Additionally, task analyses conducted among Nigerian quarry mineworkers revealed that mining jobs involved a lot of manual lifting, usually exceeding the NIOSH safety threshold during tasks performance (Egwuonwu et al., 2019). The study at baseline observed and also during follow-up reported prevalence and recurrent MSDs complaint of the different body parts by the different job categories (Relative incidence risk for Blasters: 2.1, Crushers: 1.5, Drillers; 1.47, Others 1.2) see details in Figure 4.2. The present findings agree with the findings of Boschman et al., (2012), confirming MSDs' incidence as a result of cumulative damage arising from excessive biomechanical load on working muscles (Vink et al., 2002). The implication of a relative incidence risk ratio >1 signifies the hazardous nature of mining jobs

5.6: Individual and Organisational Psychosocial Risks Associated with Mining Work Conditions

The role that individual and organisational psychosocial factors plays in relation to MSD risks have all been implicated in several epidemiological studies (North et al., 1996; Parkes and Carnell, 2005; Coggon et al., 2013 and Nyantumbu, 2017). The present study revealed that 13% of the mining cohort reported having poor mental health status which was higher than the 10% reported by a previous South African study (Dias, 2014) in similar occupational groups. The implication of the above is that participants with poor mental health will increase the likelihood that the miners will report MSDs (Solidaki et al., 2013). This stems from the fact that individuals suffering with mental health challenges are at a higher possibility of indirectly bringing about the somatising tendency, which could lead to an overestimation of MSD burden. For instance, in the studies by Coggon et al., 2013 and Dias, 2014, although the sample size was higher (11,710) in Coggon et al. (2013) compared to (691) in Dias (2014) the frequency of MSD reports associated with poor mental health was between 51 and 83% across 45 occupational groups in Coggon et al. (2013) compared to 41% reported by Dias, 2014 with a lower percentage of 10% of cases with mental disorders compare to 15% in Coggon et al. (2013).

Meanwhile, in the present study working in fear or negative psychosomatic symptoms was reported by 75% of miners compared to 5.5 % reported by Dias, (2014) among South African mineworkers. The considerable difference could be explained by culturally determined differences in the populations of the mineworkers' work situations captured in both studies. The present findings were similar to the report of Nyantumbu, (2017) and possibly arose from somatising tendency of about 71% among Nurses and Bankers in South Africa with MSDs prevalence rates of 80% and 84% respectively. The somatising tendency is an experience that pre-empts the individual to communicate psychological distress in the form of somatic symptoms. Meanwhile, psychosomatic conditions occur when a person feels extreme anxiety about physical symptoms such as pain or fatigue. It is more commonly expressed in people with mental disorders such as

depression and anxiety (Linton et al., 2005). Mental disorders therefore could lead to a worker working with fear, and working with fear is believed to be a significant predictor of MSDs across multiple sites (Solidaki et al., 2013).

With respect to adverse beliefs about pain, analyses revealed that this factor was not a significant predictor of MSDs (HR: 0.92-0.84 95% CI), which is in contrast with the study by Dias (2014) among mineworkers (OR <1). It is very likely to be a case of non-differential misclassification of outcome among cohorts (Wisdom and Creswell, 2013). It could also be attributed to the fact that the workers may not have distinguished between tendency to somatise from mental disorders and working with fear such as found in anxiety or depression. Furthermore, the interpretation is that adverse belief about pain, poor mental health and working with fear are mediated by somatising tendency (Solidaki et al., 2013). Additionally, in a previous prospective cohort study by Pincus et al. (2010) to determine predictors of Musculoskeletal pain chronicity and disability beliefs, there was evidence that somatising tendency associated with distressing events, as opposed to having a mental disorder may be responsible for sufferers presenting with multiple sites of musculoskeletal disorders. The important role of somatising tendency has been confirmed in recent studies (Carugno et al., 2012; Solidaki et al., 2013; & Coggon et al., 2018). However, there is no certainty that somatic symptoms alone were responsible for the greater frequency of MSDs report found in the present study, since mental disorders as well as suffering from distressing events both lead to somatisation by participants (Pincus et al., 2010; Vargas-Prada et al., 2013; & Coggon et al., 2018). It is also possible that the significant associations between poor mental health and MSD found in the present study could be attributed to miners mismatching cognitive demand and capabilities leading to work related stress. The psychophysiological state of poor mental health as found in anxiety and depression usually results in elevated muscle tension and over-excitation of contracting muscle and fatigue that invariably leads to MSD occurrence (Linton, 2005; and Vargas-Prada et al., 2013). There is also evidence supporting a possible interaction of psychophysiological state of poor mental health, adverse beliefs and expectations about pain and

poor execution of tasks, misinterpretation of tasks demand and miner's capabilities mediating the onset of fatigue and work-related stress and injury occurrence among miners (Vargas-Prada et al., 2013).

5.7: Severity of Musculoskeletal Disorders

The severity of MSDs was assessed using the symptom and disability duration part of the CUPID questionnaires. It is a subjective but validated instrument from previous studies by Andrea et al. (2010) and Solidaki et al. (2010). The participants' response at baseline for duration of symptom from previous 12-month MSD history was about (32-49%: 95% CI) with pain lasting for 1-7 days. Meanwhile during the follow up the majority of the mineworkers (two-thirds) had MSDs at multiple sites, summarised in Table 4.8. The implication is that retrospectively at baseline and follow-up, a substantial number of the MSD complaints of mineworkers were acute or new cases since most symptoms fell within the range of 1-7 days. Meanwhile, about 14-21% of the MSDs complaints were chronic cases (lasting for between two weeks and more) both at baseline and follow up. This implies that there is an indication of over one-fifth of the miner's being at risk of acute MSDs cases degenerating into full-scale disability. The word 'disability or disabling' in the present thesis refers to the interference of MSDs with a person's activity of daily living, such as performing basic individual need like bathing, dressing up and other domestic activities. Disabling is used to distinguish symptoms that were more severe (Coggon et al., 2018).

The pattern of presentation of MSDs past history shows that shoulder pain was the highest, followed closely by wrist pain with right hand dominance about 69% and 68% respectively. Right Knee pain was reported by 52% of the cohort and lastly lower back with (45%) of past medical history among exposed cohorts. The right limb dominance of the Nigerian mineworkers was also reported in a previous mining task analyses study by Egwuonwu et al., (2019). Surprisingly, knee and shoulder pain with high report of past medical history, coincidentally had the lowest sick-leave absence and were least associated with disabilities for activities of daily living. The mineworkers perceived that elbow pain had the highest sick-leave absence (45%) followed by back pain (34%)

during the previous 12-months (summarized in Table 4.10). A previous South African study among miners by Dias (2014) found a 96% of the workers with symptoms suggestive of disability. The implication of the report could be explained by the higher (691) sample size of that study compared to the present study and the environmental variations where the work was taking place. Additionally, the present study involved a higher percentage of experienced workforce, with about 50% of miners in the present study having above 5 years work experience compared to 33% with more than 5 years on the job experience in the study by Dias, (2014). The duration of MSD symptoms also revealed that less than half of mineworkers reported the previous history of disabling MSDs at baseline whilst half of mineworkers reported the presence of disability during the 6-month follow-up lasting between 1-5 days and more than 30 days. The presents findings reinforced the fact that reoccurrence of new cases of MSDs at multisite overtime was gradually degenerating into full-scale chronic disability for miners. The pattern of disability in the present study showed that less than half of mineworkers declared sickness absence, due to back, wrist and knee pain complaints. The present findings support those of Boschman et al., (2013) Nyantumbu (2017) and Coggon et al., (2018), among construction workers, Nurses, Bankers and people of working age respectively. It was also observed that more than half of participant's followed-up reported new cases of MSDs in their respective studies. Furthermore, majority of the respondents in the present study during the 6-months follow-up declared a past medical history of shoulder, back and neck pains at one point or the other. The presence of previous history of MSDs is an indication that there is likelihood of somatisation or that the cumulative effect of persistent biomechanical factors associated with mining operations could be partly responsible for aggravating the incidence of MSDs. The substantial report of previous history of MSDs could also influence participant's adverse belief about pain. This could be explained by a physiological process known as adaptation of neural perception of pain, which may account for the non-significant association reported previously on adverse believe about pain (Palmer et al., 2005).

5.8: Stakeholders' (FGD) Perceived Health Impact of Psychosocial Risks

The focus group discussion provided a large number of themes and sub-themes to capture the mining stakeholders' perspectives on context and content of psychosocial risks associated with mining operations. This includes an overview of the mining stakeholders understanding of psychosocial risks, as well as an emphasis on existing barriers and policy frameworks to unearth the level of implementation of all the necessary workplace policy. Generally, the main stakeholders (FGD participants) believed that there were poor interpersonal relationships between the various stakeholders in the context of their respective mining operations. The participants also agreed that psychosocial risks and work-related biomechanical risks have serious health and economic impact on the Nigerian mining sector.

5.8.1: Amalgamation of Qualitative Findings from Focus Group Discussion with Cupid Survey Findings Regarding Explanatory Variables

Several issues arose from the FGD by stakeholders were relatively consistent with findings from the CUPID survey. The majority of the themes and subthemes that emerged from the FGD provided additional perspectives on the role which that psychosocial risks associated with quarry mining in the Nigerian mining context played in MSD development as outlined in the results section. A consistent challenge related to how poor work design, as emphasized by mine stakeholders was also a prominent feature that may have been responsible for the high incidence of MSDs found in the CUPID survey. This could be related to results presented in tables 4.5 -4.8 in the phase one of the study. Poor task design encompasses almost all the physical risk factors such as working in awkward postures during task performance by miners. The lifting of weights greater than 25kg and working above shoulder during mining task by extension is also a descriptor of poor task design.

The lack of social support and poor motivation which prominently featured during the FGD could account for the substantial mental disorders and somatisation found in the incident survey among mineworkers. Stakeholders also raised serious concern about their inability to control the job, in

terms of participating in shift scheduling and work-rest ratio. These descriptors of work management could be extrapolated as low decision latitude and could be seen as psychosocial interacting factors with other physical factors mediating the high MSDs' occurrence reported among Nigerian miners. There were barriers also introduced by poor workplace safety and hazards associated with poor compliance to standard best practices and safety which impact productivity and worker's health. Poor health in essence significantly accounts for the elevated reports of MSDs associated with the context of quarry mining operations in Nigeria.

The value of the focus groups lies in the fact that work challenges faced by stakeholders were discussed in much more in-depth and participants elaborated issues of the vulnerabilities of the highly informal Nigerian mining sector workers. The dire situations of poverty and sub-standard working conditions, as well as threats of job insecurity resulting from downsizing of workforce faced by the miners. The high poverty levels among the mineworkers arising from the poor incentive system have a negative effect on workers and their families (Jeyaratnam, 2002). This is an important issue, since poverty and inequality continues to increase in many parts of low to middle income countries such as Nigeria, with 10% of workers in extreme poverty despite substantial years of working (Nuwayhid, 2004). The ripple effect of job insecurity, elevated work-related stress, low socioeconomic status, poor nutritional and housing statuses, increased inequality and other social determinants of injuries will consequently hamper the individual workers' immunity and recovery from repetitive strain injuries, thereby serving as a potential mechanism for increased risk of MSDs. The collective view expressed by focus group participants was that the poor social support could predispose to poor health. This may be extrapolated to high level of MSDs found in the incidence survey which may be the consequence of elevated levels of psychosocial stress and work-related factors faced by key stakeholders in the workplace (Actors and Decision makers). The stakeholders recommended the need for concerted action to address these issues through stakeholder engagement and participatory ergonomics approach at different organisational levels.

The participants believed that physical risks only cause somatic problems, whereas heightened psychosocial stress is known to cause both poor physical well-being and psychosomatic state for workers (Kortum, 2011)'. Therefore, psychosocial risks are more complex and have greater potential to increase loss events at work than all the physical risks put together. They can cause harm both to psychological and psychosomatic states. "*I have never thought about that even though I feel if I am distressed psychologically or financially at work that it affects my performance and it may possibly result in me making mistakes and easily getting tired and developing injuries especially back aches*..." With anatomic causes, you only have physical problems, when combined with psychosocial risks the interaction begets more aggravation of MSDs causes. A good psychological working environment can mitigate the consequences of poor working conditions (WHO, 2007).

There is extensive evidence in literature to suggest that workers affected by psychosocial risks in the workplace are less likely to engage in health promoting behaviours at the workplaces (Kivimäki et al., 2003; Kortum, 2011; and Roquelaure, 2016). It was also revealed that there was high psychosocial stress faced by key actors in the Nigeria quarry mine sector. This according to them may portend danger in the workplace due to lack of engagement in safe work policy implementation. The obvious lack of social support, recalcitrant attitudes towards corporate social responsibilities and spending on capacity building, low decision latitude, and increased time pressure to complete tasks, needs to be addressed by every stakeholder, otherwise they will definitely be fueling future safety concern in the sector. The low job resources have also led to poor motivation of miners towards organisational goals as result of poor management practices by Chinese owners that are currently drifting to capitalist and exploitative policy of the proletariats in the Nigerian mines. The increased work stress has also affected work-family interrole conflict with devastating consequences on the workers physical and psychological health. These could also explain the significant associations in the multivariate models for both physical demands of work

and psychosocial aspects of work. It is a clear indication of the dire need to address head on the poor organisational policies of the Nigerian Quarry Mining sectors.

5.8.2: Stakeholders' Recommendation on Getting Right Policy Framework to Tackle Systems Challenges

Stakeholders, share the conviction that there was a need for priority action to mitigate the power dynamics within various stakeholders' hierarchy via a concerted action at different levels by engaging stakeholders on policy formulation and implementation. The suggestion by stakeholders in the qualitative aspect of the present study was the need to devise strategies to modify content and context of work and consequently mitigate aggravating factors responsible for unhealthy work environment. This could be done in the following way: By formalization of jobs in the mining sectors which presently is operating mostly largely at the informal levels through provision of tax and credit incentives to most mining enterprise. Formulation of social policy guaranteeing right at work especially for vulnerable workers, by social protection of work environment and workers families through social dialogue in an attempt to build cohesive societies. They also suggested the need to accommodate actor's role in policy-making process regarding job controls. The workers feel that their voices are not heard and blamed decision makers for neglecting them as actors in the policy-making process regarding structuring of mining operations. The entire neglects according to them has impact on their health and well-being. It was raised also by the various stakeholders during the FGDs of the need to engage actors in decision making process regarding job control which will serve as motivation for them towards firm progress. This is an excerpt from one of the quarry worker during the FGD: "*how we feel about the work we do is not important to them and never discussed with us, all they do is mount pressure on you to keep working. If you fail to abide by their instruction and work you are suspended, if you are on probation twice you get fired and replaced. Despite the fact that the task schedule and work structure may be affecting your health".*

5.9: Work Content and Context Findings from FGDs

The participants expressed serious concern regarding lack of authority to partake in decision making as regard job control. They believed that there is a dire need for a more robust and redesigned work organisation. They were very worried about what they call divide and rule policy' been utilized by the decision makers and influencers. According to the participants' power dynamics across stakeholder's hierarchy was a major barrier regarding mineworkers' participation in decision making process regarding work design. Job insecurity and poor social support had become an ugly trend which have discourage miners from driving organisational goals. There is need for active improvement of job security by capacity building and social support which is known to be associated with positive development of the economy, while low investment in human capital is a disadvantage in the economic competition (Dollard and Bakker, 2010). Job insecurity fuels societal unemployment, while lack of social support begets social hostility and depression. "*Unemployment is a "scourge which spares no country". It is a "threat to social peace, hampering the efforts made to alleviate poverty and destitution, nullifying any attempt at economic, political, or social reform" (ILO, 2008).*

In terms of workload participants believed that continuous employment of less capable employees due to nepotism is also an important factor negating productivity in the firms. It is a known fact that nepotism reinforces inefficiency and ineffective work force breads poor productivity which indirectly affects other workers who are overworked and consequently breaks down into fatigue and injury (Moore et al., 2008). The most prominent problem perceived by participants in the context of work was interpersonal conflict and lack of policy framework regarding staff welfare, fuelled by poor incentive system. Non-declaration of MSDs by mineworkers due to poor or non-sick leave incentive reported by stakeholders could likely affect productivity. Since the feeling of pain could lead them to work more slowly and sometimes avoid certain activities which will worsen their pain and create cumulative workload for healthier team mates. Since mining jobs are usually categorised into designated teams or units, situations like this will increase workload demand on

the other team members, consequently increasing the likelihood of others developing disability (Moore et al., 2008 and Dias, 2014). This highlights that the workplace set-up and all other interacting factors need to be understood. The focus group participants highlighted that quarrymen may be faced with heightened psychosocial risks in the workplace, which supported major explanatory variables interrogated in the CUPID incidence survey. Psychosocial stressors are believed to mediate physical health risks which at the long run interfere with workers' health and well-being in the workplaces.

5.10: Prospective Cohort Control Studies

The appropriateness of a prospective cohort design in the present study was born out of several limitations reported by similar surveys such as cross-sectional survey, nested case control and retrospective case control studies targeted at observing exposure and disease variables among occupational groups (Song and Chung, 2010). Adopting a case-control design by a previous study reported in a similar occupational group in South Africa by Dias (2012) resulted in a significant underestimation of MSDs risks. The present study had baseline and follow-up components with a forward observation of exposure to the disease risk variables utilising standardised and validated instruments. Additionally, for the purpose of the present study, cross-culturally validated and adaptation of the previously validated CUPID questionnaires was utilized following the process of forward and back translation into Igbo. The follow-up component in a prospective cohort design has not been utilised before in studies on MSDs in any Nigerian occupational group. This type of design is mostly preferred because it satisfies the temporality criterion necessary to make inference on the causality of diseases (Wisdom and Creswell, 2013).

Finally, as a prospective cohort design, the study more clearly indicates the temporal sequence between exposure and outcome, because the participants were enrolled disease-free at the beginning of the observation period when their exposure status is established. Even though it was more expensive to conduct longitudinal follow-up, when compared to a case-control design it was

vital to determine how well exposure to mining work and psychosocial situations of quarrymen predict the risk of MSDs using survival analyses. This allows the calculation of the incidence of disease in exposure groups, as well as relative risk between exposed and unexposed cohorts. A number of previous investigators have observed inconsistency in the relative risk of MSDs complaints between exposed and unexposed cohorts in various occupational groups in the published literature (Anderson et al., 2007 and Ger et al., 2014). Many of the previous studies in Nigeria on quarry mineworkers were cross-sectional and therefore susceptible to bias from recall and cause-effect reversal (Olusegun et al., 2009; & Sufiyan and Ogunleye, 2016). Specifically, in cross-sectional studies, information is collected once and it is likely that the time of MSDs experience, as well as differential misclassification, will affect reports of relative risks. Such recall and reversal biases are unlikely in a prospective cohort design like the current study (Wisdom and Creswell, 2013). The prospective cohort design utilized in the present study was actually very expensive which is disadvantage making it difficult to conduct without adequate funding. The problem of conflict of interest regarding funded project is also a problem for another time. The study adopted a 6-month follow-up period in other to curtail loss to follow up which is a serious threat to the validity of the findings. To a greater degree, this may have underestimated some of the participants with longer latency for the occurrence of musculoskeletal disorders.

The descriptions of symptom severity using subjective response summarized in Table 10 are prone to non-response or recall bias. However, the adoption of prospective follow-up of participants may mitigate such bias to a large extent. The assessment of symptom severity using objective methods such as x-rays, subsequent tests or examinations is known to be more robust for arriving at sick leave decision (Mealand et al., 2013). The absence of such objective measures may have affected the number of miners expected to proceed for a possible sick leave. The inconsistencies regarding the obvious lack of objective measure for symptoms severity may account for the high frequency of recurrence found in the present study (Moore et al., 2008).

Mineworkers may have also failed to report the extent of severity due to the absence of sick leave insurance in the Nigeria mining sector.

5.11: Strengths and Limitations of Mixed Study Design

Mixed methods research is a methodology for conducting research that involves collecting, analysing and integrating quantitative (surveys) and qualitative (focus groups, interviews) research. This approach to research was utilised for integration and providing a better understanding of risks associated with MSDs problems common to the working population instead of either of each alone. The audio records from the focus group's discussion were analysed by aggregating the responses of participants into categories of information and presenting the diversity of ideas gathered during data collection. The mixing of both quantitative and qualitative research and data in the present study provided an in-depth of understanding and corroboration, while offsetting the weaknesses inherent to using individual approach. One of the most advantageous characteristics of conducting mixed methods research is the possibility of triangulation. Triangulation is the use of several means (methods, data sources, and researchers) to examine the same phenomenon. It allows one to identify aspects of a phenomenon more accurately by approaching it from different vantage points using different methods and techniques. Successful triangulation requires careful analysis of the type of information provided by each method, including its strengths and limitations (Wisdom and Creswell, 2013).

CHAPTER SIX
CONCLUSION AND RECOMMENDATION

6.1: Conclusions, Recommendation and Implication for future studies

The findings of this study have highlighted that the Nigerian quarrymen studied are exposed to high risk of MSDs and reported high incidences of MSDs. The high MSDs complaints by quarry mineworkers stems from physical work-related factors previously not fully understood in the Nigerian context. The focus group discussions have also revealed several sources of MSD risk that were not previously known. The heavy casualization of workforce in the Nigerian mining workplaces is increasing the level of psychosocial stressors in the sectors. The high level of manual task execution still practiced in the Nigerian quarry mining context, confers a heavy biomechanical load on the miners thereby increasing the physical risks faced by the workers. Additionally, stakeholders shared the conviction that there is need for a concerted action by various groups within the sector to be engaged in safe work policy implementation initiatives. The MSDs' occurrence in mineworkers may portend danger in the workplace such as increasing healthcare cost from health care utilisation and rise in lost work time. The rising economic cost of MSDs may also have implications for productivity at the mines. The incidence and prevalence of MSDs showed that shoulder pain was the highest MSDs complaint; closely followed by lower back pain. Prospective parallel mixed method design was a unique and innovative attempt. To the best of the author's knowledge, it was the first effort made to generate of incidence report from a prospective cohort survey in this occupational group in Nigeria. The incidence data may serve as a source of information for future prediction of possible challenges that mineworkers are face with an effort to get the stakeholders perspective of the true situation in their workplace. The research characterised the disability pattern and symptom severity which also painted a gloomy picture of a possible biomechanical overload which was not necessarily the only important factor responsible for the development of regional musculoskeletal disorders. The presence of interactional factors such as poor work management, poor interpersonal relationships during organisational

communication, was also brought to light during the stakeholders' engagement. The study upon completion had improved stakeholders understanding of psychosocial risks as an important mediator of MSDs among quarry miners.

The relative risk estimate for exposure was also a novelty effort to recommend a measurable and sustainable understanding of the contributions of various risks responsible for the persistence of MSDs. The knowledge of causes of MSDs was needed to formulate possible policy to guide future intervention to mitigate health risk associated with quarry mining jobs. The combination of baseline retrospective and prospective follow-up survey components of miners MSD complaints in a single study design was necessary to delve into the particularities of their work situation. The results produced MSD prevalence, incidence and risk factors associated with MSDs particular to quarrymen. The involvement of stakeholders' perspectives on the role of their interaction during quarry mining activities was to unmask the complexities of organisational influences as risks to employees' vulnerabilities to workplace injuries

6.2: Application of research findings to designing work for Nigerian quarrymen

It is pertinent to relate to the central topic of the present thesis to reality on ground based on contemporary challenges experienced by miners, over the years, psychosocial risk factors are obviously contributimg greatly to MSDs. However, the role of physical factors to MSDs are also extremely important. This was clearly reflected by the high MSDs complaints by Nigerian quarry mineworkers, which stems from physical work related-factors previously not fully understood in the Nigerian context. The present observation is expected to guide future applied research in the Nigerian mining workspace. There was also a serious need to incorporate psychosocial and organizational risk factors as important part of intervention approach in the future, to provide robust outcome especially in middle-income countries context, like the Nigerian mining industries. It is shown in figure 6.1 below, which explains the integration and analysis of all the health and safety risks as the most valid panacea to inculcate multidisciplinary and participatory intervention

approach. The present study was actually a good first step in the right direction since it highlighted the critical areas of work-related risks calling for appropriate intervention.

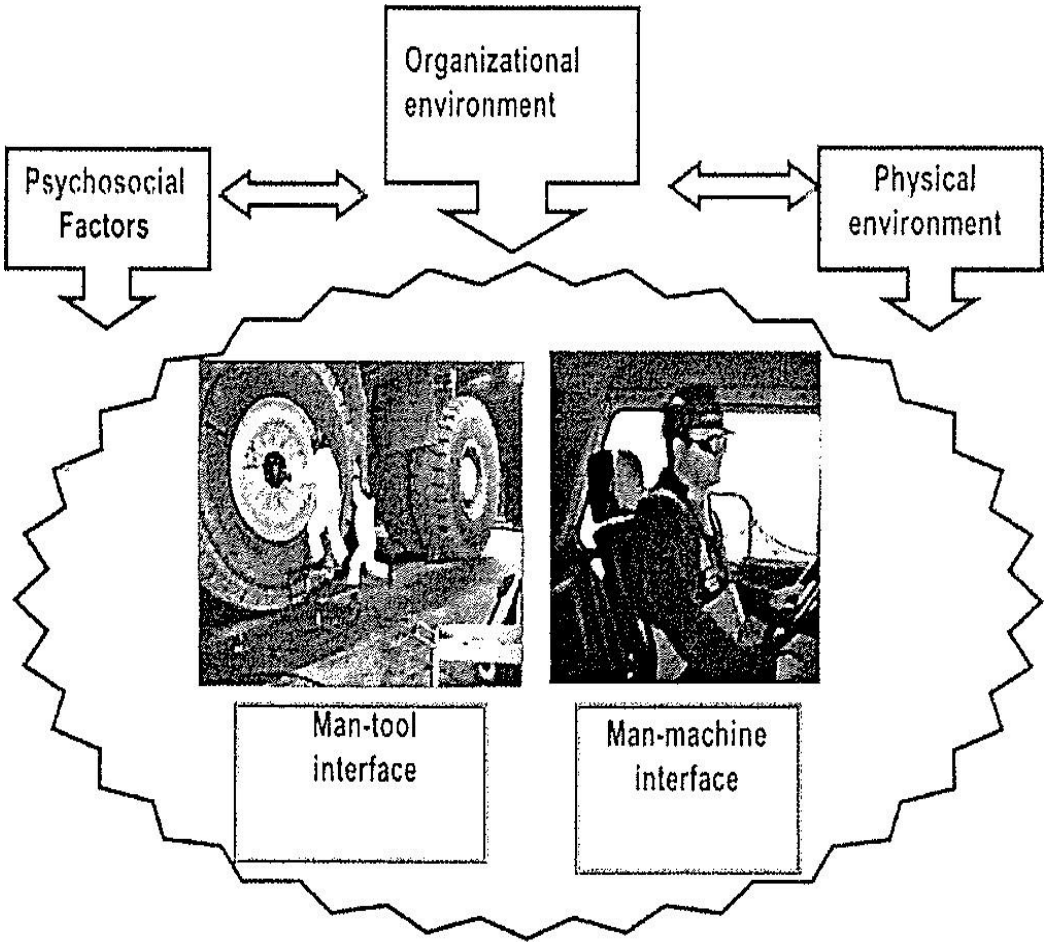


Figure 6.1: A Multidisplinary and Participatory Ergonomic Approach Adapted from Elias Apud, 2012; Ergonomics in Mining: The Chilean Experience

The miners' perspectives as reflected in the results from the focus group study, show that listening to people and comparing visions is a contribution to start work that allows to control and mitigate risks. It is believed that the findings of the present thesis maycontribute to generating the basic data nedded to initiate future participatory interventions. It is important to also insist on the concept of multi-level intervention approaches because the findings of the present studies were alarming and there is an urgent need to initiate solutions at the source, which may appear to be quite challenging. Additionally, following basic scheme of participatory intervention: that links the present findings which also considers the experience of many other middle-income countries, to understanding worker's capacities, limitations and needs to cope with their daily activities. Looking at table 4.1, almost 60% of the workers were illiterate. Therefore, education of the mineworkers is a must, the results of the present thesis have an important link with previous studies such as reported in Apud, (2012). The high incidence of MSDs can generate a large number of disabled people in the near future, and because of their low educational leve, they do not have the possibility of accessing jobs with greater intellectual demands, so that it is more likely that they will be unemployed due to chronic disability in the nearest future, increasing the social problem even more (Karwoski, 2012).

Therefore, in the presence of excessive manually driving tasks as obtained in middle-income countries context, it becomes necessary to improve the understanding of the worker's health and safety awareness, to protect them from work hazards by proposing adequate intervention. This calls for future attempts to gather more information about physical fitness of the workers, with the BMI serving as a basic indicator of fitness. Nowadays body composition and response to effort can be evaluated with simple field methods that provide information regarding the aptitude of a worker for tasks of high energy demands. It would also be interesting and necessary to take into consideration the nutritional status of these workers. Finally, other aspect stemming from the thesis, which could be linked with the concept of middle-income countries, is the facts regarding the magnitude of the MSDs incidence from the present study. The high incidence report of MSDs

as obtained presently, provides sufficient evidence to promote anticipation criteria for technological development, designed for the population studied. The aspect of innovation in technological domain is not merely related to automation but also to work organization. Specifically, technologically organising working hours, shifts, rest pauses, time pressure, productivity standards and safety needs has to be modelled based on miner's limitations, which is presently often neglected in order to tackle the alarming findings of MSDs incidences and disabilities. Not only in Nigeria, but in many other middle-income countries as well. It is imperative to have stricter rules and legislation helping to protect workers, from work-related health and safety challenges. Evidence like the one obtained in this research may be of help to promote multidisciplinary intervention goals. It is noteworthy to state that policy makers should utilse this reports as a basis for the design of fair legislation aimed at protecting the working populations. A simple schematic of such framework, was shown in figure 6.2 below.

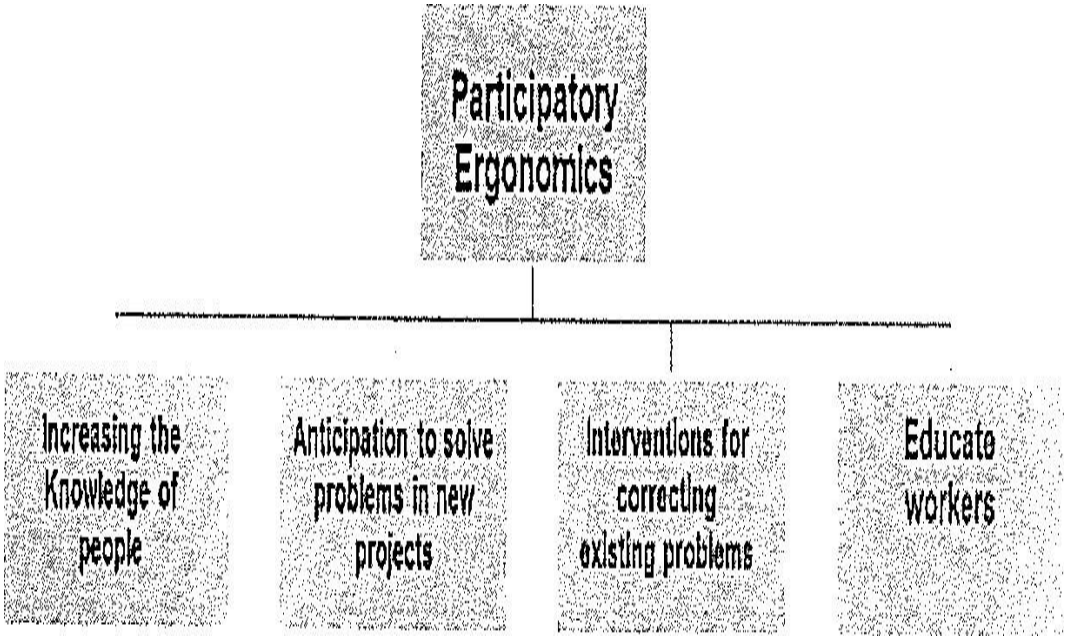


Figure 6.2: A scheme of participatory ergonomics: Adapted from Elias Apud et al, 2016; Ergonomics and Labour in Forestry: The Chilean Experience

6.3: Reflections and Recommendations from the Present Study

The significant health and economic cost of persistent MSDs despite attempt to reduce its occurrence have inspired the call for an extended research paradigm to unmask the extent of the contribution of each risk factors domain. The implication is that it is not enough to determine what the risks are but to unearth the percentage contribution of the various risk utilising robust quantitative and qualitative methods. The emerging risks associated with working conditions in a middle-income country context like Nigeria, makes it necessary to appropriately estimate the potential cost of MSDs burden imposed on healthcare and productivity for the Nigerian mining industry. The way to promote good practice at work is to formulate a comprehensive effort towards identifying existing and emerging risks that will impact health and productivity in the sector.

The investigation of both existing and emerging risks in the mining workplace calls for the need to emphasize, devise and implement policies to ensure the health and safety of workers. The basis for going forward is an emphasis on continues surveillance programs by regulatory agencies to adequately determine the true extent of MSDs on mineworkers to minimize possible underestimation of the incidence. Time dependent research designs such as the present 6-month follow-up may not be adequate for individuals with longer latency of MSDs manifestation.

Future studies should consider the role neural adaptation to pain perception could contribute in underestimation of the MSDs' incidence among occupational groups with high recurrence of MSDs cases. Lastly, the evidence on culturally determined factors has continued to emerge to explain MSDs persistence in the workplaces. However, the role of acculturation within workplaces especially in occupational set-ups such as found in South Eastern Nigerian quarry mining context with employees from culturally diverse group of people.

6.4: Practical Recommendations for Future Studies

There is need to incorporate task-based exposure assessment, such as time of fatigue onset, strain index estimation and time in posture categories, as miners undertake mining operations. It is necessary since recommendation of adequate work-rest ratio will mitigate possible cumulative effect of tissue breakdown associated with highly repetitive tasks, such as mining.

There is the need for promotion of stakeholder's engagement concerning safe work policy implementation initiatives in the mining sector. The high tendency to somatise observed in the present study and nocebo effects of adverse pain believe and expectation reported by the miners' calls for the need to adopt rehabilitation programs for drug addicts and disenchanted mineworkers. The rehabilitation programs will be needed to minimise mental health challenges such as working with fear and depression common among disenchanted workforce.

There is also an obvious need for an upgrade on incentives as a form of encouragement and morale booster for the productive workforce. Hence adoption of appropriate reward system in the organisation could help mitigate some of the actor's financial constraint and family interrole pressure, thereby reducing loss hours at work.

Futheremore, the study has revealed various multifactorial causes of severe regional pain complaints among quarry mineworkers, which was in line with the reports of previous studies in forestry and mining with heavy physiological demands. The study has also obtained stakeholders perspective of the problem and have proposed some solution from the stakeholders' forum. The stakeholder engagement is the first of its kind in the sector in Nigeria, and it is hopeful that policy makers might find the rich information presented in this thesis as a useful resource for future attemptto tackling MSDs in the sector.

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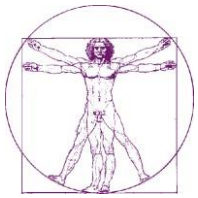


HUMAN KINETICS & ERGONOMICS
Tel: +27 (0)46 6038471
Fax: +27 (0)46 6038934

APPENDIX I

01 September 2017

Afamefuna Victor Egwuonwu – g15E0006@campus.ru.ac.za

Dear Victor Egwuonwu,

Re: Ethical Clearance – Application HKE-2017-03

Your application for ethical clearance for the study titled" "**THE INCIDENCE OF MUSCULOSKELETAL DISORDERS AND INFLUENCE OF STAKEHOLDER INTERACTIONS ON THE PERCEPTION OF PHYSICAL DISABILITY IN SOUTH-EAST NIGERIAN QUARRY MINING CONTEXT"** (reference number HKE-2017-03) has been approved with stipulations by the HKE Ethics Committee.

These stipulations include:

- Permission from the mining companies' management needs to be obtained

The companies' permissions should be submitted to the HKE Ethics Committee for record keeping purposes.

Any significant changes made to the study and procedures need to be communicated to the HKE Ethics Committee, and another full review may be requested.

Upon completion of your study, please submit a short report indicating whether the research was conducted successfully, if any aspects could not be completed, or if any problems arose that the HKE Ethics committee should be aware of.

Sincerely,

Miriam Mattison

M.C. Mattison
2017 HKE Ethics Chairperson
Department of Human Kinetics and Ergonomics
Rhodes University; Grahamstown
Tel: + 27-46-603 8468
Cell: +27-82 319 4626
E-mail: m.mattison@ru.ac.za

CRUSHEDROCKINDUSTRIES(NIGERIA)

LIMITED

APPENDIX II

Head Office: Address: Km16 Aba Expressway, Eleme Junction. Port Harcourt, Rivers State. Mail Bag: P. M. B. 5498, Port Harcourt. Rivers State. Nigeria.

Tel: 0803-326-9466, 0803-504-7892, 0816-051-5589, 0803-341-4129

May17, 2016

Operations Unit, Crushed RockQuarries

Kilometer10 Calabar express way,

Ishiagu, Ebonyi state, South East, Nigeria.

DearSir,

ApprovalLetter toConduct Research atIshiaguquarrymines

It is to myknowledge that a PhD student (Mr. Egwuonwu A Victor) will be conducting his research studyatIshiaguquarries on "**THE INCIDENCE OF MUSCULOSKELETAL DISORDERS AND INFLUENCE OF STAKEHOLDER INTERACTIONS ON THE PERCEPTION OF PHYSICAL DISABILITY IN SOUTH-EAST NIGERIAN QUARRY MINING CONTEXT".**

Mr. Egwuonwu, A. Victor, is astudent of Rhodes University, Grahamstown, South Africa, and had informed themanagement ofthe studydesignas well as the target population.

Iwriteto conveytheManagements approval to allow him access to the facilities subject to the Health ResearchandEthics Committeestipulations.Please accord himall the needed support necessaryforthesuccessfulconductof his study. Ifyou have anyquestions, please do not hesitate to contactme via08033414129.

Yours Sincerely,

Mr. Amaeze Emeka Onyema

Director HumanResourcesCrushedRockQuarriesPLC.

Appendix 1II

P.M.B. 5025, NNEWI, ANAMBRA STATE, NIGERIA

Professor Ivara E. Esu, OFR
B.S.c., (Ife) M. Sc. (Minnesota), PhD. (ABU)
Chairman
Board of Management

B.O. Chukwuma
B.Sc., MA, MHA, AHA,
Director of Administration/
Secretary of the Board

Professor Anthony O. Igwegbe
MBBS, FWACS, FICS, FISS
Chief Medical Director/
Chief Executive

Dr, E.A.E. Afiadigwe
BSc (Hons) Nig. MBBS (NAU), FWACS, FICS
Chairman
Medical Advisory Committee

E-mail: nauthcmd@yahoo.co.uk
nauthnnewi@hotmail.com
Telegram: TEACHOS NNEWI

Your Ref: NAUTH/CS/66/VOL.7/58

Our Ref: _____

Date: 25th August, 2016

Egwuonwu Afamefuna Victor
Department of Human Kinetics and Ergonomics
Rhodes University,
Grahamstown,
South Africa

ETHICS COMMITTEE APPROVAL

RE: TRANSLATION, CULTURAL ADAPTATION AND VALIDATION OF THE CULTURAL AND PSYCHOSOCIAL INFLUENCE ON DISABILITY QUESTIONNAIRES (CUPID Q1 & Q2)

We write to inform you that after due consideration of your ethics application and research proposal, approval is hereby conveyed for you to commence the study.

The principal investigator is required to send a progress report to the Ethics Committee at the expiration of three (3) months after ethical clearance to enable the committee carry out her oversight function.

Please note that this approval is subject to revocation if you fail to obtain proper authorization from your study site.

Prof. P.U. Ele
Chairman, NAUTH Ethics Committee

25-8-16

Udemezue N. O. (Mrs)
Sec. NAUTH Ethics Committee

APPENDIX IV

BASELINE QUESTIONNAIRE

INTERNATIONAL SURVEY OF WORK AND HEALTH

Biko denye ụbọchi na ohere di n'aka ekpe Oge: ☐☐☐☐☐☐

Ụbochi Ọnwa afọ

NKEJI NKE MBU: MAKA ONWE GI

1. Biko denye Ụbochi amuru gi ☐☐☐☐☐☐

   Ụbochi Onwa afo

2. Nya na okike gi Nwoke ☐ Nwanyi ☐

3. I na-eme aka ekpe ma obu aka nri Aka nri ☐ Aka ekpe ☐ Aka abuo ☐

4. Kedu agburu gi

   Onye Pakistani ☐ Onye Bangladeshi ☐ Onye Indian ☐

   Obodo ọzọ (biko dee ya) ☐ Onye African/Caribbean ☐ Onye Chinese ☐

5. Afọ ole ịdị mgbe ịguchara akwụkwọ? _____

   Under 14 years ☐ 14-16 years ☐ 17-19 years ☐ 20 years or older ☐

6. Kedu ka ogolgo gi ha? ☐☐☐ cms ☐ ft ☐☐ in

7a) Ọ dị tụwo mgbe ị na-ese sig a mgbe niile? Odighi ☐ Ee ☐

b) Ọbụrụ eziokwu, ike na-ese siga oge ọbụla? odighi ☐ Ee ☐

NKEJI NKE ABUO: MAKAOLU GI

8. Kedu ihe bụ isi ihe ị na-arụ? ☐ ☐

9. Ogologo oge ole ka ị meworo ọrụ a?

Less than 1 year ☐ Otu afo rụọ afo ise ☐ Ihe kariri afo ise ☐

10. Ogologo awa kwa izuka kari ọrụ a? ☐☐☐ Hours

11. E nwere nkeji obula ndi aso na olu gi a?
(biko họrọ odighi ma obu ee)

		Odighi	*Ee*
a)	Ojiji nke Keyboard ma obu nkumigwe n'ihi na ihe kariri awa anon a ngukota?	☐	☐
b)	Ọrụ ndi ozo gbasara ụgboro mmeghari aka mkpisi aka dika ihe kariri awa anọ na ngụkọta?	☐	☐
c)	Ugboro ugboro ekwe na hulite gị n'ikpere aka dika ogologo oge karia ọtụ awa na ngụkọta?	☐	☐
d)	Irụ ọrụ dika ogologo oge kariri otu awa na ngụkọta na aka n'elu ubu elu?	☐	☐
e)	I weli ịgwe nke kariri Kilograms ịrị abụọ na ise site n'aka?	☐	☐
f)	Irigo elu ma ọ bụ ala ihe kariri nzo ukwu iri ato na ubochi?	☐	☐
g)	Igbu ikpere n'ala ma ọ bụ itụkwụ ala ogologo oge kariri otu awa na ngụkọta?	☐	☐
h)	Ọrụ ole ka a na-akwu gị ụgwọ ka gị na ndị ọtụ ọrụ gị na-aru n'ubochi?	☐	☐
i)	O nwere, okwu ọrụ ole gị na-atu anya na gị na ndị ọtụ gị ga-aru n'ụbọchi?	☐	☐
j)	Ụgwọ nke bu bonusu ma ọ bụrụ na in a-eme ma ọ bụ n'ịsị n'ubochị?	☐	☐
k)	Irụ ọrụ nrụgide mezue ihe a ga-eme site a otu oge?	☐	☐

12. N’ ọrụ gị, ị nwere ohere, ighoro ihe ị ga-eme::

	Oge obula	*Oge ufodu*	*O dikata*	*O dighi oge obula*
Kedụ ka isi aru oru gi?	☐	☐	☐	☐
Kedụ ihe in a-aru n’ebe in a na-aru ọrụ?	☐	☐	☐	☐
Ezụmụike na nhazi ọrụ gi?	☐	☐	☐	☐

13. Ụgboro ole n’ole ka ị na-enweta enyeme aka na nkwado sitere n’aka ndi otu ọrụ gị ma obu onye nlekota gi mgbe in a-enwe nsogbu?

Oge obụla ☐ Oge ụfọdu ☐ ọdikata ☐ Ọdighi oge obụla ☐ Okweghi omume ☐

14. N’ itinye ihe niile n’ echịche ojuju afo ole k’inwegoro n’oru niile in a-aru?

E nwere m afo ojụjụ nke ụkwụ ☐ E nwew m afo ojụjụ ☐ E nweghi m afo ojụjụ ☐ E nweghi m afo ojụjụ chacha ☐

15. Kedu nchekwa iche n’inwere n’ ọrụ gị ma ọ bụrụ na-iriaba oria ma ọ bụrụ onye n’ejeghi ọrụ ihe ruru ọnwa ato?

Very safe ☐ Safe ☐ Rather unsafe ☐ Very unsafe ☐

16. I nwere ọrụ ọzọ ị na-arụ? O dighi ☐ Ee ☐

Ọ bụrụ na in were, kedu ụdi ọrụ bụ ihe ahụ?

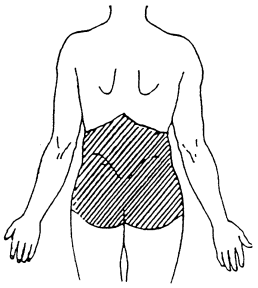
_____

_____

NKEJI NKE ATO: NTAKASI MA MGBỤ

IHE MGBỤ MGBADATA AZỤ N'IME ỌNWA IRI NA ABỤỌ GARA AGA

17a) Dika ihe eserese a dina mgbada nakowa, i nwenụgo azụ mgbụ nọrụrụ ihe kariri otụ ụbochi kamgbe ọnwa iri abụọ gara aga (etintekwala mgbụ metụtara nso ma ọ bụ ime nwanyi ma ọbụkwanụ iba)



Odighi ☐ Ee ☐

Ọ bụrụ n' onweghi, biko gafee n'ajụjụ nke iri abụọ, mana ọ bụrụ n'onwere gaba n'iru.

b) O nwego ka ya bụ mgbu si were si n'ebe obidoro banye n' ụkwụ gi ma ọ bụ gafee n'ikpere gị kamgbe ya ? Odighi ☐ Ee ☐

c) Yabụrụ na ịgbakọ oge yabu ihe malitere kamgbe ọnwa iri abụọ na abụọ, kedu oge ị nwere ike ikwụ na yabụ mgbu anọgo?

Otụ ụbọchi rụo ụbọchi isii ☐ Otụ ụbọchi rụo ụbọchi ano ☐ Otụ ụbọchi rụo ọnwa iri na abụọ ☐

d) Ijego hu dọkinta ma ọ bụ onye ọrụ ahu ike maka yabụ ọria mgbu kamgbe ọnwa iri na abụọ? Odighi ☐ Ee ☐

e) Ụgboeo ole na ole ka ya bụ ụkkwụ mgbụ gbochiri hị ije ọrụ gi kamgbe ọnwa iri na abụọ ?

Odighi ụbochi ọbụla ☐ Otụ ụbochi rụo ụbọchi isii ☐ ụbochi isii rụo ụbọchi iri atọ ☐ Ihe kariri ụbọchi iri atọ ☐

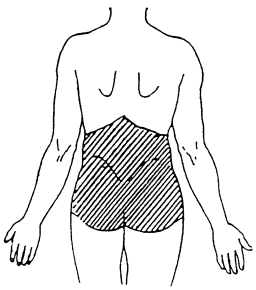
18. Do you eupect that your back pain will be a problem in 12 months time?

Odighi ☐ E nwere ike ☐ O nwere ike ime ☐ Ọ ga-emeriri ☐

IHE MGBỤ NKE NDIDA AZỤ N'IME ỌNWA GARA AGA

Ọ kachasi mkpa ma o bụrụr n'i nwere mgbụ azụ na ọnwa nkke gara aga

19a) I nwere ihe mgbụ nke ndịda azụ n'ebe a esere ije oji na ihe ngosi din a, nke kariri otụ ụbochi n'oge gara aga n'ọnwa gara gara aga? (Biko, ihe mgbụ nke nso nwaanyi ma ọbụ, nke imu nwa, ahu nwa, ahụ ọkụ eso gin a ya)



Ọ dighi ☐ Ee ☐

Ma ọ bụrụ n' ọ dighi, biko ga na ajuju nke iri abụọ, ọ bụrụ ee, biko anụgidena.

b) Site na ọnwa gara aga, onwego oge ihe mgbụ gafere na akuku ahu gị dika okpa gị ma ọbu ikpere gị Ọdighi ☐ Ee ☐

c) Igbajota ụbọchi niile ị nwere ihe mgbụ ụkwụ gị, na oge gara aga, dika ogologo oge ole ka ọ ga-adi?

Otụ ụbochi rụo ụbọchi isii ☐ Otụ izụ uka rụọ izụ ụka abụọ ☐ Ihe kariri izụ ụka abụọ ☐

20. N'ime ọnwa ndi gara aga onwego ka ọria azu mgbu si mee ka i ghara irụ ụfodu ụrụ ndi a edeputara na mgbada?

		Ee	*Ọ dighi mfe*	*Ọ kweghi omume*
a)	Ibechasi mbo ụkwụ gị	☐	☐	☐
b)	I yiri akwa	☐	☐	☐
c)	Irụ ọrụ ndi ị na adura arugasi ọrụ ndi ị na-arụbụ n' ụlọ	☐	☐	☐

21. Biko chelaa echiche azụ oge n'ibidobeghi nwebe ọria azụ mgbụ ruru ọtụ ọnwa maọbu karia. oge yabu ọria azụ mgbụ malitere kedu ka osiri malite?

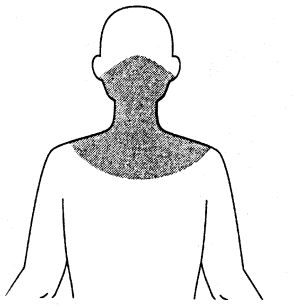
Ngwa ngwa (nerụghi otụ nkeji)oge ino n' ọru gị ☐

Ngwa ngwa (nerụghi otụ nkeji) mana ọ bụghi oge na-arụ ọrụ ☐

Ntakiri ntakiri ☐

ONỤ MGBỤ N' ỌNWA IRI NA ABỤỌ GARA AGA

22. Inwenụgo ihe mgbụ n' onụ dika n'eseresea nke nọrụgoro karia otụ ụbọchi n'ọnwa iri na abụọ gara aga?



Odighi ☐ Ee ☐

Biko o buru n'odighi, ga na ajuju nke iri abụọ na ato, mana ọ bụrụ n'onwere gaba n'iru

.

b) Ọ bụrụ na i gbakosia ụbọchi ole i nwegoro ahu ike ma ọ bụ onye ọbụla gbasara ihe mgbụ n' onụ n' onwa iri na abụọ gara aga?

Otụ ụbochi rụo ụbọchi isii ☐ Otụ izụ uka rụọ izụ ụka anọ ☐ Ọtụ onwa rụọ ọnwa iri na abụọ ☐

c) I gakwụrụgo dọkinta ma ọbụ onye na ahu maka ahụ ike ma ọbụ onye ọbụla gbasara ihe mgbụ n'onụ kamgbe ọnwa iri na abụọ? odighi ☐ Ee ☐

d) N' agbata ọnwa iri na abụọ gagoro aga, ụbochi ole ka ihe mgbụ n' onụ gbochiri gị iga ọrụ?

Ọ dighi ụbochi ọbụla ☐ Ọtụ ụbochi rụọ ụbochi ise ☐ Ụbochi isii rụọ ụbochi iri atọ ☐ Ihi karia ụbochi iri atọ ☐

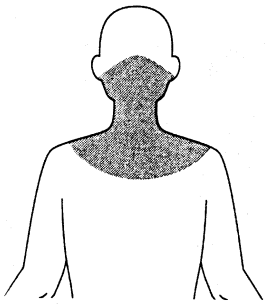
23. Ina-atụanya na ihe onu gi a ga-abu ihe nsogbu nye fi n'onwa iri n'abụọ na abia abia??

odighi ☐ Ọ nwere ike ☐ Ọ nwere ike ime ☐ Ọ ga emeriri ☐

ỌNU MGBỤ N' ỌNWA IRI NA ABỤỌ GARA AGA

Ọkachasi anyi mkpa na mgbụ ọnụ ọbụla in were n'oge ọbụla n' ọnwa nke gara aga

24a) I nwere ihe mgbụ nke ọnụ na ebe esere ihe oji na ihe ngosi di n'ala, nke kariri otụ ụbọchi, oge ọbụla n' ọnwa gara aga?



odighi ☐ Ee ☐

Biko o buru n'dighi, ga na ajuju nke iri abụọ na isii, ma oburu ee biko anogidela

b) Ikpakota ụbọchi niile in were onu mgbu, n'onwa gara aga, oge oleka ọ ga adi?

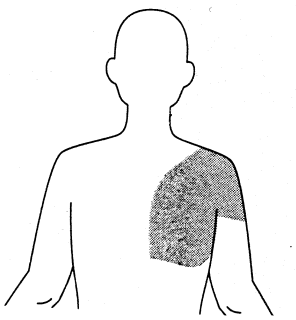
Otụ ụbochi rụo ụbọchi isii ☐ Otụ izụ uka rụọ izụ ụka abụọ ☐ Ihe kariri izụ ụka abụọ ☐

25. Na ọnwa gara aga, onu mgbụ in were oge ọbula ọ mere ka osiere gi ike ime ihe ndi a dị ịche ịche?

		Ee	*Ọ dighi mfe*	Ọ*kweghi omume*
a)	Iyi akwa	☐	☐	☐
b)	Irụ ọrụ ndi ị na-arụ n' ụlọ gị	☐	☐	☐

IHE MGBỤ ỤBỤAKA N'IME ỌNWA IRI NA ABỤỌ GARA AGA

26a) Inwenụgo ihe mgbụ n' ụbụaka dika n'eseresea nke nọrụgoro karia otụ ụbọchi n'ọnwa iri na abụọ gara aga?



Ọ dighi ☐ Ụbụaka nri sọsọ ☐

Ụbụaka ekpe sọsọ ☐ Ụbụaka abụọ ☐

Ọ buru n'ọ digh, biko ga n'ajụjụ nke iriatụ, ọ buru eeh biko bidokwa

b) Ọ bụrụ na i gbakosia ụbọchi ole i nwegoro ahu ike ma ọ bụ onye ọbụla gbasara ihe mgbụ n' ụbụaka n' onwa iri na abụọ gara aga?

Otụ ụbochi rụo ụbọchi isii ☐ Otụ izụ uka rụọ izụ ụka ano ☐ Ọtụ onwa rụọ ọnwa iri na abụọ ☐

c) I gakwụrụgo dọkinta ma ọbụ onye na ahu maka ahụ ike ma ọbụ onye ọụla gbasara ihe mgbụ n'ụbụaka ọnwa iri n'abụọ gara aga? Ọdighi ☐ Ee ☐

d) N' agbata ọnwa iri na abụọ gagoro aga, ụbochi ole ka ihe mgbụ n' ụbụaka gbochiri gị iga ọrụ ?

Ọ dighi ụbochi ọbụla ☐ Ọtụ ụbochi rụọ ụbochi ise ☐ Ụbochi isii rụọ ụbochi iri atọ ☐ Ihi karia ụbochi iri atọ ☐

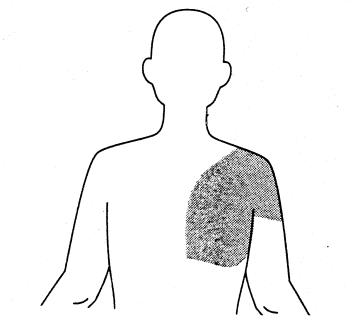
27. Ina-atụanya na ihe mgbụ ụbụaka gi a ga-abu ihe nsogbu nye fi n'onwa iri n'abụọ na abia abia?

Odighi ☐ Ọ nwere ike ☐ Ọ nwere ike ime ☐ Ọ ga emeriri ☐

IHE MGBỤ ỤBỤAKA N' ỌNWA GARA AGA

Ihe anyi choro ima bụ ihe mgbụ ọbụla i nwere n'ụbụaka gi nime ọnwa gara aga

28. I nwenụgo ihe mgbụ n' ụbụaka dika i di n' eseresea, nke nogoro karia otụ ụbọchi n'ime ọnwa gara aga?



Odighi ☐ Ụbụaka nri sọsọ ☐

Ụbụaka ekpe sọsọ ☐ Ụbụaka abụọ ☐

Ọ bụrụ n'ọdighi, biko gaa n' ajụjụ nke iri atọ, ma ọbụrụ ee biko bidokwa.

b) Ọ bụrụ na igbakọsia ụbọchi ole i nwegoro ihe mgbụ n'ụbụaka n'ọnwa gara aga, kedu ole ka nke ahu ga-aputa?

Otụ ụbochi rụo ụbọchi isii ☐ Otụ izụ uka rụọ izụ ụka abụọ ☐ Ihe kariri izụka abụọ ☐

29. N' agbata onwa gara aga, Enwere ihe mgbụ n'ụbụaka nyere gi nsogbụ ma ọ bụ kwụsiri gị ime ihe otụ n'ime ihe ndi a?

	Ee	*O dighim mfe*	*Io kweghi m omume*
a) Ivọ ntụtụ gi	☐	☐	☐

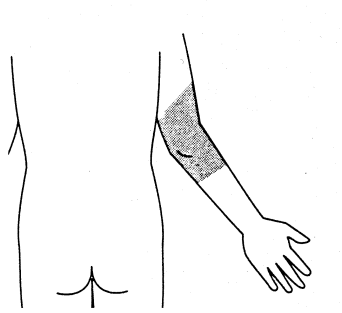
b) Isa ahụ ☐ ☐ ☐

c) Ikwado/iti akwa ☐ ☐ ☐

d) I din a-arụ ọrụ in a-arụ na mgburugburu ụlọ gị ☐ ☐ ☐

IHE MGBỤ N'IKI AKA N'IME ỌNWA IRI NA ABỤỌ GARA AGA

30. I nwenụgo ihe mgbụ na ikiaka dika ọ di n'eserese a, nke nọrụgoro karia ọtụ ụbọchi n'ime ọnwa iri na abụọ gara aga?



Odighi ☐ Ikụaka nri ☐

Ikụaka ekpe sọsọ ☐ Ikụaka abụọ ☐

Ọ bụrụ n' ọdịghị, biko gaa n'ajụjụ iri atọ na anọ ọ bụrụ ee biko bidokwa .

b) Ọ bụrụ na igbakọsia ụbọụhi ole in were ihe mgbụ na ikụaka n'ime ọnwa iri na abụọ gara, kedu oge ole nke ahu pụtara ?

Otụ ụbochi rụọ ụbọchi isii ☐ Otụ izụ uka rụọ izụ ụka anọ ☐ Ọtụ onwa rụọ ọnwa iri na abụọ ☐

c) I gakwugoro dokinta ma o bụ onye na-ahu maka ahu ike ma obụ onye obula gbasara ihe mgbu n'ikuaka onwa iri abụọ? odighi ☐ Ee ☐

d) N'ime onwa iri na abụọ gara aga, ubochi ole ka ihe mgbụ ikụaka gbochiri g ii ga-oru?

Ọ dighi ụbochi ọbụla ☐ Ọtụ ụbochi rụọ ụbochi ise ☐ Ụbochi isii rụọ ụbochi iri atọ ☐ Ihe karia ụbochi iri atọ ☐

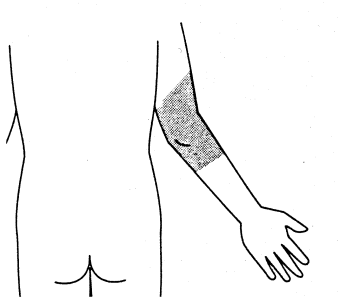
31. I na-atu anya na ihe mgbụ n'ikiaka ga-aburu gi nsogbu n'onwa iri abụọ ha abia abia?

Odighi ☐ O nwere ike ☐ Ọ nwere ike ime ☐ O ga emeriri ☐

IHE MGBU N'IKIAKA N'IME ONWA GARA AGA

ihe anyi choro ima bụ ka in were ihe mgbụ ọbụla n'ikiaka n'ime onwa gara aga

32. I nwenụgo ihe mgbụ n' iki aka dika i odi n' eseresea, nke nogoro karia otụ ụbọchi n'ime ọnwa gara gara?



Odighi ☐ Ikuaka nri soso ☐

Ikuaka ekpe soso ☐ Ikuaka abụọ ☐

O buru n' i dighi, biko ga n'ajuju iri-ato na ano, oburu eeh biko bidokwa .

b) Ọ bụrụ na igbakọsia ụbọchi ole i nwe ihe mgbụ n'ikiụaka na ime ọnwa gara agaoge ole ka nke ahu ga-aputa?

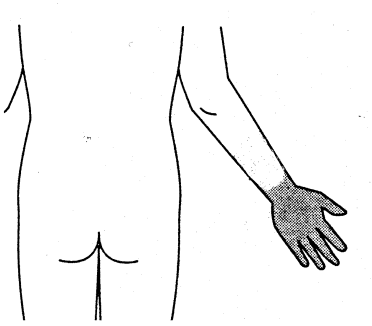
Otụ ụbochi rụo ụbọchi isii ☐ Otụ izụ uka rụọ izụ ụka abụọ ☐ Ọtụ onwa rụọ ọnwa iri na abụọ ☐

33. N'ime onwa gara aga ihe mgbu n'ikuaka enyere gi nsogbu n'ime otu n'ime ihe ndia ?

		odighi	*O digh m mfe*	*Iokweghi m omume*
a)	I din a-emepe kalama. Ololo, maobu mgbata	☐	☐	☐
b)	Ikwado/Iyi akwa	☐	☐	☐
c)	Idi na-arụ oru ina aru gburugburu	☐	☐	☐

ihe mgbu na nkwojiaka ma obu aka nime onwa iri na abụọ gara aga

34. I nwenugo ihe mgbu na knwojiaka ma obu aka dika i di nịeserese a nke norugoro karia otu ubọchi n'ime onwa iri na abụọ gara aga?



O dighi ☐ Nkwoji aka ma obu aka nri ☐

Nkwojiaka ma obụ aka ekpe ☐ Nkwojiaka ma obu aka abụọ ☐

O buru n' o dighi, biko ga na ajuju iri ato na asato oburu ee niko bido kwa .

b) O buru na igbakosia ubochi ole in were ihe mgbu na nkowjiaka ma o bun a aka n'ime onwa iri na abụọ gara aga, oge ole ka nke ahu ga-aputa?

Otụ ụbochi rụọ ụbọchi isii ☐ Otụ izụ uka rụọ izụ ụka anọ ☐ Ọtụ onwa rụọ ọnwa iri na abụọ ☐

c) I gakwugoro dokinta ma obu onye na-ahu maka ahu ike gbsara ihe mgbu na nkwojiaka maobu n'aka n'ime onwa iri na abụọ gara aga? Odighi ☐ Ee ☐

d) N'ime onwa iri na abụọ gara aga, ubochi ole ka ihe mgbu na nkwojiaka ma obu n'aka gbochiri gi iga-oru?

Ọ dighi ụbochi ọbụla ☐ Ọtụ ụbochi rụọ ụbochi ise ☐ Ụbochi isii rụọ ụbochi iri atọ ☐ Ihe Karia ụbochi iri atọ ☐

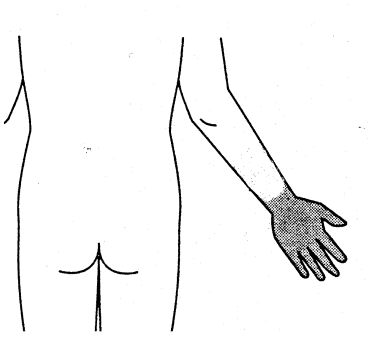
35. I na-atu anya na ihe mgbu na nkwojiaka maobu n'aka gi, ga buru gi ihe nsogbu na onwa iri na abuo ga-abia abia?

Odighi ☐ O nwere ike ☐ Ọ nwere ike ime ☐ O ga emeriri ☐

IHE MGBU NKWOJIAKA NA AKA N'IME ONWA GARA AGA

Ihe anyi choro ima bu ka isi-nwe ihe mgbu na nkwojiaka ma obu n'aka n'ime onwa gara aga

36. I nwenugo ihe mgu na nkwojiaka ma obu n'aka gi dika n' eserese a, nke norugoro karia otu ubochi n'ime onwa gara aga?



Ee ☐ Nkwojiaka ma obu aka nri soso ☐

Nkwojiaka ma obu aka ekpe soso ☐ Nkwojiaka ma obu aka abuo ☐

O buru n' odighi, biko gaa n' ajuju iri ato na asato, o buru ee, biko bidokwa.

b) O buru na igbakosia ubochi in were ihe mgbu na nkwojiaka ma o bu aka n'ime onwa gara aga, oge ole ka nke ahu ga-aputa?

Otụ ụbochi rụọ ụbọchi isii ☐ Otụ izụ uka rụọ izụ ụka abụọ ☐ Ọtụ onwa rụọ ọnwa iri na abụọ ☐

37. N'ime onwa gara aga, ihe mgbu na nkwojiaka ma o bu n'aka, enyere gi nsogbu n'ime otu n'ime ihe ndi a?

		Ee	*O dighi m mfe*	*O kweghi omume*
a)	Ide ihe	☐	☐	☐
b)	Igbape na ikpochi onu uzo	☐	☐	☐
c)	Imepe kalama, ololo ma obu mgbata	☐	☐	☐
d)	I kwado/ iyi akwa	☐	☐	☐
e)	I din a-aruoru in a-aru na gburugburu ulo	☐	☐	☐

mgbu ikpere na ime onwa iri na abụọ gara aga

38. E nwego mgbe in were ihe mgbu n'ikpere dika ihe eserese a di na mgbada na-akowa nke kariri otu ubochi n'ime onwa iri na abụọ gara aga?

O dighi ☐ Ikpere aka nri soso ☐

Ikpere akaekpe soso ☐ Ikpere abụọ ☐

O buru n' o dighi, biko gaa n'ajuju nke iri anon a abuo, o buru ee, biko bidokwa.

b) O buru na igbakoo ubouhi niile in were ihe mgbu n'ikpere n'ime onwa iri na abuo gara aga, ugboro ole ka nke ahu ga-aputa?

Otụ ụbochi rụọ ụbọchi isii ☐ Otụ izụ uka rụọ izụ ụka ano ☐ Ọtụ onwa rụọ ọnwa iri na abụọ ☐

c) E nwego mgbara i gara na nke donkita ma obu onye o bula na-ahu maka ahu ike gbasara ihe mgbu n'ikpere n'ime onwa iri na abuo gara aga? Odighi ☐ Ee ☐

d) N'ime onwa iri na abuo gara ga, ubochi ole ka ihe mgbu n'ikpere gbochiri g ii ga-oru?

Ọ dighi ụbochi ọbụla ☐ Ọtụ ụbochi rụọ ụbochi ise ☐ Ụbochi isii rụọ ụbochi iri atọ ☐ Ihe Karia ụbochi iri atọ ☐

39. I na-atu anya na ihe mgbu n'ikpere nwere ike i buru gi nnukwu nsogbu n'onwa iri na abụọ na abia abia?

Odighi ☐ O nwere ike ☐ Ọ nwere ike ime ☐ O ga emeriri ☐

mgbu ikpere n'ime onwa gara aga

ihe anyi choro ima bu ka in were ihe mgbu obula n'ikpere n'ime onwa gara agaụ

40. E nwego mgbe in were ihe mgbu n'ikpere dika ihe eserese a din a mgbada na-akowa, nke kariri otu ubochi n'ime onwa gara aga??

O dighi ☐ Ikpere aka nri soso ☐

Ikpere aka ekpe soso ☐ Ikpere abuo ☐

O buru n' o dighi, biko gaa n'ajuju nke iri anon a abụọ, o buru ee, bidokwa.

b) O buru na igbako ubochi nile i nwere ihe mgbu n'ikpere n'onwa gara aga, ugboro ole ka nke ahu ga aputa ?

Otụ ụbochi rụo ụbọchi isii ☐ Otụ izụ uka rụọ izụ ụka abụọ ☐ Ọtụ onwa rụọ ọnwa iri na abụọ ☐

41. N'ime onwa hara aga, e nwere ka ihe mgbu n'ikpere siri gbochie maobu nye gi nsogbu na ime ihe ndia?

		O dighi	*Odighi mfe*	*O gahi eme*
a)	I gbago elu na igbada ala n'ulo	☐	☐	☐
b)	I ga n'ala di mma	☐	☐	☐
c)	I kwado na iyi akwa	☐	☐	☐
d)	I din a-aru oru in a aru na gburugburu ulo.	☐	☐	☐

NKEJI NKE ANO: MAKA IHE MGBU NKE NDI OZO

IHE MGBU MGBADA AZU

42. E nwere onye i mara nwereburu ihe mgbu na mgbasa azu n' onwa iri na abụọ gara aga?

a) N'oru O dighi ☐ Ee ☐

b) N'abughi oru O dighi ☐ Ee ☐

ONU MGBU

43. E nwere onye i mara nweburu onu mgbu n'ime onwa iri na abuo gara aga?

a) N'oru O dighi ☐ Ee ☐

b) N'abughi oru O dighi ☐ Ee ☐

IHE MGBU NA OGWE AKA, UBUAKA, NA AKA

44. E nwere onye i mara nweburu ihe mgbu n'ogwe aka, ubuaka ma obu n' aka n'ime onwa iri na abuo gara aga?

a) N'oru O dighi ☐ Ee ☐

b) N'abughi oru O dighi ☐ Ee ☐

IHE MGBU N'IKPERE

45. E nwere onye i mara nweburu ihe mgbu n'ikpere n'ime onwa iri na abuo gara aga?

a) N'oru O dighi ☐ Ee ☐

b) N'abughi oru O dighi ☐ Ee ☐

NKEJI NKE ISE: IHE IMA GBASARA IHE NA AKPATA IHE MGBU NA OTU OGAGHI ESI WERE MEE

46. Site na echiche nkegi na kwa ihe dookinta gwara gi gbasara ihe mgbu n' ogbe aka, ubuaka, kedu ka isiri kwenyesie ike n' okwu ndia?
(Horo otu n' ime akpati ndia)

Mka onye nwere nsogbua.	*Ekwetaghi m chacha*	*Enwere ike ekwetaghi m*	*Ekwetaghi m*	*Enwere m ike ikweta*	*Ekweta mu*
Izere ime ihe siri ike n'ihu, na onwere ike idi na emeru ubuaka ahu	☐	☐	☐	☐	☐
Nsogbu ndia na-adikari mma n'ime onwa ato	☐	☐	☐	☐	☐
I nwe ezumike na-adi mkpa maka ahu idi mma	☐	☐	☐	☐	☐
Ileghara udi nsogbua anya ga-ebuta nsogbu n'ahu ike, na adighi enwe nkwusi	☐	☐	☐	☐	☐
Ihe na-ebute kari nsogbua bu oru ndi mmadu na-aru	☐	☐	☐	☐	☐

47. Site n' echiche gi nakwa nihe dokinta maobu onye ozo gwara gi gbasara ihe mgbu na mgbada azu, kedu ka isi kwenyesie ike n'okwu ndia? (Ghoro otu n'ime akpai ndia.)

Mka onye nwere nsogbua.	*Ekwetaghi m chacha*	*Enwere ike ekwetaghi m*	*UEkwetaghi m*	*Enwere m ike ikweta*	*Ekwerem*
Izere ime ihe siri ike n'ihi onwere ike idi na emeru azu ahu	☐	☐	☐	☐	☐
Nsogbu ndi a na-adikari mma n'ime onwa ato	☐	☐	☐	☐	☐
I nwe ezuimke di mkpa maka ahu idi mma	☐	☐	☐	☐	☐
Ileghara udi nsogbua anya ga-ebuta nsogbu n'ahu ike, na adighi enwe nkwusi	☐	☐	☐	☐	☐
Ihe na-ebute kari nsogbua bu oru ndi mmadu na-aru	☐	☐	☐	☐	☐

48. Inunugo ma obu guo ihe gbasara repetitive strain injury (rsi), oru gbasara upper limb disorder (wruld) or cumulative trauma syndrome (cts)? **(Appropriate terms may vary by country.)**

O dighi ☐ Ee ☐

NKEJI NKE ISII: IHE GBASARA AHU IKE GI NILE

UBOCHI ASAA GARA AGA

49. N'okpuru ebe a bu nsogbu ndi mmadu na-enwe mgbe ufodu. biko guo nke obula nke oma, ma kachiebido nomba nke kowari ka nsogbu gin a n'ime mkpuru ubochi asaa gara aga nke gunyere taa.
Kachibido naani otu nomba maka otu nsogbu ma amafekwala nke o bula

	Not at all	*A little bit*	*Moderately*	*Ọuite a bit*	*Eụtremely*
a) ikubi ume na anya ntugari	0	1	2	3	4
b) ihe mgbu nke mkpuru obi	0	1	2	3	4
c) Igbo agbo ma obu afo inye nsigbu	0	1	2	3	4
d) Nsogbu n'ikute ume gi	0	1	2	3	4
e) Enweghi mmetuta maobu ihe idipu akuku ahu gi	0	1	2	3	4
f) Adighi ike n' akuku ahu gi	0	1	2	3	4
g) Ikpo oku maobu iju oyi	0	1	2	3	4

ONWA GARA AGA

50. Ajuju ndi a bum aka isi enwe mmetuta nakwa ka ihe siri diri gi nñ ime onwa gara aga, maka ajuju obula, biko nye aziza nke kowari nke oma ka ihe siri diri gi n'ime onw a gara aga. kedu ugboro ole o di nime onwa gara aga
Kachibido nomba nke a bula okirikiri

	Oge obula	*Mgbe obula*	*O dikata omem*	*Mgbe dite aka ome m*	*Mgbe tere aka ka oji emem*	*O nweghi oge o na eme m*
a) i bu onye na-enwe anuri?	1	2	3	4	5	6
b) i nwenugo mmetuta di nwayoo na udo?	1	2	3	4	5	6
c) i bu onye na-atubu ujo	1	2	3	4	5	6
d) i nwenugo mmetuta di nwute?	1	2	3	4	5	6
e) i nwenugo mwute nke na o nweghi ihe ga-	1	2	3	4	5	6

ONWA IRI NA ABUO GARA AGA

51. N'ihe kariri onwa iri na abuo gara aga, gbakota ubochi ole ka ihe ndi a gbochiri g ii ga-oru maka:

a) Nsogbu n'azu gi, ubuaka, ikiaka, nkwojiaka, aka, na ikpere

Odighi ubochi obula ☐ Otu ubochi ruo ubochi ise ☐ Ubochi isii ruo ubochi iri ato ☐ Ihe kariri ubochi iri ato ☐

b) oria ndi ozo

Odighi ubochi obula ☐ Otu ubochi ruo ubochi ise ☐ Ubochi isii ruo ubochi iri ato ☐ Ihe kariri ubochi iri ato ☐

APPENDIX VI

CSEP-PATH: PHYSICAL ACTIVITY AND SEDENTARY BEHAVIOUR QUESTIONNAIRE (PASB-Q) **ADULT (18 AND OVER)**

Please answer the following questions based on what you do in a typical week. To increase accuracy, you may wish to log your physical activity and sedentary behavior for one week prior to answering the questions.

Aerobic Physical Activity

1. Frequency: In a typical week, how many days do you do moderate-intensity (like brisk walking) to vigorousintensity (like running) aerobic physical activity?

   days/week

2. Time or Duration: On average for days that you do at least moderate-intensity aerobic physical activity (as specified above), how many minutes do you do?

   minutes/day

Total: Multiply your average number of days per week by the average number of minutes per day.

minutes/week

Muscle Strengthening Physical Activity

3. In a typical week, how many times do you do muscle strengthening activities (such as resistance training or very heavy gardening)? times/week

Perceived Aerobic Fitness

4. In general, would you say that your aerobic fitness (ability to walk/run distances) is:

Excellent Very Good Good Fair Poor

Sedentary Behaviour

5. On a typical day, how many hours do you spend in continuous sitting: at work, in meetings, volunteer commitments and commuting (i.e., by motorized transport)?

⑤ None ⑤< 1 hour ⑤ 1 to < 2 ⑤ 2 to < 3

⑤ 3 to < 4 ⑤ 4 to < 5 ⑤ 5 to < 6 ⑤> 6

6. On a typical day, how many hours do you watch television, use a computer, read, and spend sitting quietly during your leisure time?

⑤ None ⑤< 1 hour ⑤ 1 to < 2 ⑤ 2 to < 3

⑤ 3 to < 4 ⑤ 4 to < 5 ⑤ 5 to < 6 ⑤> 6

Total Sedentary Behaviour (add responses to questions 5 and 6) hours/day

7. When sitting for prolonged periods (one hour or more), at what interval would you typically take a break to stand and move around for two minutes?

⑤ < 10 minutes

⑤ 10 to < 20 minutes

⑤ 20 to < 30 minutes

⑤ 30 to < 45 minutes

⑤ 45 to < 1 hour

⑤ 1 to < 1.5 hours

⑤ 1.5 to < 2 hours

⑤ > 2 hours

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Supplement S2

Modified Leisure Time Physical Activity Questionnaire

Please think back to the past 4 weeks. During a typical week in the past 4 weeks, how many minutes per day as a rule do you do the following types of physical activity or exercise for **more than 10 minutes at a time** during your **free time?**

a) STRENUOUS PHYSICAL ACTIVITY – *heart beats rapidly* (i.e. brisk walking uphill, jogging, sports like hockey, soccer, basketball, cross-country skiing, judo, vigorous swimming, long distance bicycling).

Day	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
Minutes								

b) MODERATE PHYSICAL ACTIVITY – *not exhaustive* (i.e. fast walking, doubles tennis, easy bicycling, volleyball, easy swimming, aqua-fit classes, popular and folk dancing).

Day	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
Minutes								

c) MILD PHYSICAL ACTIVITY – *minimal effort* (i.e. yoga, archery, curling, bowling, golf, horseshoes, easy walking)

Day	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
Minutes								

APPENDIX VII

Sampling Size Calculation for Phase One Study

The difference in proportion formula for prospective cohort studies was used to estimate the sample size.

$$n = 2\frac{(.265)(1-.265)(.84+1.96)^2}{(.33-.20)^2} = 181$$

Where n refers to population size; and *n*, to sample size

r = ratio of exposed to unexposed cohorts

P refers to a population proportion; and *p*, to a sample proportion

$Z_{\alpha/2}$ = refers to level of statistical significance (typically 1.96)

Z_{β} = *refers to* desired power (typically .84 for 80% power)

$\hat{p}$ = refers to measure of variability (similar to standard deviation)

How many exposed to unexposed cohorts do you need assuming 80% power

You want to detect an odds ratio of 2.0 or greater

An equal number of exposed to unexposed cohorts (r=1)

The proportion exposed in the control group is 20%

For 80% power, Z_{β}=.84

For 0.05 significance level, Z_{α}=1.96

r=1 (equal number of exposed to unexposed cohorts)

The proportion exposed in the control group is 20%

To get proportion of cases exposed:

$$p_{case\,\exp} = \frac{2.0(.20)}{(.20)(2.0-1)+1} = \frac{.40}{1.20} = .33$$

Average proportion exposed = (.33+.20)/2=.265

$$n = \left(\frac{r+1}{r}\right)\frac{(\bar{p})(1-\bar{p})(Z_{\beta} + Z_{\alpha/2})^2}{(p_1 - p_2)^2}$$

Therefore, n=362 (181 cases, 181 controls)

Check for updates

APPENDIX VIII

Field Evaluation of Task Requirements of Mining Jobs in Nigerian Quarry Mines: A Pilot Study

Afamefuna Victor Egwuonwu[1(&)], Matthias Goebel[1], and Perpetua Chinenye Obi[2]

[1] Department of Human Kinetics and Ergonomics, Rhodes University, Grahamstown, South Africa vaegwuonwu@gmail.com

[2]Peak Wellness Centre, Plot 1706, Gitto Road, Mabushi District, Abuja, Nigeria

Abstract. Musculoskeletal disorders emains a major constraint to mining task performance. Task analyses were conducted of different mining jobs from several work shifts. The 3DSSPP program was utilized for biomechanical stressors evaluation in mining jobs. The energy cost and muscle activities of Latissmus Dorsi and upper Trapezius muscles of miners were assessed for different job categories using heart rate, VO^2 max and electromyogram. The muscle activities showed right dominance among the miners. There was high energy demand on miner's tasks, with compressive and shearing forces for most jobs exceeding safety NIOSH scores. There is need for task formalization considering miner's capabilities.

Keywords: Musculoskeletal disorders Energy cost, Biomechanical stressors, Muscle fatigue

Introduction

The principles of ergonomics in the workplace, involves adapting work processes to the worker's anthropometry and capabilities [1]. The early ergonomist has attempted to emphasize the use of physical variables such as workstation design and teaching of proper posture to control musculoskeletal disorders (MSDs) incidence due to work activities [1]. Despite the effort by ergonomists to control physical risk factors to prevent MSDs at work, its continuous resurgence in the workplace constitute performance constraint to industrial workers [2]. The high MSDs reported in a previous study among quarry miners in Nigeria, calls for a comprehensive activity analysis to identify the associated injury risk factors of mining jobs [3]. Presently, there is no published research in Nigeria that have conducted task analyses of mining jobs. Task analysis is a systemic approach to examine all the steps taken or required to perform tasks (productive and unproductive tasks), so as to break down the demands specific to the task within a workplace with reference to the worker's capabilities [4]. Previous studies by [5] in the USA, examined physical risk factors in underground coalmines that predisposes the workers to MSDs. The study assessed a handful of work tasks by identifying work

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activities that predisposes miners to injury risk. Although it culminated in the development of an intervention that reduced risk factors for examined work tasks, however the study failed to cover the entire mining job categories, as well as complete work shift. Additionally, [6] in his study examined the match between work demands and work ability in Australian coal miners by identifying differences in work-related factors that affects capabilities of workers across different age groups. Furthermore, these studies were conducted on mining tasks with a special focus on high income countries such as USA and Australia [6]. The findings from these previous studies may not be extrapolated to the Nigerian quarry-mining context, which like other low-middle income countries will present with different organizational factors, socioeconomic and cultural challenges [7]. The Nigerian miners as typical scenario of a low-middle income country performs its mining tasks with heavy manual labour and low-level automation due to over-dependence on human labourers, [3, 6, 8]. Perhaps, this calls for a detailed task analyses of the Nigerian quarry mining job categories in a complete work shift. Hence, the need for the present field study that conducted task analyses of the different job categories in several work shifts in selected Nigerian quarry mines. The job categories were drilling, blasting, loading, crushing, stockpiling and equipment maintenance tasks. The task analyses attempted to shed more light on specific risks faced by the different categories of workers. The physiological and biomechanical demands of the mining tasks in several eight hours shift, was examined to identify the aspect of the tasks with potential to predispose the workers to MSD injuries [8]. The location of the study was Ishiagu community in Ebonyi State, South East Nigeria.

Methods

Task analyses were conducted with video records of the quarry mining jobs in a complete work shift, using a real-time video observation. The video records were fed into the 3DSSPP program for biomechanical simulation to evaluate the biomechanical stressors in the quarry mining job cycle. The energy demand of the different tasks was estimated using physiological measures such as heart rate responses and VO^2 max of the workers. This was done based on the recommendations of the American College of Sports Medicine [9]. The workers muscle activity was determined with selected muscle groups (Latissmus dorsi and upper Trapezius) sampled to be activated during mining tasks performance of different job categories using electromyography (EMG). The idea is to identify the level of muscle motor unit recruitment to physical workload associated with different mining jobs in Nigerian context.

2.1 Participants

Following ethical approval of the experimental protocol from the University of Nigeria Teaching Hospital, Medical Research Ethics Committee and obtaining written informed consent, 18 healthy volunteers was consecutively recruited to participate in the study.

The participants were non-smoking quarry miners with at least 1 year on the job experience. The smoking status and work experience of participants was obtained by oral interview.

2.2 Experimental Design and Procedure

Subjects participated in a field-testing sessions, performed during the workers' regular 8-hrs work shift while performing their normal assigned mining job. Participants after completing an informed consent form were asked to arrive for the scheduled work shifts; 60 min earlier than their normal arrival time so that the participants could be appropriately instrumented prior to their movement down the crusher machine workstations in the mine. The testing involved real-time video recording and observation that was fed into a biomechanical simulation model (3DSSPP program) to evaluate the biomechanical stressors and musculoskeletal injury susceptibility (risks) of the specific tasks category in the quarry job cycle. The heart rate responses of the miners were obtained during task performance using a heart rate monitor. A small amount of gel was applied to the HR sensor before securing this to participants, to ensure optimum skin contact. Resting HR was collected in the morning in a sitting posture after taking rest under the shed for at least 15 min before starting their jobs and working HR after every 5 working cycles and at the end of each rest-break. Actual energy expenditure measurement in the field is difficult to implement in natural settings without affecting work shift. Therefore, the workers were brought in the laboratory and their maximum aerobic capacity (VO2max) was measured by a submaximal bicycle ergometer exercise. While exercising, working HR rates at different grades of work and corresponding O2 consumption was collected simultaneously using a portable ergospirometer. The instrument analysed breath-by-breath physiological responses of the workers although the emphasis was HR and VO2max needed to determine the relationship between HR and rate of O2 consumption for each worker. This HR-O2 relation was utilized to estimate energy cost of work from the recorded HR. Maximum HR and maximum aerobic power was recorded in maximum work-stressed condition. The muscle activity during shift duty of mineworkers in the different job categories was measured using the surface electromyography (EMG). The surface EMG was used to capture the muscle activities of upper Trapezius and Latissimus dorsi muscle groups (Left and Right). The recordings were conducted with non-invasive bipolar surface electrodes with sensitivity set at 3 mV and sampling rate set at 1000 Hz. The surface EMG was deployed to ascertain how the workers responded to high physical workload.

Prior to the testing an on-site walk through task analysis survey, task inventory, and video recording of the participants during their work shift was performed. This was necessary to conduct a comprehensive task analysis on the categories of mining task that was purposively selected for the study. They were selected based on walk through task analysis survey as having the risk of MSDs; rock drilling, blasting, excavation, loading, stock-pilling and crushing operations. The number of participants evaluated from the different mines identified was as follows:

1. Production drilling and conventional mining (jumbo drill and long-hole drill) (n = 3): horizontal drilling straight into the rock face and drilling straight down into the rock floor.
2. Excavator and jackhammer operation (n = 3)—operating an excavator and jackhammer mining vehicle that breaks and loads excavated ore debris into the loadhaul-dump vehicle.
3. Production ore transportation (load-haul-dump vehicle) (n = 3)—operating a longhaul dump mining vehicle that removes excavated ore and debris.
4. Rock blasting and manual bolting (n = 3)—drilling to install explosives and charging explosives to disintegrate rocks into sizeable pieces of stones for transportation.
5. Crusher machine operation (n = 3)—manual breaking and sorting of stones in the crusher and changing of crusher belts for dimension stone cutting into sizes.
6. General services (n = 3)—mining support jobs, including workers performing mechanical, welding, pipe installation, vehicle and machine maintenance, and general construction duties.

Task inventory involved recording of the types of task performed, task frequency, task duration, and rest interval.

After the initial testing, information collected with the video recorder was subjected to time-motion analysis and the six-unit supervisors independently verified the task inventory done. The discrepancies reported by the supervisors were reviewed and final data subsequently analyzed.

The second testing involved the collection of surface EMG of the worker's muscle activities using the selected muscles upper trapezius and latissimus dorsi, and heart rate responses, during work shifts. The data logger and polar heart rate testers were secured to the miner's body using adhesive tapes, which was reinforced with a crepe bandage, to avoid displacement during movement, and interference with work activities.

2.3 Instrumentation

Video monitoring was conducted using a video recorder (DCR-DVD301 Handycam; Tokyo, Japan). The video recorder was positioned no farther than 15 feet from the participants. The position of the recorder was adjusted according to the movement and activity of the participants.

The University of Michigan's 3D Static Strength Prediction Program (3DSSPP Version 4.3.7) was used to compute static compression forces of the workers bending postures as captured by the video analyses in the different job categories.

EMG: Biometrics® data-logger (Datalog MWX8) made in the United Kingdom was used for surface EMG recording.

Heart rate (HRs) was measured using Pacer heart rate monitor (Polar Sports Tester TM, Polar Electro Oy, Finland).

A portable ergospirometer (Cosmed® k4b^2) was used to record VO^2 max of workers during submaximal test.

Rating of Perceived Exertion (RPE) scale was the psychophysical rating instrument used to obtain workers perception of how difficult the task performed was at the end of the shift.

Data Analysis

The biomechanical variables were reported as sum scores of 3DSSPP simulation reports. The statistical analysis was performed using STATISTICA (version 13) software. The normal probability plots were performed for most of the data and the distributions were approximately normal ($p < 0.05$). Descriptive measures of physiological and perceptual data included percentages, mean values, and standard deviations. The alpha level was set at $p < 0.05$, with a confidence interval of 95%. The Pearson's moment correlation was used to test the relationship between heart rate response with shift time both at rest and work time. A one-way ANOVA was used to compare differences between %MVE of the right and left EMG muscle activity across the different job categories.

Results

The mean age from table, one of participants was 32.3 ± 6.1, while the BMI was 22.1 ± 2.8. The VO_2Max of the quarry miners stood at 1.9 ± 2.3. Meanwhile, the years of working experience ranged from 1–11 years. The peak mean energy expenditure was high 36.42 ± 23.1 which was estimated from the HR-O_2 model see Table 1.

Table 1. Physical characteristics of respondents

Variables	Mean ± SD	Range
Age (years)	32.3 ± 6.1	21–37
BMI (kg/m^2)	22.1 ± 2.8	17.2–23.3
Rest HR (bpm)	83.0 ± 3.7	75.3–88.2
Work HR (bpm)	140.6 ± 22.9	122.4–163.7

Mean VO_2Max (l.min[1])	1.9 ± 2.3	1.2–2.1
Mean years of experience	7.31 ± 4.2	1–11
Mean energy expenditure (kj.min[1])	36.42 ± 23.1	24.7–45.54

BMI = Body Mass Index SD = standard deviation; Range VO_2Max = Maximum volume of oxygen (Figs. 1, 2, 5, 6 and 9) and (Table 2).

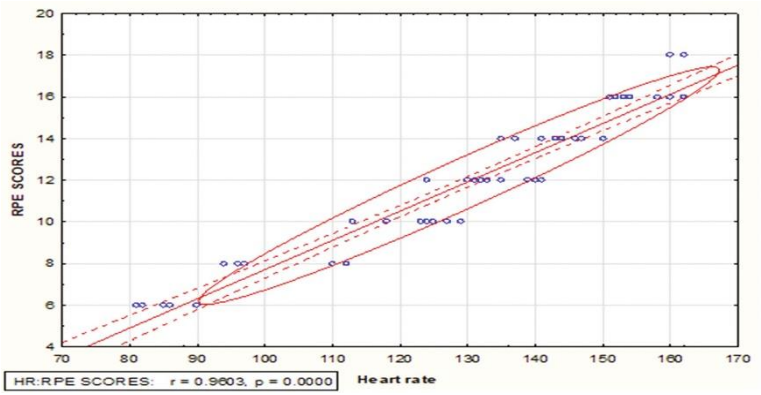

Fig. 1. Correlation of heart rate against RPE scores

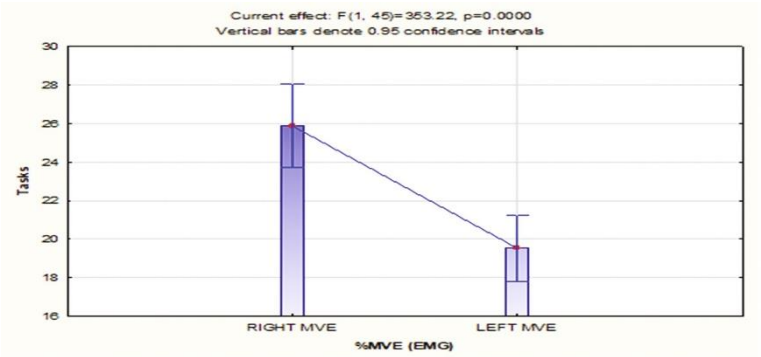

Fig. 2. % MVE (EMG) over an 8-hrs shift of right and left Latissmus dorsi muscles

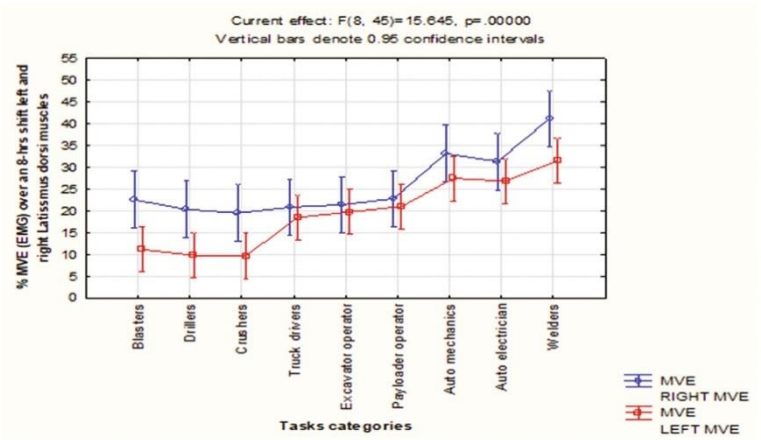

Fig. 3. % MVE (EMG) for task categories of right and left Latissmus dorsi muscles

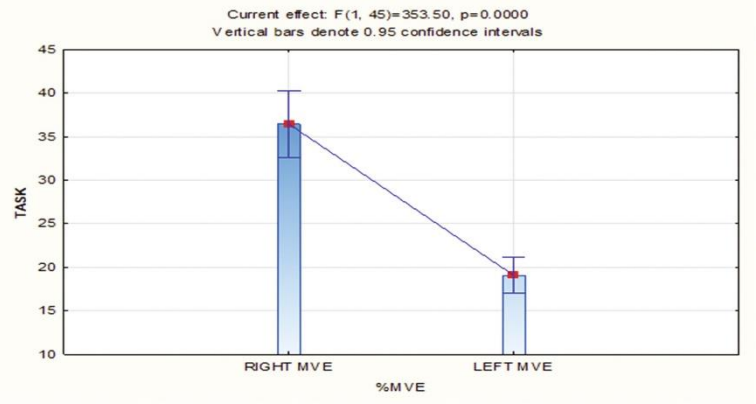

Fig. 4. % MVE (EMG) over an 8-hrs shift of right and left upper trapezius muscles

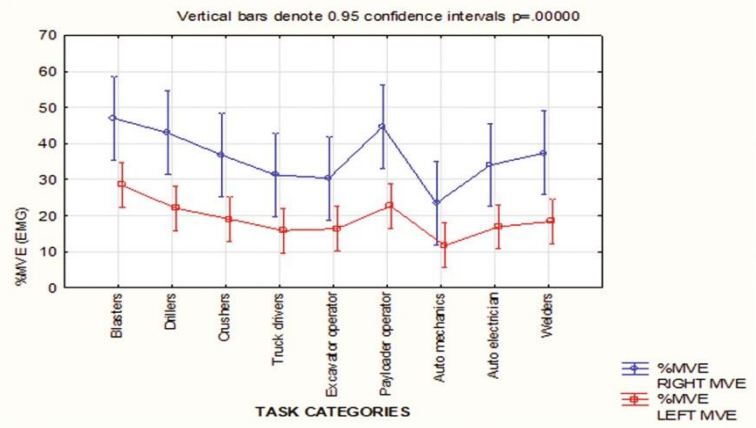

Fig. 5. % MVE (EMG) for task categories of right and left upper trapezius muscles

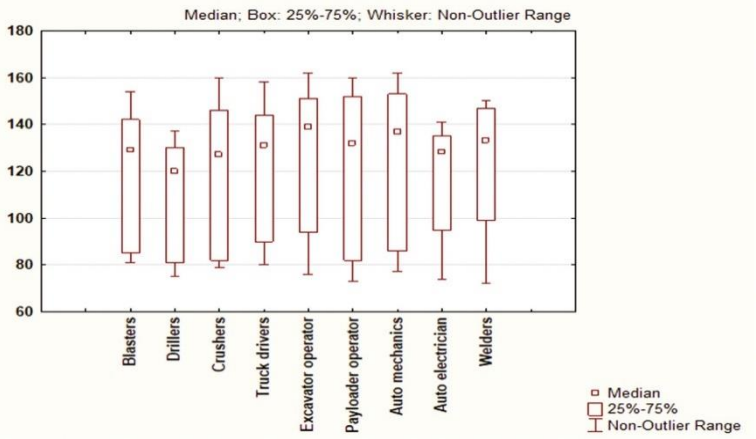

Fig. 6. Heart rate responses of quarrymen over an 8-hrs shift

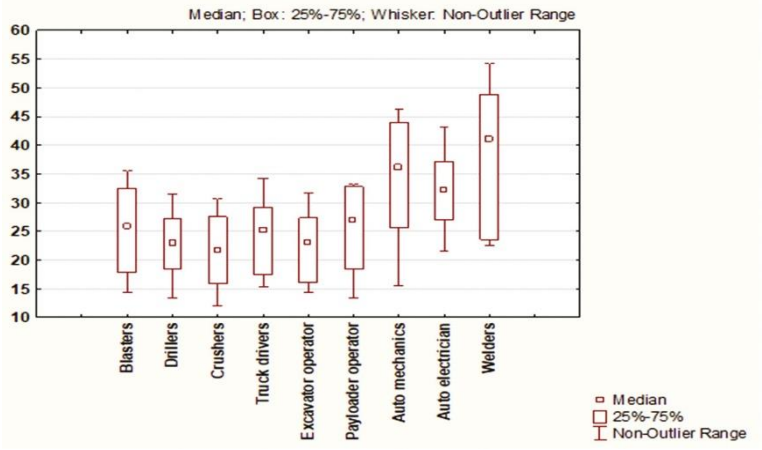

Fig. 7. Percentage MVC values of quarrymen Latissimus dorsi muscles over the shift

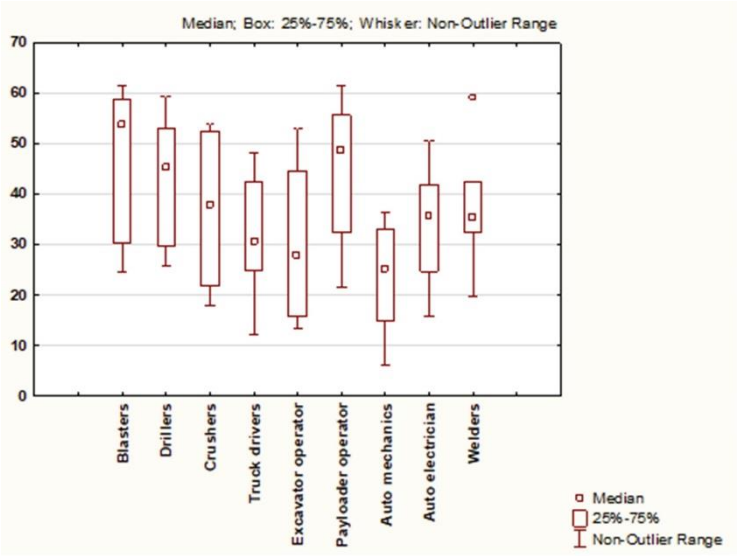

Fig. 8. Percentage MVC values of quarry-men upper trapezius muscles over the shift

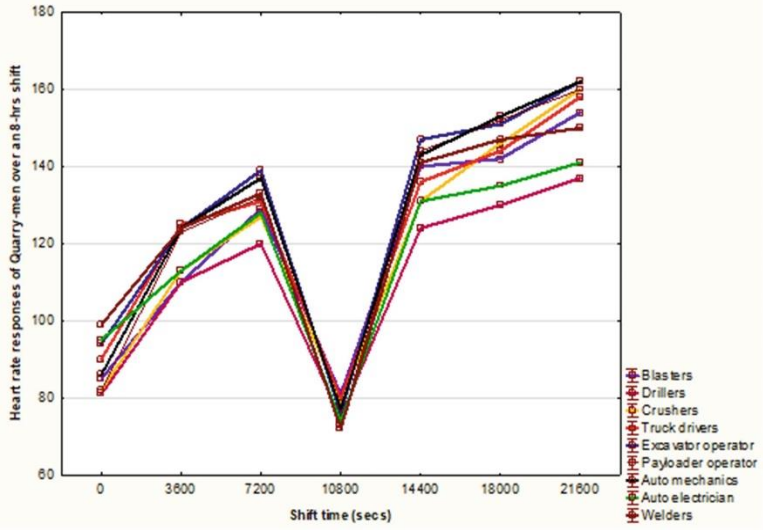

Fig. 9. Heart rate changes of quarrymen with time over the shift

Table 2. Compressive and shear forces on L5/S1 of quarry mining tasks using the 3DSSPP software using the instruments mass to be lifted (2 hands).

Instrument mass	Action	Compressive force (N)	Shearing (N)
Force jumbo and long-hole. Drills and drill steel 145 kg	Drilling and cutting through rocks (2 hands)	4819	1022
Welding compression engine, gas cylinder, welding hammer, 160 kg	Fabrication of crusher tanks, construction of drive belt seating etc. (2 hands)	4983	1084
Blasting materials ANFO and booster bags, 1.5 kg	Disintegrating rocks with explosives (2 hands)	3107	294
Scaffold 50 kg crusher's hammer	Crushing and cutting into sizeable stones (2 hands)	4906	1097
Toolbox 140 kg. Toolbox 120 kg. Pulley bench 33 kg	Auto mechanical and auto electrical maintenance of mining equipment's (2 hands)	4251	1029

Discussions

Mining have been regularly described as a physically demanding task globally by ergonomist and occupational hygienist [7, 10, 11]. The health problems of miners ranged from MSDs, noise and respiratory dust inhalation from mineral extraction. The challenges of conducting a field study in a low-middle income countries context, such as Nigeria is that workers face a lot of socioeconomic, sociocultural and organisational problems [12]. These problems come in form of poor wages, lack of adequate infrastructure, poor job security and the neighbourhood effect of extreme hunger especially in the Nigerian context where extended family social responsibility still prevails. The workers may be faced with family problems which may increase the possibility of non-response bias. The non-response bias was a serious limitation in the present study which made recruitment of willing participants difficult, hence the few participants involved in the present study.

Nevertheless, the results of the study showed that the mining tasks was associated with high physiological demands, this was obvious from the high working HR (122.4– 163.7, 95% CI). The conclusion was reached because despite the fact that the workers where relatively young with the range of 21–37 years the HR still increased during the performance of the mining tasks. The workers BMI (22.1 ± 2.8) was also a pointer to the fact that the miners were not on any "cardiovascular" disease risk since it is within the WHO normal range classification to warrant the high working HR

that was obtained from the participants. This may also be attributed to the small sample size involved in the present study. The VO_2max (1.9 ± 2.3) and energy expenditure values (36.42 ± 23.1) speaks volume of the high-energy cost of mining task performance when considering the fact that the work pace was normal. The findings is in line with the report of [4], that studied physiological demands of deep see miners in Canada as well as that of [13] that accessed workload of Indian building construction workers. The result of the 3DSSPP showed that crushers, drillers, welders and auto maintenance workers in the quarries are on the unsafe zones for compressive and shearing forces. These may be explained by the awkward postures adopted by the workers during tasks performance. The walk through survey conducted during this study also shows that the mineworkers are most times required to adopt postures that expose the joint range of motions near the extreme positions (at end of joint range of motion). The workers adopt postures of kneeling, stooping, squatting or lying down for prolonged periods, making the ligaments not immediately return to their resting length afterwards. The musculoskeletal system of the workers is regularly exposed to endure substantial performance limitations with sizeable axial torque on the spine as a result of unavoidable stretching and twisting of the trunk and lifting of heavy weight in the confined spaces This agrees with the report of [5] among Coal miners in France. The workers are often working in static postures with little or no movement at a reasonable period of time (beyond 30 min at a time) due to restricted workstations [10]. The body parts that were in static postures with inability to shift load from fatigued muscles to another may have led to the elevated discomfort and MSDs because the flow of blood through muscles to provide energy and remove waste depends on muscle movement (isokinetic contraction). Tasks that involve static postures quickly lead to discomfort, especially if combined with exposure to other risk factors [10].

The study showed a significant positive correlation between central rating of perceived exertions and working heart rate ($p > 0.05$), the findings suggest a clear understanding of the workers' feelings of how hard the mining tasks is which may be attributed to their years of working experience. There was also a significant asymmetric increase in muscle excitation for both the Latissmus dorsi and Upper Trapezius muscle, from the %MVE values obtained during EMG testing showing a predominately-high right %MVE than the left across all the job categories Figs. 3 and 4. It may be explained by right sided physical dominance of the workers, which may portend a more right sided susceptibility to MSDs suggesting a need for further investigation on injury patterns among quarry miners.

The study also revealed that the HR was continuously increasing with time during work shift, with a sharp drop at the time of rest break and started increasing while the work commenced, the sharp drop may explain some element of fitness among the workers, which explains the automatic recovery of the HR within an hour break. This may be an adaptation, which could also lead to further study to unravel the mystery behind the quick HR recovery. This finding is in line with that of [13] but in contrast with that of [14] who studied the cardiovascular responses of coal mine workers with the recovery rate being only about 70% and taking longer time despite the fact that the age range of the workers were similar to the present study. These may be associated with the fewer participants in the present study or a pointer to the need for a research to determine the physical capabilities of the Nigerian mining workforce, which was far above that of the previous studies.

The findings of this study suggest that the workers may be experiencing some element of fatigue in the muscle group studied since the result (%MVE values) showed a steady increase in motor unit recruitment as described in Figs. 7 and 8. The muscles will recruit motor unit to continue to generate more force to accomplish tasks, which increase the firing rate to keep up with force requirement for muscle contraction during task performance [15].

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Appendix IX: INFORMED CONSENT FORM (To be administered in Igbo Language)

I, _____, have been fully informed of the following research project titled; **Musculoskeletal DisorderIncidence of Mine Workers and Development of Macroergonomics Model to Unmask Stakeholders interactions within Organizational Hierarchy in the Nigerian Quarry Mining Industry.**

I have understood the information letter provided by the researcher and fully understand the research procedures that will take place. I am aware of all that is expected of me as a participant. I am also aware of my right to ask questions and speak out freely if there are any misunderstandings. I am aware that I can withdraw my participation without any consequences at any time. I am aware that the researchers will measure my height, weight. I am also aware that information about my age, work, and family life will be sought by the researchers. I am also aware that my participation in the study is for six months with at least once a month follow-up. I am aware of risk and benefits of the study and will be taking full responsibility in case it occurs. I hereby accept voluntarily consenting to participate in this research. The researchers will not be responsible for accidents and injuries that are work-related which may occur during the course of this study. I do however waive any legal recourse against the researcher, or against Rhodes University, and will take full responsibility in the event that the injury is shown to be self-inflicted.

I realize that my anonymity will be preserved throughout the study through the use of coding instead of my name; however, I am aware that the results from this study will be published as part of a combined group's results for statistical purposes. I am aware that during this study photographs will be taken for illustrative purposes in the final project; however, my identity will be completely protected through blocking out any identifying features. I consent that photographs may be taken during the research study for illustrative purposes if my identity is kept completely anonymous. I am fully aware of the above information and I hereby give my consent to voluntarily participate in this study.

	Signature	**Date**
Participant	----------	
RESEARCHER	----------	
WITNESS 1	----------	

APPENDIX X

Privacy, Anonymity and Confidentiality

The researcher is giving an assurance that privacy and anonymity will be protected throughout the field study and during report writing of the study. This will be achieved through the use of participants' codes. The participants will have the option to withdraw participation at any time, without any negative consequences. Feedback will be provided to participants by organizing a short meeting a month after analyzing the data and results from the research to communicate to participants the significance of the findings to the organization. The feedback will exclude any personal information as all results will be reported as summative data (i.e. the combined data of all participants). The overall results of the study will remain open to all but only to be used as a reference for future scientific research and to gain an in-depth understanding in this area.

The researcher will obtain verbal consent from participants for all photographs that will be used for illustrative purposes while reporting the study. However, any identifying features of participants will be blocked out. The name of the company (Crushed rock quarries) will be replaced as Quarry X in all report writing and communications. The data will be sent to databases and repositories for archiving and long-term retention for public use.

Yours sincerely,

Egwuonwu, Afamefuna Victor

(PhD student at Human Kinetics and Ergonomics Department, Rhodes University)

Supervisors Details:

Dr. Jonathan P Davy

Mr. Andrew Todd

APPENDIX XI

TABLE 2: Translation of original version of the CUPID to Igbo version of CUPID (T1 and T2)

Original Version Item:	Forward Translated Version T-1	Forward Translated Version T-2
1. Please fill in your date of birth	Biko denye ụbochi amụrụ gị	Gbambo ka ị denye ubochi omụmụ gị
2. and your sex.	Nya na okike gị	Na okike nke gi
3. Are you right or left-handed?	I na-eme aka ekpe ma obu aka nri?	I bụ onye na eme aka nri ka obụ aka ekpe
4. How would you best describe your ethnic origin.	Kedu agbụrụ gị	Kedu agbụrụị sonyere na ya
5. How old were you when you finished full time education?	Afo ole ka ịdị mgbe ịgụchara akwụkwo?	Mgbe ị gụchara akwukwo kedu afo ole ịdị
6. How tall are you?	Kedu ka ogologo gị ha?	Mgbako ogologo gị bu gini
7a.Have you ever smoked regularly (ie at least once per day for a month or longer)?	Ọ dị tụwo mgbe ị na-ese siga mgbe niile?	Ọnwetula mgbe i sere sigi ihe dika otu na ubochi ma obu karia.
7b. If ***YES***, do you still smoke regularly?	Ọburu eziokwụ, ika na-ese siga oge obụla?	Ọburu eeh, Ọ ka na ese siga ma ugbụa
8. What is your main occupation?	Kedu ihe bu isi ihe ị na-arụ?	Kedu aha oru ị na aru ugbụa
9. How long have you done this job?	Ogologo oge ole ka i meworo orụ a?	I ruo la oru Ogologo oge ole
10. How many hours per week do you normally work in this job?	Ogologo awa kwa izuka i na-aru kari orụ a?	Ihe dika awa ole ka i na aru na izu uka.
11. Does **average working day** in the job involve any of the following?	E nwere nkeji ubochi obula ndi aso na olu gi a? *(biko horo ee ma obụ ee)*	Ihe dika nkeji ubochi oge ole ka i na aru oru na ubochi

a. Use of a keyboard or typewriter for more than four hours in total?	Ojiji nke keyboard ma obu nkumigwe n'ihi na ihe kariri awa ano na ngukota?	I ji ojiji aka ihe kariri awa ano nke computa ma obu igwe edemede oso na oru gi
b. Other tasks involving repeated movements of the wrist or fingers for more than four hours in total?	Ọru ndi ozo gbasara ụgboro ụgboro mmeghari aka mkpisi aka dika ihe kariri awa anọ na ngụkota?	Oru ndi ozo i na aru ogbasara oke imeghari nkpisi aka ihe kariri awa anọ na nchikota.
c. Repeated bending and straightening of your elbow for longer than one hour in total?	Ugboro ụgboro ekwe na hulite gị n'ikpere aka dika ogologo oge karia otụ awa na ngụkọta?	Oru gi ometutara ngbati na ngbako iku aka ihe kariri awa otu na nchikota
d. Working for longer than one hour in total with your hands above shoulder height	Irụọrụ dika ogologo oge kariri otụ awa na ngụkota na aka n'elu ubu elu?	Oru gi ometutara iru oru ga eme ka i na eweli aka gafe ubu aka, ihe kariri otu awa.
e. Lifting weights of 25 Kg (56 lbs) or more by hand?	I weli igwe nke kariri kilograms iri abuo na ise site n'aka?	Ibu ni ibu kariri ogu gram iri abuo na ise site na iji aka gi.
f. Climbing up or down more than 30 flights of stairs a day?	Irigo elu ma ọ bu ala ihe kariri nzo ukwu iri ato na ubọchi?	Oru gi ona eme ka ina ari elu nke step iri ato na ubọchi.
g. Kneeling or squatting for longer than one hour in total?	Igbu ikpere n'ala ma ọ bu itụkwụ ala ogologo oge kariri otụ awa na ngụkọta?	I sekpu ala ma obu i tukwu ala ihe kariri otu awa na nchikota.
h. Piecework in which you are paid according to the number of articles or task you or your team make or finish in the day?	Ọru ole ka a na-akwu gịụgwọ ka gị na ndị otụọrụ gị na-aru n'ụbọchi?	Nkeji oru ole i na aru ma obu ndi otu gi na aru ka unu na aru si na ubochi.
i. A target number of articles or tasks that you or your team are expected to make or finish in the day?	O nwere, okwụọrụ ole gị na-atu anya na gị na ndị otụ gị ga-aru n'ụbọchi?	O nwere, okwụọrụ ole gị na-atu anya na gị na ndị otụ gị ga-aru n'ụbọchi

j. Payment of a bonus if you make or finish more than an agreed number of articles/tasks in the day?	Ụgwọ nke bu bonusu ma ọ bụrụ na i na-eme ma ọbu n'ịsị n'ụbọchi?	Ụgwọ nke bu bonusu ma ọ bụrụ na i na-eme ma ọbu n'ịsị n'ụbọchi
k. Working under pressure to complete tasks by a fixed time?	Irụọrụ nrụgide mezue ihe a ga-eme site a otu oge?	Irụọrụ nrụgide mezue ihe a ga-eme site a otu oge
12. In your job, do you have a choice in deciding	N'ọrụ gị, ị nwere ohere, ighoro ihe ị ga-eme	N'ọrụ gị, ị nwere ohere, ighoro ihe ị ga-eme
13. When you have difficulties in your work, how often do you get help and support from your colleagues or supervisor/manager?	Ugboro ole n'ole ka ị na-enweta enyeme aka na nkwado sitere n'aka ndi otu ọrụ gị ma obu onye nlekota gi mgbe i na-eme nsogbu?	Ugboro ole n'ole ka ị na-enweta enyeme aka na nkwado sitere n'aka ndi otu ọrụ gị ma obu onye nlekota gi mgbe i na-eme nsogbu
14. How satisfied have you been with your job as a whole, taking everything into consideration?	N'itinye ihe niile n'echịche ojuju afo ole k'inwegoro n'oru niile i na-aru?	N'itinye ihe niile n'echịche ojuju afo ole k'inwegoro n'oru niile i na-aru
15. How secure do you feel your job would be if you had a significant illness that kept you off work for three months?	Kedu nchekwa iche n'inwere n' ọrụ gị ma ọ bụrụ na-iriaba oria ma ọ bụrụ onye n'ejeghi ọrụ ihe ruru ọnwa ato?	Kedu nchekwa iche n'inwere n' ọrụ gị ma ọ bụrụ na-iriaba oria ma ọ bụrụ onye n'ejeghi ọrụ ihe ruru ọnwa ato?
16. Do you have any other job(s)? If yes, what are the other jobs?	I nwere ọrụọzọị na-arụ? Ọ bụrụ na i nwere, kedu ụdi ọrụ bu ihe ahu?	I nwere ọrụọzọị na-arụ? Ọ bụrụ na i nwere, kedu ụdi ọrụ bu ihe ahu?
17a. Have you had low back pain in the area shown below which lasted for more than a day at any time during the	Dika ihe eserese a di na mgbada nakowa, i nwenụgo azụ ma ọbụụkwụ mgbụnọrụrụ ihe kariri	Ntuzi aka ihe eserese a di na ebe na kowa, ma onwela mgbu azụ ma ọbụụkwụnọọro ihe kariri otụụbọchi ka mgbe ọnwa iri na

past 12 months? *(Do not include pain associated only with menstrual periods, pregnancy or during a course of a feverish illness.)*	otụụbọchi ka mgbe ọnwa iri na abụọ gara aga (etintekwala mgbụ metụtara nso ma ọbụ ime nwanyi ma ọbụkwanụ iba. Ọ bụrụ n'onweghi, biko gafee n'ajụjụ nke iri abụọ, mana ọ bụrụ n'onwere gaba n'irụ	abụọ nke gara aga (etintekwala mgbụ metụtara nso ma ọbụ ime nwanyi ma ọbụkwanụ iba. Ọ bụrụ n'onweghi, biko gafee n'ajụjụ nke iri abụọ, mana ọ bụrụ n'onwe ga na irụ
17b. Within the past 12 months, has the pain ever spread down your leg(s) to below the knee (sciatica)?	O nwego ka ya bu mgbu si were si n'ebe obidoro banye n' ukwu gị ma ọbụ gafee n'ikpere gị kamgbe ya bu onwa iri abụọ na abụọ?	Onwere ka mgbu si were si n'ebe obidoro banye n' ukwu gị ma ọbụ gafee n'ikpere gị kamgbe ya bu onwa iri abụọ na abụọ
17c. If you add together all the days on which you have had low back pain, during the past 12 months, how long a period would that make?	Yabụrụ na ịgbakọ oge yabu ihe malitere kamgbe ọnwa iri abụọ na abụọ, kedu oge ị nwere ike ikwụ na yabụ mgbụ anọgo?	O bụrụ na ịgbakọ oge mmalite ka mgbe ọnwa iri abụọ na abụọ, kedu oge ị nwere ike ikwụ na mgbụ anọro
17d. Have you consulted a doctor or a medical person or alternative practitioner because of low back pain during the past 12 months?	Ijego hu dọkinta ma ọ bụ onye ọrụ ahu ike maka yabụọria mgbu kamgbe ọnwa iri na abụọ?	I jela hu dibia bekee ma ọ bụ onye ọrụ ahu ike maka yabụọria mgbu kamgbe ọnwa iri na abụọ
17e. During the past 12 months on how many days did low back pain prevent you from going to work?	Ugboro ole na ole ka ya bụ ukwu mgbụ gbochiri gị ije ọrụ gi kamgbe ọnwa iri na abụọ?	Ka mgbe ole na ole ka ukwu mgbụ a gbochiri gị ije ọrụ kamgbe ọnwa iri na abụọ?
18. Do you expect that your back pain will be a problem in 12 months' time?	I chere n' ụkwụ mgbụ gị nwere ike ibụtere gị nnụkwụ nsogbụ n' ọnwa iri na abụọ 'abia abia?	I chere n' ụkwụ mgbụ nkea nwere ike I nye gị nsogbụ n' ọnwa iri na abụọ 'na iru

We are particularly interested in any back pain you may have had during the past month	Ọ kachasi mkpa ma o bụrụ n'i nwere mgbụ azụ na ọnwa nke gara aga	O kachasi anyi mkpa ka anyi mara na i nwela mgbụ azụ na ọnwa nke gara aga
19a. Have you had low back pain in the area shown below which lasted for more than a day at any time during the past month? *(Do not include pain associated only with menstrual periods, pregnancy or during a course of a feverish illness*	I nwere ihe mgbụ nke ndịda azụ n'ebe a esere ihe ojị na ihe ngosi di na, nke kariri otụụbọchi n'oge gara aga n' ọnwa gara aga? *(Biko,ihe mgbụ nke nso nwaanyi ma ọbụ, nke imu nwa ,ahụọkụ eso gi na ya*	I nwela ihe mgbụ nke ndịda azụ n'ebe a esere ihe ojị na ihe ngosi, nke kariri otụụbọchi n'oge gara aga n' ọnwa gara aga? *(Biko,ihe mgbụ nke nso nwaanyi ma ọbụ, nke imu nwa ,ahụọkụ eso gi ya*
19b. Within the past month, has the pain ever spread down your leg(s) to below the knee (sciatica)?	Site na ọnwa gara aga, onwego oge ihe mgbụ gafere na akuku ahu gị dika okpa gị ma ọbu ikpere gị?	Site na ọnwa gara aga, onwela oge ihe mgbụ gafere na akuku ahu gị dika okpa gị ma ọbu ikpere gị
19c. If you add together all the days on which you have had low back pain, during the past month, how long a period would that make?	Igbakota ụbọchi niile ị nwere ihe mgbụ nke ndida ụkwụ gị, na oge gara aga, dika ogologo oge ole ka ọ ga-adi?	Ichikota ụbọchi niile ị nwere ihe mgbụ nke ndida ụkwụ, na oge gara aga, dika ogologo oge ole ka ọ nwere ike idi.
20. During the past month, has low back pain at any time made it difficult or impossible to do any of the following activities?	N'ime ọnwa ndi gara aga onwego ka ọria azu mgbu si mee ka i ghara irụụfodu olu ndi a edeputara na mgbada?	N'ime ọnwa ndi gara aga onwego ka ọria azu mgbu si mee ka i ghara irụụfodu orụ ndi a edeputara na mgbada
a. Cutting your toe nails	Ibechasi mbo ụkwụ gị	I kpacha mbo ụkwụ
b. Getting dressed	I yiri akwa	I yi akwa
c. Doing the jobs that you	Irụ ọrụ ndi ị na adura arugasi	Irụ ọrụ ndi ị na aru na ụlọ

normally do around the house	orụ ndi ị na-arụbụ n' ụlọ	
21. Please think back to the last time that you were free from low back pain for a month or longer. When your most recent episode of low back pain then started, how did it begin?	Biko chelaa echiche azụ oge n'ibidobeghi nwebe ọria azụ mgbụ n'ihe ruru ọtụọnwa maọbu karia. Oge yabu ọria azụ mgbụ malitere kedu ka osiri malite?	Biko che echiche azụ oge n'ibidobeghi nwebe ọria azụ mgbụ n'ihe ruru ọtụọnwa maọbu karia. Oge ọria azụ mgbụmalitere kedu ka osiri bido.
22a. Have you had pain in the neck in the area shown below which lasted for more than a day at any time during the past 12 months?	Ihe esere ese a dinamgbada negosipụta i nwenụgo ihe mgbụ n'olụ gị nke nokariri otụụbọchi n'ime ọnwa iri na abụọ gara aga?	Ihe esere ese a dina mgbada ipụta i nwenụgo ihe mgbụ n'olụ gị ɔkariri otụụbọchi n'ime ọnwa iri ụọ gara aga.
22b. If you add together all the days on which you have had neck pain, in the past 12 months, how long a period would that make?	Yaburụ na igbako oge yabụ olụ mgbụ malitere kamgbe ọnwa iri na abụọ, kedụ oge i nwere ike ikwụ na yabu mgbụ anogo?	Yaburụ na igbako oge yabụ olụ mgbụ malitere kamgbe ọnwa iri na abụọ, kedụ oge i nwere ike ikwụ na yabu mgbụ anogo
22c. Have you consulted a doctor or a medical person or alternative practitioner because of neck pain during the past 12 months?	Ijerụgo hu dọkinta ma ọbụ onye ọrụ ahụ ike maka yabu ọria ọlu mgbụ kamgbe ọnwa iri na abụọ?	Ijerụgo hu dọkinta ma ọbụ onye ọrụ ahụ ike maka yabu ọria ọlu mgbụ kamgbe ọnwa iri na abụọ
22d. During the past 12 months on how many days did neck pain prevent you from going to work?	Ụgboro ole na ole ka ya bụọlụ mgbgụ gbochigoro gị ije ọrụ kamgbe ọnwa iri na abụọ?	Ụgboro ole na ole ka ya bụọlụ mgbgụ gbochigoro gị ije ọrụ kamgbe ọnwa iri na abụọ.
23. Do you expect that your	I chere n'ọlụ mgbụ gị nwere	I chere n'ọlụ mgbụ gị nwere ike

neck pain will be a problem in 12 months time?	ike ibụtere gị nnụkwụ nsogbụn'ọnwa iri na abụọ n'abia abia?	ibụtere gị nnụkwụ nsogbụn'ọnwa iri na abụọ n'abia abia.
We are particularly interested in any neck pain you may have had during the past month	Ọkachasi anyi mkpa na mgbụọnụọbụla i nwere n'oge ọbụla n' ọnwa nke gara aga	Ọkachasi anyi mkpa na mgbụọnụọbụla i nwere n'oge ọbụla n' ọnwa nke gara aga

24a. Have you had pain in the neck in the area shown below which lasted for more than a day at any time during the past month?	I nwere ihe mgbụ nke ọnụ na ebe esere ihe oji na ihe ngosi di n'ala, nke kariri otụụbọchi, oge ọbụla n' ọnwa gara aga?	I nwere ihe mgbụ nke ọnụ na ebe esere ihe oji na ihe ngosi di n'ala, nke kariri otụụbọchi, oge ọbụla n' ọnwa gara aga
24b. If you add together all the days on which you have had neck pain, during the past month, how long a period would that make?	Ikpakota ụbochi niile i nwere onu mgbụ, n'onwa gara aga, oge oleka ọ ga adi?	Ikpakota ụbochi niile i nwere onu mgbụ, n'onwa gara aga, oge oleka ọ ga adi
25. During the past month, has neck pain at any time made it difficult or impossible to do any of the following activities?	Na ọnwa gara aga, onu mgbụ i nwere oge ọbula ọ mere ka osiere gi ike ime ihe ndi a dịịche ịche?	Na ọnwa gara aga, onu mgbụ i nwere oge ọbula ọ mere ka osiere gi ike ime ihe ndi a dịịche ịche
a. Getting dressed	Iyi akwa	Iyi akwa
b. Doing the jobs that you normally do around the house	Irụọrọ ndi ị na-arụ n' ụlọ gị	Irụọrọ ndi ị na-arụ n' ụlọgị
26a. Have you had pain in the shoulder in the area shown below which lasted for more than a day at any time during the past 12 months?	Inwenụgo ihe mgbụ n' ụbụaka dika ọdi n'eseresea nke nọrụgoro karia otụụbọchi n' ọnwa iri na abụọ gara aga?	Inwenụgo ihe mgbụ n' ụbụaka dika ọdi n'eseresea nke nọrụgoro karia otụụbọchi n' ọnwa iri na abụọ gara aga

26b. If you add together all the days on which you have had shoulder pain, in the past 12 months, how long a period would that make?	Ọ bụrụ na i gbakosia ụbọchi ole i nwegoro ahu ike ma ọbụ onye ọbụla gbasara ihe mgbụ n' ụbụaka n' ọnwa iri na abụọ gara aga?	Ọ bụrụ na i gbakosia ụbọchi ole i nwegoro ahu ike ma ọbụ onye ọbụla gbasara ihe mgbụ n' ụbụaka n' ọnwa iri na abụọ gara aga?
26c. Have you consulted a doctor or a medical person or alternative practitioner because of shoulder pain during the past 12 months?	I gakwụrụgo dọkinta ma ọbụ onye na ahu maka ahụ ike ma ọbụ onye obụla gbasara ihe mgbụ n'ụbụaka ọnwa iri n'abụa gara aga?	I gakwụrụgo dọkinta ma ọbụ onye na ahu maka ahụ ike ma ọbụ onye obụla gbasara ihe mgbụ n'ụbụaka ọnwa iri n'abụa gara aga?
26d. During the past 12 months on how many days did shoulder pain prevent you from going to work?	N'agbata ọnwa iri na abụọ gagoro aga, ụbọchi ole ka ihe mgbụ n'ụbụaka gbochiri gị ga ọrụ?	N'agbata ọnwa iri na abụọ gagoro aga, ụbọchi ole ka ihe mgbụ n'ụbụaka gbochiri gị ga ọrụ?
27. Do you expect that your shoulder pain will be a problem in 12 months time	I na-atụanya na ihe mgbụụbụaka gị a ga-abu ihe nsogbu nye gi n'onwa iri n'abụọ na abia abia?	I na-atụanya na ihe mgbụụbụaka gị a ga-abu ihe nsogbu nye gi n'onwa iri n'abụọ na abia abia?
We are particularly interested in any shoulder pain you may have had during the past month	**Ihe anyi choro ima bụ ihe mgbụọbụla i nwere n'ụbụaka gi nime ọnwa gara aga**	**Ihe anyi choro ima bụ ihe mgbụọbụla i nwere n'ụbụaka gi nime ọnwa gara aga**
28a. Have you had pain in the shoulder in the area shown below which lasted for more than a day at any time during the past month?	I nwenụgo ihe mgbụ n'ubụaka dika o di n'eseresea, nke nogoro karia otụ ụbọchi n'ime ọnwa gara aga?	I nwenụgo ihe mgbụ n'ubụaka dika o di n'eseresea, nke nogoro karia otụ ụbọchi n'ime ọnwa gara aga?
28b. If you add together all the	Ọ bụrụ na igbakọsia ụbọchi ole	Ọ bụrụ na igbakọsia

days on which you have had shoulder pain, during the past month, how long a period would that make?	i nwegoro ihe mgbụ n'ụbụaka n'onwa gara aga, kedu ole ka nke ahu ga-aputa?	ụbọchi ole i nwegoro ihe mgbụ n'ụbụaka n'onwa gara aga, kedu ole ka nke ahu ga-aputa?
29. During the past month, has shoulder pain at any time made it difficult or impossible to do any of the following activities?	N' agbata onwa gara aga, Enwere ihe mgbụ n'ụbụaka nyere gi nsogbụ ma ọbụ kwụsiri gị ime ihe otụ n'ime ihe ndi a	N' agbata onwa gara aga, Enwere ihe mgbụ n'ụbụaka nyere gi nsogbụ ma ọbụ kwụsiri gị ime ihe otụ n'ime ihe ndi a
a. Combing or brushing your hair	Ivo ntụtụ gi	Ivo ntụtụ gi
b. Bathing/Showering	Isa ahụ	Isa ahụ
c Getting dressed	Ikwado/ iyi akwa	Ikwado/ iyi akwa
d. Doing the jobs that you normally do around the house	I di na-arụọrụ i na-aru na mgburugburu ụlọ gị	I di na-arụọrụ i na-aru na mgburugburu ụlọ gị
30a. Have you had pain in the elbow in the area shown below which lasted for more than a day at any time during the past 12 months?	I nwenụgo ihe mgbụ na ikiaka dika ọ di n'esere a, nke nọrụgoro karia otụụbọchi n'ime ọnwa iri na abụọ gara aga?	I nwenụgo ihe mgbụ na ikiaka dika ọ di n'esere a, nke nọrụgoro karia otụụbọchi n'ime ọnwa iri na abụọ gara aga?
30b. If you add together all the days on which you have had elbow pain, in the past 12 months, how long a period would that make?	Ọ bụrụ na igbakọsia ụbọchi ole i nwere ihe mgbụ na ikuaka n'ime ọnwa iri na abuo gara, kedu oge ole nke ahu pụtara?	Ọ bụrụ na igbakọsia ụbọchi ole i nwere ihe mgbụ na ikuaka n'ime ọnwa iri na abuo gara, kedu oge ole nke ahu pụtara?
30c. Have you consulted a doctor or a medical person or alternative practitioner because of elbow pain during the past 12 months?	I gakwugoro dokinta ma obu onye na-ahu maka ahu ike ma obu onye obula gbasara ihe mgbu n'ikuaka n'ime onwa iri na abuo gara aga?	I gakwugoro dokinta ma obu onye na-ahu maka ahu ike ma obu onye obula gbasara ihe mgbu n'ikuaka n'ime onwa iri na abuo gara aga?

30d. During the past 12 months on how many days did elbow pain prevent you from going to work?	N'ime onwa iri na abuo gara aga, ubochi ole ka ihe mgbu ikuaka gbochiri gi i ga-oru?	N'ime onwa iri na abuo gara aga, ubochi ole ka ihe mgbu ikuaka gbochiri gi i ga-oru

31. Do you expect that your elbow pain will be a problem in 12 months time?	I na-atu anya na ihe mgbu n'ikiaka ga-aburu gi ihe nsogbu n'onwa iri na abuo ga abia abia?	I na-atu anya na ihe mgbu n'ikiaka ga-aburu gi ihe nsogbu n'onwa iri na abuo ga abia abia?
We are particularly interested in any elbow pain you may have had during the past month	Ihe anyi choro ima bu ka i nwere ihe mgbu obula n'ikiaka n'ime onwa gara aga	Ihe anyi choro ima bu ka i nwere ihe mgbu obula n'ikiaka n'ime onwa gara aga
32a. Have you had pain in the elbow in the area shown below which lasted for more than a day at any time during the past month?	I nwenugo ihe mgu n'iki aka dika odi n'ihe eseresea nke norugoro karia otu ugbochi n'ime onwa gara aga?	o nwela ihe mgu n'iki aka dika odi n'ihe eseresea nke norugoro karia otu ugbochi n'ime onwa gara aga?
32b. If you add together all the days on which you have had elbow pain, during the past month, how long a period would that make?	Oburu na igbakosia ubochi ole i nwere ihe mgbu n'ikuaka na ime onwa gara aga, oge ole ka nka ahu ga-aputa?	Oburu na igbako ubochi i nwere ihe mgbu n'ikuaka na onwa gara aga, oge ole ka nka ahu ga-abu
33. During the past month, has elbow pain at any time made it difficult or impossible to do any of the following activities?	N'ime onwa gara aga ihe mgbu n'ikuaka enyere gi nsogbu n'ime otu n'ime ihe ndia	Na onwa gara aga ihe mgbu ikuaka onyere gi nsogbu ime ihe ndia.
33a. Opening bottles, jars or taps	i di na-emepe kalama. Ololo,	i di na-emepe kalama. Ololo,

	maobu mgbata	maobu mgbata
33b. Getting dressed	ikwado/ iyi akwa	Nkwado eyim akwa
33c. Doing the jobs that you normally do around the house	idi na-aru oru ina aru gbururgburu ulo	Iru oru ina aru na ezi na ulo
34a. Have you had pain in the wrist or hand in the area shown below which lasted for more than a day at any time during the past 12 months?	I nwenugo ihe mgbu na nkwojiaka ma obu aka dika o di n'eserese a nke norugoro karia otu ubochi n'ime onwa iri na abuo gara aga?	Onwela ihe mgbu na nkwojiaka ma obu mkpisi aka dika egosiri n'eserese a nke noro karia otu ubochi n'ime onwa iri na abuo gara aga?
34b. If you add together all the days on which you have had wrist/hand pain, in the past 12 months, how long a period would that make?	Oburu na igbakosia ubochi ole i nwere ihe mgbu na nkwojiaka ma obu na aka n'ime onwa iri na abuo gara aga, oge ole ka nke ahu ga-aputa?	Oburu na igbako ubochi ole i nwere ihe mgbu na nkwojiaka ma obu mkpisi aka na onwa iri na abuo gara aga, oge ole ka nke nkea ga-abu?
34c. Have you consulted a doctor or a medical person or alternative practitioner because of wrist/hand pain during the past 12 months?	I gakwugoro dokinta ma obu onye na-ahu maka ahu ikem gbasara ihe mgbu na nkwojiaka maobu n'aka n'ime onwa irir na abuo gara aga?	I jela hu dibia oyibo ma obu olu ahu ike na dozi ahu mgbu na nkwojiaka maobu n'aka n'ime onwa irir na abuo gara aga
34d. During the past 12 months on how many days did wrist/hand pain prevent you from going to work?	N'ime onwa iri na abuo gara aga, ubochi ole ka ihe mgbu na nkwojiaka ma obu n'aka gbochirir gi iga-oru?	Na onwa iri na abuo gara aga, ubochi ole ka ihe mgbu na nkwojiaka ma obu mkpisi aka gbochiri gi iru-oru
35. Do you expect that your wrist/hand pain will be a problem in past 12 months time.	I na-atu anya na ihe mgbu na nkwojiaka maobu n'aka gi, ga buru gi ihe nsogbu na onwa iri na abuo ga-abia abia?	I na-atu anya na ihe mgbu na nkwojiaka maobu n'aka gi, ga buru gi ihe nsogbu na onwa iri na abuo ga-abia abia
We are particularly interested in	Ihe anyi choro ima bu ka isi-	Ihe anyi choro ima bu ka i

any wrist/hand pain you may have had during the past month	nwe ihe mgbu na nkwojiaka ma obu n'aka n'ime onwa gara aga	nwere ihe mgbu obula n'ikiaka n'ime onwa gara aga
36a. Have you had pain in the wrist or hand in the area shown below which lasted for more than a day at any time during the past month?	I nwenugo ihe mgbu na nkwojiaka ma obu n'aka gi dika o di n'eserese a, nke norugoro karia otu ubochi n'ime onwa gara aga?	Onwela ihe mgbu na nkwojiaka ma obu mkpisi aka egosiri na eserese a, nke norugoro karia otu ubochi n'ime onwa gara aga
36b. If you add together all the days on which you have had wrist/hand pain, during the past month, how long a period would that make?	O buru na igbakosia ubochi ole i nwere ihe mgbu na nkwojiaka ma obu aka n'ime onwa gara aga, oge ole ka nke ahu ga-aputa?	Igbako ubochi ole i nwere ihe mgbu na nkwojiaka ma obu mkpisi aka n'ime onwa gara aga, oge ole ka oga abu.
37. During the past month, has wrist/hand pain at any time made it difficult or impossible to do any of the following activities?	N'ime onwa gara aga, ihe mgbu na nkwojiaka ma obu n'aka, e nyere gi nsogbu n'ime otu n'ime ihe ndi a?	Na onwa gara aga, ihe mgbu na nkwojiaka ma obu mkpisi aka, onyere gi nsogbu n'ime otu n'ime ihe ndi a
37a. Writing	Ide ihe	Ide edemede
37b. Locking and unlocking doors	Igbape na ikpochi onu uzo	Nmepe na nkpochi onu uzo.
37c Opening bottles, jars or taps.	Imepe kalama, ololo ma obu mgbata	Ikpope kalama ololo ma bu pumpu
37d. Getting dressed	I kwado/ iyi akwa	Nkwado eyim akwa
37e. Doing the jobs that you normally do around the house	I di na-aru oru i na-aru na gburugburu ulo	I di na-aru oru i na-aru na gburugburu ulo
38a. Have you had pain in the knee in the area shown below which lasted for more than a day at any time during the past 12 months?	E nwego mgbe i nwere ihe mgbu n'ikpere dika ihe eserese a di na mgbada na-akowa nke kariri otu ubochi n'ime onwa iri na abuo gara	E nwego mgbe i nwere ihe mgbu n'ikpere dika ihe eserese a di na mgbada na-akowa nke kariri otu ubochi n'ime onwa iri na abuo gara

	aga?	aga
38b. If you add together all the days on which you have had knee pain, in the past 12 months, how long a period would that make?	O buru na igbakoo ubochi niile i nwere ihe mgbu n'ikpere n'ime onwa iri na abuo gara aga, ugboro ole ka nke ahu ga-aputa?	O buru na igbakoo ubochi niile i nwere ihe mgbu n'ikpere n'ime onwa iri na abuo gara aga, ugboro ole ka nke ahu ga-aputa
38c. Have you consulted a doctor or a medical person or alternative practitioner because of knee pain during the past 12 months?	E nwego mgbara i gara na nke dokinta ma obu onye o bula na-ahu maka ahu ike gbasara ihe mgbu n'ikpere n'ime onwa iri na abuo gara aga?	Onwela mgbara i gara na nke dokinta ma obu onye o bula na-ahu maka ahu ike gbasara ihe mgbu n'ikpere n'ime onwa iri na abuo gara aga
38d. During the past 12 months on how many days did knee pain prevent you from going to work?	N'ime onwa iri na abuo gara aga, ubochi ole ka ihe mgbu n'ikpere gbochiri gi i ga-oru?	Na onwa iri na abuo gara aga, ubochi ole ka ihe mgbu n'ikpere gbochiri gi i ga-oru
39. Do you expect that your knee pain will be a problem in 12 months time?	I na-atu anya na ihe mgbu n'ikpere nwere ike i buru gi nnukwu nsogbu n'onwa iri na abuo na-abia abia?	I na-atuanya na ihe mgbu ikpere ga enye gi nsogbu.
40a. Have you had pain in the knee in the area shown below which lasted for more than a day at any time during the past month?	E nwego mgbe i nwere ihe mgbu n'ikpere dika ihe eserese a di na mgbada na-akowa, nke kariri otu ubochi n'ime onwa gara aga?	Onwela mgbe i nwere ihe mgbu n'ikpere dika ihe eserese a di na mgbada na-akowa, nke kariri otu ubochi n'ime onwa gara aga?
40b. If you add together all the days on which you have had knee pain, during the past month, how long a period would that make?	O buru na igbako ubochi nile i nwere ihe mgbu n ikpere n'onwa gara aga, ugboro ole ka nke ahu ga aputa?	Igbako ubochi nile i nwere ihe mgbu n ikpere n'onwa gara aga, ugboro ole ka nke ahu ga aputa
41. During the past month, has knee pain at any time made it difficult or impossible to do any	N'ime onwa gara aga, e nwere ka ihe mgbu n'ikpere siri gbochie maobu nye gi	Na onwa gara aga, e nwere ka ihe mgbu n'ikpere siri gbochie maobu nye gi

of the following activities	nsogbu na ime ihe ndia?	nsogbu na ime ihe ndia?
41a.Walking up and down stairs	i gbago elu na igbada ala n'ulo	i rigo elu na I irda ala n'ulo
41b. Walking on level ground	i ga n'ala di mma	i ga ije na ala di mma
41c. Getting dressed	i kwado na iyi akwa	Njike eyim akwa
41d. Doing the jobs that you normally do around the house	i di na-aru oru i na aru na gburugburu ulo	i di na-aru oru i na aru na gburugburu ulo
42. Do you know anyone who has had low back pain in the past 12 months	E nwere onye i mara nweburu ihe mgbu na-mgbada azu n'onwa iri na abuo gara aga?	Onwela onye i mara nweburu ihe mgbu na-mgbada azu n'onwa iri na abuo gara aga
42a. At work	N'oru	Na ulo oru
42b. Outside work	N'abughi n'oru	Na ilo
43. Do you know anyone who has had neck pain in the past 12 months?	E nwere onye i mara nweburu onu mgbu n'ime onwa iri na abuo gara aga?	Onwela onye i mara nweburu onu mgbu n'ime onwa iri na abuo gara aga?
43a. At work	N'oru	
43b. Outside work	N'abughi n'oru	
44. Do you know anyone who has had pain in the arm, shoulder or hand in the past 12 months?	E nwere onye i mara nweburu ihe mgbu n ogwe aka, ubuaka ma obu n'aka nime onwa iri na abuo gara aga?	
44a. At work	N'oru	Na ulo oru
44b. Outside work	N'abughi n'oru	Na iru ilo
45. Do you know anyone who has had knee pain in the past 12 months?	E nwere onye imara nweburu ihe mgbu n'ipkere n'ime onwa iri na abuo gara aga?	Onwela onye imara nweburu ihe mgbu n'ipkere n'ime onwa iri na abuo gara aga
45a. At work	N'oru	Na ulo oru
45b. Outside work	N'abughi n'oru	Na iru ilo

46. Based on your own views and what the doctor or others may have told you <u>about pain in the arm, shoulder or hands,</u> how strongly do you agree with the following statements? *(Tick one box on each line.)*	Site na echiche nkegi na kwa ihe dokinta gwara gi gbasara ihe mgbu n'ogbe aka, ubuaka, kedu ka isiri kweyesie ike n okwu ndia? *(horo otu n'ime akpati ndia.)*	Site na echiche nkegi na kwa ihe dokinta gwara gi gbasara ihe mgbu n'ogbe aka, ubuaka, kedu ka isiri kweyesie ike n okwu ndia? *(horo otu n'ime akpati ndia.)*
For someone with this problem ..	*Maka onye nwere nsogbu*	*Maka onye nwere nsogbu a*
Physical activity should be avoided as it might harm the arm	Izere ime ihe siri ike n'ihu, na onwere ike idi na emeru ubuaka ahu	Izere ime ihe siri ike n'ihu, na onwere ike idi na emeru ubuaka ahu
These problems usually get better within three months	Nsogbu ndia na-adikari mma n'ime onwa ato	Nsogbu ndia na-adikari mma n'ime onwa ato
Rest is needed to get better	I nwe ezumuike na-adi mkpa maka ahu idi mma	I nwe ezumuike na-adi mkpa maka ahu idi mma
Neglecting problems of this kind can cause permanent health problems	Ileghara udi nsogbua anya ga-ebuta nsogbu n'ahu ike, na adighi enwe nkwusi	Ileghara udi nsogbua anya ga-ebuta nsogbu n'ahu ike, na adighi enwe nkwusi
These problems are commonly caused by people's work	Ihe na-ebute kari nsogbua bu oru ndi mmadu na-aru	Ihe na-ebute kari nsogbua bu oru ndi mmadu na-aru
47. Based on your own views and what the doctor or others may have told you <u>about low-back pain,</u> how strongly do you agree with the following statements? *(Tick one box on each line.)*	Site n'echiche gi nakwa nihe dokinta maobu onye ozo gwara gi gbasara ihe mgbu na mgbada azu, kedu ka isi kwenyesie ike n 'okwu ndia? *(ghoro otu n'ime akpati ndia.)*	Site n'echiche gi nakwa nihe dokinta maobu onye ozo gwara gi gbasara ihe mgbu na mgbada azu, kedu ka isi kwenyesie ike n 'okwu ndia? *(ghoro otu n'ime akpati ndia.)*
For someone with this problem	*Maka onye nwere nsogbu a*	*Maka onye nwere nsogbu ndia*
Physical activity should be avoided as it might harm the	Izere ime ihe siri ike n'ihi onwere ike ike idi na emeru	Izere ime ihe siri ike n'ihi onwere ike ike idi na emeru

back	azu ahu	azu ahu
These problems usually get better within three months	Nsogbu ndia na-adikari mma n'ime onwa ato	Nsogbu ndia na-adikari mma n'ime onwa ato
Rest is needed to get better	I nwe ezumuike di mkpa maka ahu idi mma	Inwe ezumuike di mkpa maka ahu idi mma
Neglecting problems of this kind can cause permanent health problems	Ileghera udi nsigbua anya ga-ebute nsogbu n'ahu ike na adighi enwe nkwusi	Ileghera udi nsigbua anya ga-ebute nsogbu n'ahu ike na adighi enwe nkwusi
These problems are commonly caused by people's work	Ihe na-ebutekari nsogbu bu oru ndi mmadu na-aru	Ihe na-ebutekari nsogbu bu oru ndi mmadu na-aru
48. Have you ever heard or read about repetitive strain injury (RSI), work related upper limb disorder (WRULD) or cumulative trauma syndrome (CTS)? **[Appropriate terms may vary by country.]**		
49. Below is a list of problems people sometimes have. Please read each one carefully and circle the number that best describes HOW MUCH THAT PROBLEM HAS DISTRESSED OR BOTHERED YOU DURING THE **PAST 7 DAYS INCLUDING TODAY** *Circle only **one number** for each problem and do not skip any items*	N' okpuru ebe a bu nsogbu ndi mmadu na-enwe mgbe ufodi. Biko guo nke obula nke oma, ma kachibido nomba nke kowara ka nsogbu gi na n'ime mkpuru ubochi asaa gara aga nke gunyere taa. Kachibido naani otu nomba maka otu nsogbu ma amafekwala nke o bula	N' okpuru ebe a bu nsogbu ndi mmadu na-enwe mgbe ufodi. Biko guo nke obula nke oma, ma kachibido nomba nke kowara ka nsogbu gi na n'ime mkpuru ubochi asaa gara aga nke gunyere taa. Kachibido naani otu nomba maka otu nsogbu ma amafekwala nke o bula
49a. Faintness or dizziness	ikubi ume na anya ntughari	Nkubi ume na anya ntughari
49b. Pains in the heart or chest	ihe mgbu nke mkpuru obi	Ihe mgbu mkpuru obi

49c. Nausea or upset stomach	Igbo agbo ma obu afo inye nsogbu	Agbo ma obu afo inye nsogbu
49d. Trouble getting your breath	nsogbu n'ikute ume gi	Nsogbu iku ume
49e. Numbness or tingling in parts of your body	enweghi mmetuta maobu ihe idipu akuku ahu gi	enweghi mmetuta maobu ihe adighi ike n'akuku ahu gi
49f. Feeling weak in parts of your body	adighi ike n'akuku ahu gi	adighi ike n'akuku ahu gi
49g. Hot or cold spells	ikpo oku maobu iju oyi	ikpo oku maobu iju oyi
50. These questions are about how you feel and how things have been with you **during the past month.** For each question, please give the one answer that best describes how things have been for you during the past month. How much of the time during the **past month**: *Circle **one number** on each line*	Ajuju ndia bu maka isi enwe mmetuta nakwa ka ihe siri diri gi n'ime onwa gara aga, maka ajuju obula, biko nye aziza nke kowara nke oma ka ihe sisr diri gi n'ime onwa gara aga. Kedu ugboro ole o di nime onwa gara aga. *Kachibido nomba nke a bula okirikiri*	Ajuju ndia bu maka isi enwe mmetuta nakwa ka ihe siri diri gi n'ime onwa gara aga, maka ajuju obula, biko nye aziza nke kowara nke oma ka ihe sisr diri gi n'ime onwa gara aga. Kedu ugboro ole o di nime onwa gara aga. *Kachibido nomba nke a bula okirikiri*
50a. Were you a happy person?	ibu onye na-enwe anuri?	ibu onye na-enwe anuri
50b. Have you felt calm and peaceful?	i nwenugo mmetuta di nwayoo na udo?	Onwego mmetuta di nwayoo na udo?
50c. Have you been a very nervous person	i bu onye na-atubu ujo	i bu onye na-atubu ujo
50d. Have you felt downhearted and low?	i nwenugo mmetuta di nwute?	Onwego mmetuta di nwute?
50e. Have you felt so down	i nwenugo mwute nke na o	Onwego mwute nke na o

that nothing could cheer you up?	nweghi ihe ga-emedanwu gi obi?	nweghi ihe ga-emedanwu gi obi
51. Over the past 12 months, on how many days in total have you been prevented from going to work because of	N'ihe kariri onwa iri na abuo gara aga, gbakota ubochi ole ka ihe ndi a gbochiri gi i ga-oru maka:	Na ihe kariri onwa iri na abuo gara aga, gbakota ubochi ole ka ihe ndi a gbochiri gi i ga-oru maka
51a. A problem with your back, neck, shoulder, elbow, wrist, hand or knees	nsogbu n'azu gi, olu, ubuaka, ikiaka, nkwojiaka, aka, na ikpere	nsogbu n'azu gi, olu, ubuaka, ikiaka, nkwojiaka, aka, na ikpere
51b. other illness	Oria ndi ozo	Oria ndi ozo
Please fill in the date that you complete this form	*Biko denye ubochi tata bu na aro*	*Biko denye ubochi tata bu na aro*
52. Please fill in your date of birth	*Biko denye ubochi amuru gi*	*Biko denye ubochi amuru gi*
53. *and* your sex	denye okike gi	denye okike gi
54a. Do you still have the same main job as when we last questioned you about a year ago? If ***YES,*** please go to question 54. If ***NO,*** please continue	I ka na-enwe otu isi oru dika mgbe anyi na-ikpeazu ajuju gi banyere otu afo gara aga? O buru na ee, biko gaa na ajuju nke ano ma odighi biko anogidela	I ka na-enwe otu isi oru dika mgbe anyi na-ikpeazu ajuju gi banyere otu afo gara aga? O buru na ee, biko gaa na ajuju nke ano ma odighi biko anogidela
54b. Did you leave that job because of medical problems with your back, neck, shoulder, elbow, wrist, hand or knee?	O bu na unu na-ahapu oru ahu n'ihi na nke nsogbu ahu ike na gi azu, n'olu, ubu, n'ikpere aka, nkwonaka, aka ma obu ikpere?	O bu na unu na-ahapu oru ahu n'ihi na nke nsogbu ahu ike na gi azu, n'olu,ubu, n'ikpere aka, nkwonaka, aka ma obu ikpere
54c. And do you have another job now?	Na unu enwere oru ozo ugbu a?	Na unu enwere oru ozo ugbu a
55a. Have you had low back	Ndi i na-ala ozu mgbu na ebe e gosiri n'okpuru nke were ihe	Ndi i na-ala ozu mgbu na ebe e gosiri n'okpuru nke were

pain in the area shown below which lasted for more than a day at any time during the past month? *(Do not include pain associated only with menstrual periods, pregnancy or during a course of a feverish illness.)* If ***NO*****,** please go to question 58. If ***YES***, please continue	kariri otu ubochi n'oge o bula n' onwa gara aga? *(Anaghi agunye mgbu metutara naani na ihu nso oge, afo ime ma obu n'oge a n'ezie nke oria ahu oku).* O buru na o dighi, biko gaa na-aju asato o buru na ee, biko anogide na	ihe kariri otu ubochi n'oge o bula n' onwa gara aga? *(Anaghi agunye mgbu metutara naani na ihu nso oge, afo ime ma obu n'oge a n'ezie nke oria ahu oku).* O buru na o dighi, biko gaa na-aju asato o buru na ee, biko anogide na
55b. If you add together all the days on which you have had low back pain, during the past month, how long a period would that make?	O buru na i tinye onu ubochi niile nke unu na-eme ala azu mgbu, n'oge gara aga onwa, ruo ole a oge nke ahu ga-emeka?	O buru na i tinye onu ubochi niile nke unu na-eme ala azu mgbu, n'oge gara aga onwa, ruo ole a oge nke ahu ga-emeka?
56. During the past month, has low back pain at any time made it difficult or impossible to do any of the following activities?	N' onwa gara aga, nwere ala azu mgbu mgbe obula nke ndi na-esonu na-eme?	N' onwa gara aga, nwere ala azu mgbu mgbe obula nke ndi na-esonu na-eme
56a. Cutting your toe nails	Icha gi ukwu mbo	Icha gi ukwu mbo
56b. Getting dressed	Ijikere	Njike eyim akwa
56c. Doing the jobs that you normally do around the house	Iru oru i na-ejikari eme na gburugburu ulo	Iru oru i na-ejikari eme na gburugburu ulo
57. During the past month on how many days has low back pain prevented you from going to work?	N' onwa gara aga na otu otutu ubochi nke ala azu mgbu gbochiri gi si na-aga na aru oru?	N' onwa gara aga na otu otutu ubochi nke ala azu mgbu gbochiri gi si na-aga na aru oru
58. Within the past month, has the pain ever spread down your leg(s) to below the knee	N'ime onwa gara aga, ka ihe mgbu mgbe agbasa ala gi ukwu n'okpuru ikpere?	N'ime onwa gara aga, ka ihe mgbu mgbe agbasa ala gi ukwu n'okpuru ikpere?

(sciatica)?		
59a. Have you had pain in the neck in the area shown below which lasted for more than a day at any time during the past month? If ***NO*****,** please go to question 62. If ***YES***, please continue.	I nwere ihe mgbu na onu na ebea esere ihe oji di n'okpuru nke kariri otu ubochi na oge obula na onwa gara ga? O buru n'o dighi**,** biko gaa n'ajuju nke iri na otu. Ma o buru ee, biko bidokwa	I nwere ihe mgbu na onu na ebea esere ihe oji di n'okpuru nke kariri otu ubochi na oge obula na onwa gara ga? O buru n'o dighi**,** biko gaa n'ajuju nke iri na otu. Ma o buru ee, biko bidokwa
59b. If you add together all the days on which you have had neck pain, during the past month, how long a period would that make?	O buru na i mgbako ubochi niile inwere onu mgbu, na onwa gara aga, oga dika ogologo oge ole mkpakotara onu?	O buru na i mgbako ubochi niile inwere onu mgbu, na onwa gara aga, oga dika ogologo oge ole mkpakotara onu?
60. During the past month, has neck pain at any time made it difficult or impossible to do any of the following activities?	Na onwa gara aga onu mgbu i nwere oge obula omere ka osiere gi ike ime ihe ndi di iche iche?	Na onwa gara aga onu mgbu i nwere oge obula omere ka osiere gi ike ime ihe ndi di iche
60a. Getting dressed	Ihi akwa	Ihi akwa
60b. Doing the jobs that you normally do around the house.	Iru oru ndi i na-aru na ulo gi	Iru oru ndi i na-aru na ulo gi
61. During the past month on how many days has neck pain prevented you from going to work?	Na onwa gara aga mkpuru ubochi ole ka onu mgbu nahara gi ije oru?	Na onwa gara aga mkpuru ubochi ole ka onu mgbu nahara gi ije oru?
62a. Have you had pain in the shoulder in the area shown below which lasted for more than a day at any time during the past month? If ***NO***, please go to question 65. If ***YES***	I nwela ihe mgbu na ubu aka na ebe a esere ihe oji nke di na okpuru nke kariri otu ubochi na oge obula na onwa gara aga? O buru n'o dighi, biko gana ajuju nke iri na ano,	Onwela ihe mgbu na ubu aka na ebe a esere ihe oji nke di na okpuru nke kariri otu ubochi na oge obula na onwa gara aga? O buru n'o dighi, biko gana ajuju nke iri na ano,

please continue	ma o buru ee anogide na	ma o buru ee anogide na
62b. If you add together all the days on which you have had shoulder pain, during the past month, how long a period would that make?	O buru na igbako ubochi niile i nwere ihe mgbu na ubu aka na onwa gara aga, oga di ihe dika ogologo oge ole?	O buru na igbako ubochi niile i nwere ihe mgbu na ubu aka na onwa gara aga, oga di ihe dika ogologo oge ole?
63. During the past month, has shoulder pain at any time made it difficult or impossible to do any of the following activities?	Na onwa gara aga, ihe mgbu nke ubu aka, omere gi ka esie ike iru oru ndi di iche iche?	Na onwa gara aga, ihe mgbu nke ubu aka, omere gi ka esie ike iru oru ndi di iche iche
63a. Combing or brushing your hair	Ira ntuntu isi gi	Ira ntuntu isi gi
63b. Bathing/showering	Isa ahu gi	Isa ahu gi
63c. Getting dressed	Iyi akwa	Iyi akwa
63d. Doing the jobs that you normally do around the house	Iru oru di iche iche na ulo gi	Iru oru di iche iche na ulo gi
64. During the past month on how many days has shoulder pain prevented you from going to work?	Na onwa gara aga, ubochi ole ka ihe mgbu ubu aka naghara gi ije oru?	Na onwa gara aga, ubochi ole ka ihe mgbu ubu aka naghara gi ije oru?
65a Have you had pain in the elbow in the area shown below which lasted for more than a day at any time during the past month? If ***NO,*** please go to question 68. If ***YES*** please continue.	I nwela ihe mgbu na iku aka dika o di na eserese a, nke kariri otu ubochi n'ime onwa gara aga? O buru n'o dighi, biko ga na ajuju nke iri na asa, o buru ee, biko ano gi dena	I nwela ihe mgbu na iku aka dika o di na eserese a, nke kariri otu ubochi n'ime onwa gara aga? O buru n'o dighi, biko ga na ajuju nke iri na asa, o buru ee, biko ano gi dena
65b. If you add together all the days on which you have had elbow pain, during the past	Ikpakota ubochi niile i nwere ihe mgbu iku aka, na onwa nke gara aga,o ga dika oge	Ikpakota ubochi niile i nwere ihe mgbu iku aka, na onwa nke gara aga,o ga dika oge

month, how long a period would that make?	ole?	ole?
66. During the past month, has elbow pain at any time made it difficult or impossible to do any of the following activities?	Na onwa gara aga, ihe mgbu iku aka nke omela ga osiere gi ike ime ihe ndi di iche iche?	Na onwa gara aga, ihe mgbu iku aka nke omela ga osiere gi ike ime ihe ndi di iche iche?
66a. Opening bottles, jars or taps.	Imepe mmanya, ma obu udu, ma obu pumpu mmiri	Imepe mmanya, ma obu udu, ma obu pumpu mmiri
66b. Getting dressed	Iyi akwa	Iyi akwa
66c. Doing the jobs that you normally do around the house	Iru oru ndi i na-aru n'ulo	Iru oru ndi i na-aru n'ulo
67. During the past month on how many days has elbow pain prevented you from going to work?	Na onwa gara aga, ihe dika ubochi ole ka ihe mgbu iku aka mere ka osiere m ike ije oru?	Na onwa gara aga, ihe dika ubochi ole ka ihe mgbu iku aka mere ka osiere m ike ije oru?
68a. Have you had pain in the wrist or hand in the area shown below which lasted for more than a day at any time during the past month? If ***NO,*** please go to question 71. If ***YES*** please continue	I nwela ihe mgbu na mkpisi aka na ebe a esere ihe oji ihe kariri otu ubochi na oge obula na onwa gara aga? O buru n'o dighi, biko ga na ajuju nke iri abuo ma oburu ee anogide la	I nwela ihe mgbu na mkpisi aka na ebe a esere ihe oji ihe kariri otu ubochi na oge obula na onwa gara aga? O buru n'o dighi, biko ga na ajuju nke iri abuo ma oburu ee anogide la
68b. If you add together all the days on which you have had wrist/hand pain, during the past month, how long a period would that make?	O buru na agukota ubochi niile i nwere ihe mgbu na mkpisi aka, na onwa gara aga, ihe dika oge ole ka oga adi?	O buru na agukota ubochi niile i nwere ihe mgbu na mkpisi aka, na onwa gara aga, ihe dika oge ole ka oga adi?
69. During the past month, has wrist/hand pain at any time made it difficult or impossible to do any of the following	Na onwa gara aga, ihe mgbu mkpisi aka i nwere omela ka osiere gi ike ime ihe ndi di iche iche?	Na onwa gara aga, ihe mgbu mkpisi aka i nwere omela ka osiere gi ike ime ihe ndi di iche iche?

activities?		
69a. Writing	Ide ihe odide	Ide ihe odide
69b. Locking and unlocking doors	Imepe na imechi onu uzo ulo	Nmepe na nmechi onu uzo
69c. Opening bottles, jars or taps	Imeye okwuchi mmanya ma obu pumpu mmiri	Imeye okwuchi mmanya ma obu pumpu mmiri
69d. Getting dressed	Iyi akwa	Iyi akwa
69e. Doing the jobs that you normally do around the house	Iru oru ndi di na ulo	Iru oru ndi di na ulo
70. During the past month on how many days has wrist/hand pain prevented you from going to work?	Na onwa gara aga ihe dika ubochi ole ka ihe mgbu mkpisi aka naghara gi ije oru?	Na onwa gara aga ihe dika ubochi ole ka ihe mgbu mkpisi aka naghara gi ije oru?
71. Have you had pain in the knee in the area shown below which lasted for more than a day at any time during the past month?	I nwela mgbu ikpere na eserese oji nke a na-egosi na-ana akwukwo ihe kariri otu ubochi n'oge obula na onwa gara aga?	I nwela mgbu ikpere na eserese oji nke a na-egosi na-ana akwukwo ihe kariri otu ubochi n'oge obula na onwa gara aga?
71a. Have you had pain in the knee in the area shown below which lasted for more than a day at any time during the past month? If ***NO,*** please go to question 74. If ***YES*** please continue	I nwela mgbu ikpere na eserese oji nke a na-egosi na-ana akwukwo ihe kariri otu ubochi n'oge obula na onwa gara aga? O buru n'o dighi, biko ga na ajuju nke iri abuo na ato, ma oburu ee, biko anogide la.	I nwela mgbu ikpere na eserese oji nke a na-egosi na-ana akwukwo ihe kariri otu ubochi n'oge obula na onwa gara aga? O buru n'o dighi, biko ga na ajuju nke iri abuo na ato, ma oburu ee, biko anogide la.
71b. If you add together all the days on which you have had knee pain, during the past month, how long a period would that make?	Igbakota ubochi nke i nwere mgbu ikpere na onwa gara aga, ihe dika oge ole ka o ga adi?	Igbakota ubochi nke i nwere mgbu ikpere na onwa gara aga, ihe dika oge ole ka o ga adi?

72. During the past month, has knee pain at any time made it difficult or impossible to do any of the following activities?	Na onwa gara aga mgbu ikpere i nwere n'oge obula, omere ka osiere gi ike ime ihe ndi di iche iche?	Na onwa gara aga mgbu ikpere i nwere n'oge obula, omere ka osiere gi ike ime ihe ndi di iche iche?
72a. Walking up and down stairs	Irugo ma obu rutuo n'elu di na ulo gi	Irugo ma obu rutuo n'elu di na ulo gi
72b. Walking on level ground	I ga ije n'elu ala	I ga ije n'elu ala
72c. Getting dressed	Iyi akwa	Iyi akwa
72d. Doing the jobs that you normally do around the house	Iru oru ndi di n'ulo i na-aru	Iru oru ndi di n'ulo i na-aru
73. During the past month on how many days has knee pain prevented you from going to work?	Na onwa gara aga, ihe dika ubochi ole ka mgbu ikpere mere ka i ghara ije oru?	Na onwa gara aga, ihe dika ubochi ole ka mgbu ikpere mere ka i ghara ije oru?
74. Below is a list of problems people sometimes have. Please read each one carefully and circle the number that best describes HOW MUCH THAT PROBLEM HAS DISTRESSED OR BOTHERED YOU DURING THE **PAST 7 DAYS INCLUDING TODAY** *Circle only **one number** for each problem and do not skip any items*	Na okpuru, nsogbu oria ndi mmadu na-aria di iche iche ka edeturu maka pia ya onu biko le ruo anya ka iza etu oria ndi a siri metuta gi na ime ubochi asaa nke gara aga ma ubochi tata Biko kapia okirikiri na oria nke obula i na-aria n'ime ndi a edere ede	Na okpuru, nsogbu oria ndi mmadu na-aria di iche iche ka edeturu maka pia ya onu biko le ruo anya ka iza etu oria ndi a siri metuta gi na ime ubochi asaa nke gara aga ma ubochi tata Biko kapia okirikiri na oria nke obula i na-aria n'ime ndi a edere ede
a. Faintness or dizziness	Ikubi ume na anya ntughari	Ikubi ume na anya ntughari
b. Pains in the heart or chest	Ihe mgbu nke mkpuru obi	Ihe mgbu nke mkpuru obi
c. Nausea or upset stomach	Agu igbo agboo ma obu afo inye nsogbu	Agu igbo agboo ma obu afo inye nsogbu
d. Trouble getting your breath	Nsogbu n'ikute ume nke oma	Nsogbu n'ikute ume nke oma

e. Numbness or tingling in parts of your body	Nsogbu ighota na emeturu m aka na ihe odudu dika pinu nke na-adu n' akuku aru m	Nsogbu ighota na emeturu m aka na ihe odudu dika pinu nke na-adu n' akuku aru m
f. Feeling weak in parts of your body	Adighi ike n'akuku ahu gi	Adighi ike n'akuku ahu gi
g. Hot or cold spells	Ikpo oku ahu ma obu iju oyi n'ahu	Ikpo oku ahu ma obu iju oyi n'ahu
75. These questions are about how you feel and how things have been with you **during the past month.** For each question, please give the one answer that best describes how things have been for you during the past month. How much of the time during the **past month**: *Circle **one number** on each line*		
a. Were you a happy person?	Ibu onye na-enwe anuli?	Ibu onye na-enwe anuli?
b. Have you felt calm and peaceful?	I na-enwe obi nwayoo n'udo ahu?	I na-enwe obi nwayoo n'udo ahu?
c. Have you been a very nervous person?	I bu onye na-atu ujo	I bu onye na-atu ujo
d. Have you felt downhearted and low?	I bu onye ahu na dara juu oge obula?	I bu onye ahu na dara juu oge obula?
e. Have you felt so down that nothing could cheer you up?	I bu onye na-enwe obi mgbawa?	I bu onye na-enwe obi mgbawa?
76. Over the past 12 months, on how many days in total have you been prevented from	Na onwa iri na abuo gara aga, ubochi ole ka oria kwusiri gi oru	Na onwa iri na abuo gara aga, ubochi ole ka oria kwusiri gi oru

going to work because of:		
a. a problem with your back, neck, shoulder, elbow, wrist, hand or knees	Obu nsogbu mgbu azu, onu,ubuaka,ikuaka, mkpisi aka ma obu ikpere	Obu nsogbu mgbu azu, onu,ubuaka,ikuaka, mkpisi aka ma obu ikpere
b. other illness	Oria ndi ozo	Oria ndi ozo

TABLE 3: Synthesized version of the CUPID (T1 and T2)

Original Version Item:	Forward Translated Version T -3
1. Please fill in your date of birth	Gbambo ka ị denye ubochi omụmụ gị
2. and your sex.	Na okike nke gi
3. Are you right or left-handed?	I bụ onye na eme aka nri ka obụ aka ekpe
4. How would you best describe your ethnic origin.	Kedu agbụrụị sonyere na ya
5. How old were you when you finished full time education?	Mgbe ị gụchara akwukwo kedu afo ole ịdị
6. How tall are you?	Mgbako ogologo gị bu gini
7a.Have you ever smoked regularly (ie at least once per day for a month or longer)?	Ọnwetula mgbe i sere sigi ihe dika otu na ubochi ma obu karia.
7b. If ***YES***, do you still smoke regularly?	Ọburu eeh, Ọ ka na ese siga ma ugbụa
8. What is your main occupation.	Kedu aha oru ị na aru ugbụa
9. How long have you done this job?	I ruo la oru Ogologo oge ole
10. How many hours per week do you normally work	Ihe dika awa ole ka i na aru na izu uka.

in this job?	
11. Does **average working day** in the job involve any of the following?	Ihe dika nkeji ubochi oge ole ka i na aru oru na ubochi
a. Use of a keyboard or typewriter for more than four hours in total?	I ji ojiji aka ihe kariri awa ano nke computa ma obu igwe edemede oso na oru gi
b. Other tasks involving repeated movements of the wrist or fingers for more than four hours in total?	Oru ndi ozo i na aru ogbasara oke imeghari nkpisi aka ihe kariri awa anọ na nchikota.
c. Repeated bending and straightening of your elbow for longer than one hour in total?	Oru gi ometutara ngbati na ngbako iku aka ihe kariri awa otu na nchikota
d. Working for longer than one hour in total with your hands above shoulder height	Oru gi ometutara iru oru ga eme ka i na eweli aka gafe ubu aka, ihe kariri otu awa.
e. Lifting weights of 25 Kg (56 lbs) or more by hand?	Ibu ni ibu kariri ogu gram iri abuo na ise site na iji aka gi.
f. Climbing up or down more than 30 flights of stairs a day?	Oru gi ona eme ka ina ari elu nke step iri ato na ubọchi.
g. Kneeling or squatting for longer than one hour in total?	I sekpu ala ma obu i tukwu ala ihe kariri otu awa na nchikota.
h. Piecework in which you are paid according to the number of articles or task you or your team make or finish in the day?	Nkeji oru ole i na aru ma obu ndi otu gi na aru ka unu na aru si na ubochi.
i. A target number of articles	O nwere, okwụọrụ ole gị na-atu anya na gị na ndị otụ gị ga-aru

or tasks that you or your team are expected to make or finish in the day?	n'ụbọchi
j. Payment of a bonus if you make or finish more than an agreed number of articles/tasks in the day?	Ụgwọ nke bu bonusu ma ọ bụrụ na i na-eme ma ọbu n'ịsị n'ụbọchi
k. Working under pressure to complete tasks by a fixed time?	Irụọrụ nrụgide mezue ihe a ga-eme site a otu oge
12. In your job, do you have a choice in deciding	N'ọrụ gị, ị nwere ohere, ighoro ihe ị ga-eme
13. When you have difficulties in your work, how often do you get help and support from your colleagues or supervisor/manager?	Ugboro ole n'ole ka ị na-enweta enyeme aka na nkwado sitere n'aka ndi otu ọrụ gị ma obu onye nlekota gi mgbe i na-eme nsogbu
14. How satisfied have you been with your job as a whole, taking everything into consideration?	N'itinye ihe niile n'echịche ojuju afo ole k'inwegoro n'oru niile i na-aru
15. How secure do you feel your job would be if you had a significant illness that kept you off work for three months?	Kedu nchekwa iche n'inwere n' ọrụ gị ma ọ bụrụ na-iriaba oria ma ọ bụrụ onye n'ejeghi ọrụ ihe ruru ọnwa ato?
16. Do you have any other job(s)? If yes, what are the other jobs?	I nwere ọrụọzọị na-arụ? Ọ bụrụ na i nwere, kedu ụdi ọrụ bu ihe ahu?
17a. Have you had low back	Ntuzi aka ihe eserese a di na ebe na kowa, ma onwela mgbu azụ

pain in the area shown below which lasted for more than a day at any time during the past 12 months? *(Do not include pain associated only with menstrual periods, pregnancy or during a course of a feverish illness.)*	ma ọbụụkwụnọro ihe kariri otụụbọchi ka mgbe ọnwa iri na abụọ nke gara aga (etintekwala mgbụ metụtara nso ma ọbụ ime nwanyi ma ọbụkwanụ iba. Ọ bụrụ n'onweghi, biko gafee n'ajụjụ nke iri abụọ, mana ọ bụrụ n'onwe ga na irụ
17b. Within the past 12 months, has the pain ever spread down your leg(s) to below the knee (sciatica)?	Onwere ka mgbu si were si n'ebe obidoro banye n' ukwu gị ma ọbụ gafee n'ikpere gị kamgbe ya bu onwa iri abụọ na abụọ
17c. If you add together all the days on which you have had low back pain, during the past 12 months, how long a period would that make?	O bụrụ na ịgbakọ oge mmalite ka mgbe ọnwa iri abụọ na abụọ, kedu oge ị nwere ike ikwụ na mgbụ anọro
17d. Have you consulted a doctor or a medical person or alternative practitioner because of low back pain during the past 12 months?	I jela hu dibia bekee ma ọ bụ onye ọrụ ahu ike maka yabụọria mgbu kamgbe ọnwa iri na abụọ
17e. During the past 12 months on how many days did low back pain prevent you from going to work?	Ka mgbe ole na ole ka ukwu mgbụ a gbochiri gị ije ọrụ kamgbe ọnwa iri na abụọ?
18. Do you expect that your back pain will be a problem in 12 months' time?	I chere n' ụkwụ mgbụ nkea nwere ike I nye gị nsogbụ n' ọnwa iri na abụọ 'na iru

We are particularly interested in any back pain you may have had during the past month	O kachasi anyi mkpa ka anyi mara na i nwela mgbụ azụ na ọnwa nke gara aga
19a. Have you had low back pain in the area shown below which lasted for more than a day at any time during the past month? *(Do not include pain associated only with menstrual periods, pregnancy or during a course of a feverish illness*	I nwela ihe mgbụ nke ndịda azụ n'ebe a esere ihe ojị na ihe ngosi, nke kariri otụụbọchi n'oge gara aga n' ọnwa gara aga? *(Biko,ihe mgbụ nke nso nwaanyi ma ọbụ, nke imu nwa ,ah*ụọkụ *eso gi ya*
19b. Within the past month, has the pain ever spread down your leg(s) to below the knee (sciatica)?	Site na ọnwa gara aga, onwela oge ihe mgbụ gafere na akuku ahu gị dika okpa gị ma ọbu ikpere gị
19c. If you add together all the days on which you have had low back pain, during the past month, how long a period would that make?	Ichikota ụbọchi niile ị nwere ihe mgbụ nke ndida ụkwụ, na oge gara aga, dika ogologo oge ole ka ọ nwere ike idi.
20. During the past month, has low back pain at any time made it difficult or impossible to do any of the following activities?	N'ime ọnwa ndi gara aga onwego ka ọria azu mgbu si mee ka i ghara irụụfodu orụ ndi a edeputara na mgbada
a. Cutting your toe nails	I kpacha mbo ụkwụ
b. Getting dressed	I yi akwa
c. Doing the jobs that you	Irụ ọrụ ndi ị na aru na ụlọ

normally do around the house	
21. Please think back to the last time that you were free from low back pain for a month or longer. When your most recent episode of low back pain then started, how did it begin?	Biko che echiche azụ oge n'ibidobeghi nwebe ọria azụ mgbụ n'ihe ruru ọtụọnwa maọbu karia. Oge ọria azụ mgbụ malitere kedu ka osiri bido.
22a. Have you had pain in the neck in the area shown below which lasted for more than a day at any time during the past 12 months?	Ihe esere ese a dina mgbada negosipụta i nwenụgo ihe mgbụ gị nke nokariri otụụbọchi n'ime ọnwa iri na abụọ gara aga.
22b. If you add together all the days on which you have had neck pain, in the past 12 months, how long a period would that make?	Yaburụ na igbako oge yabụ olụ mgbụ malitere kamgbe ọnwa iri na abụọ, kedụ oge i nwere ike ikwụ na yabu mgbụ anogo
22c. Have you consulted a doctor or a medical person or alternative practitioner because of neck pain during the past 12 months?	Ijerụgo hu dọkinta ma ọbụ onye ọrụ ahụ ike maka yabu ọria ọlu mgbụ kamgbe ọnwa iri na abụọ
22d. During the past 12 months on how many days did neck pain prevent you from going to work?	Ụgboro ole na ole ka ya bụọlụ mgbgụ gbochigoro gị ije ọrụ kamgbe ọnwa iri na abụọ.
23. Do you expect that your neck pain will be a problem in 12 months time?	I chere n'ọlụ mgbụ gị nwere ike ibụtere gị nnụkwụ nsogbụ n'ọnwa iri na abụọ n'abia abia.

We are particularly interested in any neck pain you may have had during the past month	Ọkachasi anyi mkpa na mgbụọnụọbụla i nwere n'oge ọbụla n' ọnwa nke gara aga

24a. Have you had pain in the neck in the area shown below which lasted for more than a day at any time during the past month?	I nwere ihe mgbụ nke ọnụ na ebe esere ihe oji na ihe ngosi di n'ala, nke kariri otụụbọchi, oge ọbụla n' ọnwa gara aga
24b. If you add together all the days on which you have had neck pain, during the past month, how long a period would that make?	Ikpakota ụbochi niile i nwere onu mgbụ, n'onwa gara aga, oge oleka ọ ga adi
25. During the past month, has neck pain at any time made it difficult or impossible to do any of the following activities?	Na ọnwa gara aga, onu mgbụ i nwere oge ọbula ọ mere ka osiere gi ike ime ihe ndi a dịịche ịche
a. Getting dressed	Iyi akwa
b. Doing the jobs that you normally do around the house	Irụọrọ ndi ị na-arụ n' ụlọ gị
26a. Have you had pain in the shoulder in the area shown below which lasted for more than a day at any time during the past 12 months?	Inwenụgo ihe mgbụ n' ụbụaka dika ọdi n'eseresea nke nọrụgoro karia otụụbọchi n' ọnwa iri na abụọ gara aga

26b. If you add together all the days on which you have had shoulder pain, in the past 12	Ọ bụrụ na i gbakosia ụbọchi ole i nwegoro ahu ike ma ọbụ onye ọbụla gbasara ihe mgbụ n' ụbụaka n' ọnwa iri na abụọ gara aga?

months, how long a period would that make?	
26c. Have you consulted a doctor or a medical person or alternative practitioner because of shoulder pain during the past 12 months?	I gakwụrụgo dọkinta ma ọbụ onye na ahu maka ahụ ike ma ọbụ onye obụla gbasara ihe mgbụ n'ụbụaka ọnwa iri n'abụa gara aga?
26d. During the past 12 months on how many days did shoulder pain prevent you from going to work?	N'agbata ọnwa iri na abụọ gagoro aga, ụbọchi ole ka ihe mgbụ n'ụbụaka gbochiri gị ga ọrụ?
27. Do you expect that your shoulder pain will be a problem in 12 months time	I na-atụanya na ihe mgbụụbụaka gị a ga-abu ihe nsogbu nye gi n'onwa iri n'abụọ na abia abia?
We are particularly interested in any shoulder pain you may have had during the past month	**Ihe anyi choro ima bụ ihe mgbụọbụla i nwere n'ụbụaka gi nime ọnwa gara aga**
28a. Have you had pain in the shoulder in the area shown below which lasted for more than a day at any time during the past month?	I nwenụgo ihe mgbụ n'ubụaka dika o di n'eseresea, nke nogoro karia otụ ụbọchi n'ime ọnwa gara aga?
28b. If you add together all the days on which you have had shoulder pain, during the past month, how long a period would that make?	Ọ bụrụ na igbakọsia ụbọchi ole i nwegoro ihe mgbụ n'ụbụaka n'onwa gara aga, kedu ole ka nke ahu ga-aputa?
29. During the past month, has shoulder pain at any time made it difficult or impossible to do any of the following activities?	N' agbata onwa gara aga, Enwere ihe mgbụ n'ụbụaka nyere gi nsogbụ ma ọbụ kwụsiri gị ime ihe otụ n'ime ihe ndi a
a. Combing or brushing your hair	Ivo ntụtụ gi

b. Bathing/Showering	Isa ahụ
c Getting dressed	Ikwado/ iyi akwa
d. Doing the jobs that you normally do around the house	I di na-arụọrụ i na-aru na mgburugburu ụlọ gị
30a. Have you had pain in the elbow in the area shown below which lasted for more than a day at any time during the past 12 months?	I nwenụgo ihe mgbụ na ikiaka dika ọ di n'esere a, nke nọrụgoro karia otụụbọchi n'ime ọnwa iri na abụọ gara aga?
30b. If you add together all the days on which you have had elbow pain, in the past 12 months, how long a period would that make?	Ọ bụrụ na igbakọsia ụbọchi ole i nwere ihe mgbụ na ikuaka n'ime ọnwa iri na abuo gara, kedu oge ole nke ahu pụtara?
30c. Have you consulted a doctor or a medical person or alternative practitioner because of elbow pain during the past 12 months?	I gakwugoro dokinta ma obu onye na-ahu maka ahu ike ma obu onye obula gbasara ihe mgbu n'ikuaka n'ime onwa iri na abuo gara aga?

30d. During the past 12 months on how many days did elbow pain prevent you from going to work?	N'ime onwa iri na abuo gara aga, ubochi ole ka ihe mgbu ikuaka gbochiri gi i ga-oru

31. Do you expect that your elbow pain will be a problem in 12 months time?	I na-atu anya na ihe mgbu n'ikiaka ga-aburu gi ihe nsogbu n'onwa iri na abuo ga abia abia?
We are particularly interested in any elbow pain you may have had during the past month	Ihe anyi choro ima bu ka i nwere ihe mgbu obula n'ikiaka n'ime onwa gara aga
32a. Have you had pain in the	o nwela ihe mgu n'iki aka dika odi n'ihe eseresea nke

elbow in the area shown below which lasted for more than a day at any time during the past month?	norugoro karia otu ugbochi n'ime onwa gara aga?
32b. If you add together all the days on which you have had elbow pain, during the past month, how long a period would that make?	Oburu na igbako ubochi i nwere ihe mgbu n'ikuaka na onwa gara aga, oge ole ka nka ahu ga-abu
33. During the past month, has elbow pain at any time made it difficult or impossible to do any of the following activities?	Na onwa gara aga ihe mgbu ikuaka onyere gi nsogbu ime ihe ndia.
33a. Opening bottles, jars or taps	i di na-emepe kalama. Ololo, maobu mgbata
33b. Getting dressed	Nkwado eyim akwa
33c. Doing the jobs that you normally do around the house	Iru oru ina aru na ezi na ulo
34a. Have you had pain in the wrist or hand in the area shown below which lasted for more than a day at any time during the past 12 months?	Onwela ihe mgbu na nkwojiaka ma obu mkpisi aka dika egosiri n'eserese a nke noro karia otu ubochi n'ime onwa iri na abuo gara aga?
34b. If you add together all the days on which you have had wrist/hand pain, in the past 12 months, how long a period would that make?	Oburu na igbako ubochi ole i nwere ihe mgbu na nkwojiaka ma obu mkpisi aka na onwa iri na abuo gara aga, oge ole ka nke nkea ga-abu?
34c. Have you consulted a doctor or a medical person or alternative practitioner because of wrist/hand pain during the past	I jela hu dibia oyibo ma obu olu ahu ike na dozi ahu mgbu na nkwojiaka maobu n'aka n'ime onwa irir na abuo gara aga

12 months?	
34d. During the past 12 months on how many days did wrist/hand pain prevent you from going to work?	Na onwa iri na abuo gara aga, ubochi ole ka ihe mgbu na nkwojiaka ma obu mkpisi aka gbochiri gi iru-oru
35. Do you expect that your wrist/hand pain will be a problem in past 12 months time.	I na-atu anya na ihe mgbu na nkwojiaka maobu n'aka gi, ga buru gi ihe nsogbu na onwa iri na abuo ga-abia abia
We are particularly interested in any wrist/hand pain you may have had during the past month	Ihe anyi choro ima bu ka i nwere ihe mgbu obula n'ikiaka n'ime onwa gara aga
36a. Have you had pain in the wrist or hand in the area shown below which lasted for more than a day at any time during the past month?	Onwela ihe mgbu na nkwojiaka ma obu mkpisi aka egosiri na eserese a, nke norugoro karia otu ubochi n'ime onwa gara aga
36b. If you add together all the days on which you have had wrist/hand pain, during the past month, how long a period would that make?	Igbako ubochi ole i nwere ihe mgbu na nkwojiaka ma obu mkpisi aka n'ime onwa gara aga, oge ole ka oga abu.
37. During the past month, has wrist/hand pain at any time made it difficult or impossible to do any of the following activities?	Na onwa gara aga, ihe mgbu na nkwojiaka ma obu mkpisi aka, onyere gi nsogbu n'ime otu n'ime ihe ndi a
37a. Writing	Ide edemede
37b. Locking and unlocking doors	Nmepe na nkpochi onu uzo.
37c Opening bottles, jars or taps.	Ikpope kalama ololo ma bu pumpu
37d. Getting dressed	Nkwado eyim akwa
37e. Doing the jobs that you	I di na-aru oru i na-aru na gburugburu ulo

normally do around the house	
38a. Have you had pain in the knee in the area shown below which lasted for more than a day at any time during the past 12 months?	E nwego mgbe i nwere ihe mgbu n'ikpere dika ihe eserese a di na mgbada na-akowa nke kariri otu ubochi n'ime onwa iri na abuo gara aga
38b. If you add together all the days on which you have had knee pain, in the past 12 months, how long a period would that make?	O buru na igbakoo ubochi niile i nwere ihe mgbu n'ikpere n'ime onwa iri na abuo gara aga, ugboro ole ka nke ahu ga-aputa
38c. Have you consulted a doctor or a medical person or alternative practitioner because of knee pain during the past 12 months?	Onwela mgbara i gara na nke dokinta ma obu onye o bula na-ahu maka ahu ike gbasara ihe mgbu n'ikpere n'ime onwa iri na abuo gara aga
38d. During the past 12 months on how many days did knee pain prevent you from going to work?	Na onwa iri na abuo gara aga, ubochi ole ka ihe mgbu n'ikpere gbochiri gi i ga-oru
39. Do you expect that your knee pain will be a problem in 12 months time?	I na-atuanya na ihe mgbu ikpere ga enye gi nsogbu.
40a. Have you had pain in the knee in the area shown below which lasted for more than a day at any time during the past month?	Onwela mgbe i nwere ihe mgbu n'ikpere dika ihe eserese a di na mgbada na-akowa, nke kariri otu ubochi n'ime onwa gara aga?
40b. If you add together all the days on which you have had knee pain, during the past month, how long a period would that make?	Igbako ubochi nile i nwere ihe mgbu n ikpere n'onwa gara aga, ugboro ole ka nke ahu ga aputa
41. During the past month, has knee pain at any time made it	Na onwa gara aga, e nwere ka ihe mgbu n'ikpere siri gbochie maobu nye gi nsogbu na ime ihe ndia?

difficult or impossible to do any of the following activities	
41a.Walking up and down stairs	i rigo elu na I irda ala n'ulo
41b. Walking on level ground	i ga ije na ala di mma
41c. Getting dressed	Njike eyim akwa
41d. Doing the jobs that you normally do around the house	i di na-aru oru i na aru na gburugburu ulo
42. Do you know anyone who has had low back pain in the past 12 months	Onwela onye i mara nweburu ihe mgbu na-mgbada azu n'onwa iri na abuo gara aga
42a. At work	Na ulo oru
42b. Outside work	Na ilo
43. Do you know anyone who has had neck pain in the past 12 months?	Onwela onye i mara nweburu onu mgbu n'ime onwa iri na abuo gara aga?
43a. At work	
43b. Outside work	
44. Do you know anyone who has had pain in the arm, shoulder or hand in the past 12 months?	
44a. At work	Na ulo oru
44b. Outside work	Na iru ilo
45. Do you know anyone who has had knee pain in the past 12 months?	Onwela onye imara nweburu ihe mgbu n'ipkere n'ime onwa iri na abuo gara aga
45a. At work	Na ulo oru
45b. Outside work	Na iru ilo
46. Based on your own views and what the doctor or others may have told you <u>about pain in the arm, shoulder or hands,</u> how	Site na echiche nkegi na kwa ihe dokinta gwara gi gbasara ihe mgbu n'ogbe aka, ubuaka, kedu ka isiri kweyesie ike n okwu ndia? *(horo otu n'ime akpati ndia.)*

strongly do you agree with the following statements? *(Tick one box on each line.)*	
For someone with this problem ..	*Maka onye nwere nsogbu a*
Physical activity should be avoided as it might harm the arm	Izere ime ihe siri ike n'ihu, na onwere ike idi na emeru ubuaka ahu
These problems usually get better within three months	Nsogbu ndia na-adikari mma n'ime onwa ato
Rest is needed to get better	I nwe ezumuike na-adi mkpa maka ahu idi mma
Neglecting problems of this kind can cause permanent health problems	Ileghara udi nsogbua anya ga-ebuta nsogbu n'ahu ike, na adighi enwe nkwusi
These problems are commonly caused by people's work	Ihe na-ebute kari nsogbua bu oru ndi mmadu na-aru
47. Based on your own views and what the doctor or others may have told you <u>about low-back pain,</u> how strongly do you agree with the following statements? *(Tick one box on each line.)*	Site n'echiche gi nakwa nihe dokinta maobu onye ozo gwara gi gbasara ihe mgbu na mgbada azu, kedu ka isi kwenyesie ike n 'okwu ndia? *(ghoro otu n'ime akpati ndia.)*
For someone with this problem	*Maka onye nwere nsogbu ndia*
Physical activity should be avoided as it might harm the back	Izere ime ihe siri ike n'ihi onwere ike ike idi na emeru azu ahu
These problems usually get better within three months	Nsogbu ndia na-adikari mma n'ime onwa ato
Rest is needed to get better	Inwe ezumuike di mkpa maka ahu idi mma
Neglecting problems of this kind can cause permanent health problems	Ileghera udi nsigbua anya ga-ebute nsogbu n'ahu ike na adighi enwe nkwusi
These problems are commonly	Ihe na-ebutekari nsogbu bu oru ndi mmadu na-aru

caused by people's work	
48. Have you ever heard or read about repetitive strain injury (RSI), work related upper limb disorder (WRULD) or cumulative trauma syndrome (CTS)? **[Appropriate terms may vary by country.]**	
49. Below is a list of problems people sometimes have. Please read each one carefully and circle the number that best describes HOW MUCH THAT PROBLEM HAS DISTRESSED OR BOTHERED YOU DURING THE **PAST 7 DAYS INCLUDING TODAY** *Circle only **one number** for each problem and do not skip any items*	N' okpuru ebe a bu nsogbu ndi mmadu na-enwe mgbe ufodi. Biko guo nke obula nke oma, ma kachibido nomba nke kowara ka nsogbu gi na n'ime mkpuru ubochi asaa gara aga nke gunyere taa. Kachibido naani otu nomba maka otu nsogbu ma amafekwala nke o bula
49a. Faintness or dizziness	Nkubi ume na anya ntughari
49b. Pains in the heart or chest	Ihe mgbu mkpuru obi
49c. Nausea or upset stomach	Agbo ma obu afo inye nsogbu
49d. Trouble getting your breath	Nsogbu iku ume
49e. Numbness or tingling in parts of your body	enweghi mmetuta maobu ihe adighi ike n'akuku ahu gi
49f. Feeling weak in parts of your body	adighi ike n'akuku ahu gi
49g. Hot or cold spells	ikpo oku maobu iju oyi

50. These questions are about how you feel and how things have been with you **during the past month.** For each question, please give the one answer that best describes how things have been for you during the past month. How much of the time during the **past month**: *Circle **one number** on each line*	Ajuju ndia bu maka isi enwe mmetuta nakwa ka ihe siri diri gi n'ime onwa gara aga, maka ajuju obula, biko nye aziza nke kowara nke oma ka ihe sisr diri gi n'ime onwa gara aga. Kedu ugboro ole o di nime onwa gara aga. *Kachibido nomba nke a bula okirikiri*
50a. Were you a happy person?	ibu onye na-enwe anuri
50b. Have you felt calm and peaceful?	Onwego mmetuta di nwayoo na udo?
50c. Have you been a very nervous person	i bu onye na-atubu ujo
50d. Have you felt downhearted and low?	Onwego mmetuta di nwute?
50e. Have you felt so down that nothing could cheer you up?	Onwego mwute nke na o nweghi ihe ga-emedanwu gi obi
51. Over the past 12 months, on how many days in total have you been prevented from going to work because of	Na ihe kariri onwa iri na abuo gara aga, gbakota ubochi ole ka ihe ndi a gbochiri gi i ga-oru maka
51a. A problem with your back, neck, shoulder, elbow, wrist, hand or knees	nsogbu n'azu gi, olu, ubuaka, ikiaka, nkwojiaka, aka, na ikpere
51b. other illness	Oria ndi ozo
Please fill in the date that you complete this form	*Biko denye ubochi tata bu na aro*

52. Please fill in your date of birth	*Biko denye ubochi amuru gi*
53. *and* your sex	denye okike gi
54a. Do you still have the same main job as when we last questioned you about a year ago? If ***YES,*** please go to question 54. If ***NO,*** please continue	I ka na-enwe otu isi oru dika mgbe anyi na-ikpeazu ajuju gi banyere otu afo gara aga? O buru na ee, biko gaa na ajuju nke ano ma odighi biko anogidela
54b. Did you leave that job because of medical problems with your back, neck, shoulder, elbow, wrist, hand or knee?	O bu na unu na-ahapu oru ahu n'ihi na nke nsogbu ahu ike na gi azu, n'olu,ubu, n'ikpere aka, nkwonaka, aka ma obu ikpere
54c. And do you have another job now?	Na unu enwere oru ozo ugbu a
55a. Have you had low back pain in the area shown below which lasted for more than a day at any time during the past month? *(Do not include pain associated only with menstrual periods, pregnancy or during a course of a feverish illness.)* If ***NO,*** please go to question 58. If ***YES***, please continue	Ndi i na-ala ozu mgbu na ebe e gosiri n'okpuru nke were ihe kariri otu ubochi n'oge o bula n' onwa gara aga? *(Anaghi agunye mgbu metutara naani na ihu nso oge, afo ime ma obu n'oge a n'ezie nke oria ahu oku).* O buru na o dighi, biko gaa na-aju asato o buru na ee, biko anogide na
55b. If you add together all the days on which you have had low back pain, during the past month, how long a period would that make?	O buru na i tinye onu ubochi niile nke unu na-eme ala azu mgbu, n'oge gara aga onwa, ruo ole a oge nke ahu ga-emeka?
56. During the past month, has	N' onwa gara aga, nwere ala azu mgbu mgbe obula nke ndi

low back pain at any time made it difficult or impossible to do any of the following activities?	na-esonu na-eme
56a. Cutting your toe nails	Icha gi ukwu mbo
56b. Getting dressed	Njike eyim akwa
56c. Doing the jobs that you normally do around the house	Iru oru i na-ejikari eme na gburugburu ulo
57. During the past month on how many days has low back pain prevented you from going to work?	N' onwa gara aga na otu otutu ubochi nke ala azu mgbu gbochiri gi si na-aga na aru oru
58. Within the past month, has the pain ever spread down your leg(s) to below the knee (sciatica)?	N'ime onwa gara aga, ka ihe mgbu mgbe agbasa ala gi ukwu n'okpuru ikpere?
59a. Have you had pain in the neck in the area shown below which lasted for more than a day at any time during the past month? If ***NO*****,** please go to question 62. If ***YES***, please continue.	I nwere ihe mgbu na onu na ebea esere ihe oji di n'okpuru nke kariri otu ubochi na oge obula na onwa gara ga? O buru n'o dighi**,** biko gaa n'ajuju nke iri na otu. Ma o buru ee, biko bidokwa
59b. If you add together all the days on which you have had neck pain, during the past month, how long a period would that make?	O buru na i mgbako ubochi niile inwere onu mgbu, na onwa gara aga, oga dika ogologo oge ole mkpakotara onu?
60. During the past month, has neck pain at any time made it difficult or impossible to do any	Na onwa gara aga onu mgbu i nwere oge obula omere ka osiere gi ike ime ihe ndi di iche

of the following activities?	
60a. Getting dressed	Ihi akwa
60b. Doing the jobs that you normally do around the house.	Iru oru ndi i na-aru na ulo gi
61. During the past month on how many days has neck pain prevented you from going to work?	Na onwa gara aga mkpuru ubochi ole ka onu mgbu nahara gi ije oru?
62a. Have you had pain in the shoulder in the area shown below which lasted for more than a day at any time during the past month? If ***NO***, please go to question 65. If ***YES*** please continue	Onwela ihe mgbu na ubu aka na ebe a esere ihe oji nke di na okpuru nke kariri otu ubochi na oge obula na onwa gara aga? O buru n'o dighi, biko gana ajuju nke iri na ano, ma o buru ee anogide na
62b. If you add together all the days on which you have had shoulder pain, during the past month, how long a period would that make?	O buru na igbako ubochi niile i nwere ihe mgbu na ubu aka na onwa gara aga, oga di ihe dika ogologo oge ole?
63. During the past month, has shoulder pain at any time made it difficult or impossible to do any of the following activities?	Na onwa gara aga, ihe mgbu nke ubu aka, omere gi ka esie ike iru oru ndi di iche iche
63a. Combing or brushing your hair	Ira ntuntu isi gi
63b. Bathing/showering	Isa ahu gi
63c. Getting dressed	Iyi akwa
63d. Doing the jobs that you normally do around the house	Iru oru di iche iche na ulo gi
64. During the past month on	Na onwa gara aga, ubochi ole ka ihe mgbu ubu aka naghara gi

how many days has shoulder pain prevented you from going to work?	ije oru?
65a Have you had pain in the elbow in the area shown below which lasted for more than a day at any time during the past month? If ***NO,*** please go to question 68. If ***YES*** please continue.	I nwela ihe mgbu na iku aka dika o di na eserese a, nke kariri otu ubochi n'ime onwa gara aga? O buru n'o dighi, biko ga na ajuju nke iri na asa, o buru ee, biko ano gi dena
65b. If you add together all the days on which you have had elbow pain, during the past month, how long a period would that make?	Ikpakota ubochi niile i nwere ihe mgbu iku aka, na onwa nke gara aga,o ga dika oge ole?
66. During the past month, has elbow pain at any time made it difficult or impossible to do any of the following activities?	Na onwa gara aga, ihe mgbu iku aka nke omela ga osiere gi ike ime ihe ndi di iche iche?
66a. Opening bottles, jars or taps.	Imepe mmanya, ma obu udu, ma obu pumpu mmiri
66b. Getting dressed	Iyi akwa
66c. Doing the jobs that you normally do around the house	Iru oru ndi i na-aru n'ulo
67. During the past month on how many days has elbow pain prevented you from going to work?	Na onwa gara aga, ihe dika ubochi ole ka ihe mgbu iku aka mere ka osiere m ike ije oru?
68a. Have you had pain in the wrist or hand in the area shown below which lasted for more	I nwela ihe mgbu na mkpisi aka na ebe a esere ihe oji ihe kariri otu ubochi na oge obula na onwa gara aga? O buru n'o dighi, biko ga na ajuju nke iri abuo ma oburu ee anogide la

than a day at any time during the past month? If ***NO,*** please go to question 71. If ***YES*** please continue	
68b. If you add together all the days on which you have had wrist/hand pain, during the past month, how long a period would that make?	O buru na agukota ubochi niile i nwere ihe mgbu na mkpisi aka, na onwa gara aga, ihe dika oge ole ka oga adi?
69. During the past month, has wrist/hand pain at any time made it difficult or impossible to do any of the following activities?	Na onwa gara aga, ihe mgbu mkpisi aka i nwere omela ka osiere gi ike ime ihe ndi di iche iche?
69a. Writing	Ide ihe odide
69b. Locking and unlocking doors	Nmepe na nmechi onu uzo
69c. Opening bottles, jars or taps	Imeye okwuchi mmanya ma obu pumpu mmiri
69d. Getting dressed	Iyi akwa
69e. Doing the jobs that you normally do around the house	Iru oru ndi di na ulo
70. During the past month on how many days has wrist/hand pain prevented you from going to work?	Na onwa gara aga ihe dika ubochi ole ka ihe mgbu mkpisi aka naghara gi ije oru?
71. Have you had pain in the knee in the area shown below which lasted for more than a day at any time during the past month?	I nwela mgbu ikpere na eserese oji nke a na-egosi na-ana akwukwo ihe kariri otu ubochi n'oge obula na onwa gara aga?

71a. Have you had pain in the knee in the area shown below which lasted for more than a day at any time during the past month? If ***NO,*** please go to question 74. If ***YES*** please continue	I nwela mgbu ikpere na eserese oji nke a na-egosi na-ana akwukwo ihe kariri otu ubochi n'oge obula na onwa gara aga? O buru n'o dighi, biko ga na ajuju nke iri abuo na ato, ma oburu ee, biko anogide la.
71b. If you add together all the days on which you have had knee pain, during the past month, how long a period would that make?	Igbakota ubochi nke i nwere mgbu ikpere na onwa gara aga, ihe dika oge ole ka o ga adi?
72. During the past month, has knee pain at any time made it difficult or impossible to do any of the following activities?	Na onwa gara aga mgbu ikpere i nwere n'oge obula, omere ka osiere gi ike ime ihe ndi di iche iche?
72a. Walking up and down stairs	Irugo ma obu rutuo n'elu di na ulo gi
72b. Walking on level ground	I ga ije n'elu ala
72c. Getting dressed	Iyi akwa
72d. Doing the jobs that you normally do around the house	Iru oru ndi di n'ulo i na-aru
73. During the past month on how many days has knee pain prevented you from going to work?	Na onwa gara aga, ihe dika ubochi ole ka mgbu ikpere mere ka i ghara ije oru?
74. Below is a list of problems people sometimes have. Please read each one carefully and circle the number that best describes HOW MUCH THAT PROBLEM HAS DISTRESSED OR	Na okpuru, nsogbu oria ndi mmadu na-aria di iche iche ka edeturu maka pia ya onu biko le ruo anya ka iza etu oria ndi a siri metuta gi na ime ubochi asaa nke gara aga ma ubochi tata Biko kapia okirikiri na oria nke obula i na-aria n'ime ndi a edere ede

BOTHERED YOU DURING THE **PAST 7 DAYS INCLUDING TODAY** *Circle only **one number** for each problem and do not skip any items*	
a. Faintness or dizziness	Ikubi ume na anya ntughari
b. Pains in the heart or chest	Ihe mgbu nke mkpuru obi
c. Nausea or upset stomach	Agu igbo agboo ma obu afo inye nsogbu
d. Trouble getting your breath	Nsogbu n'ikute ume nke oma
e. Numbness or tingling in parts of your body	Nsogbu ighota na emeturu m aka na ihe odudu dika pinu nke na-adu n' akuku aru m
f. Feeling weak in parts of your body	Adighi ike n'akuku ahu gi
g. Hot or cold spells	Ikpo oku ahu ma obu iju oyi n'ahu
75. These questions are about how you feel and how things have been with you **during the past month.** For each question, please give the one answer that best describes how things have been for you during the past month. How much of the time during the **past month**: *Circle **one number** on each line*	
a. Were you a happy person?	Ibu onye na-enwe anuli?
b. Have you felt calm and peaceful?	I na-enwe obi nwayoo n'udo ahu?
c. Have you been a very nervous person?	I bu onye na-atu ujo
d. Have you felt downhearted	I bu onye ahu na dara juu oge obula?

and low?	
e. Have you felt so down that nothing could cheer you up?	I bu onye na-enwe obi mgbawa?
76. Over the past 12 months, on how many days in total have you been prevented from going to work because of:	Na onwa iri na abuo gara aga, ubochi ole ka oria kwusiri gi oru
a. a problem with your back, neck, shoulder, elbow, wrist, hand or knees	Obu nsogbu mgbu azu, onu,ubuaka,ikuaka, mkpisi aka ma obu ikpere
b. other illness	Oria ndi ozo

TABLE 4: Back translation of the consensus version of the Igbo CUPID (T1 and T2)

Original Version Item:	**Back-Translated Version BT-1**	**Back-Translated Version BT -2**
1. Please fill in your date of birth	Kindly write down your birth date	Please write your date of birth
2. and your sex.	And your gender	And you sex
3. Are you right or left-handed?	Do you utilize right or left hand	Do you use your right or left hand
4. How would you best describe your ethnic origin.	What is your tribal identity	What tribe do you belong to
5. How old were you when you finished full time education?	When you finished your full time education what was your age	What was your age when you finished full time schooling
6. How tall are you?	What was your height	How tall are you
7a.Have you ever smoked regularly (ie at least once per day for a month or longer)?	Are you a regular smoker (ie at least once in a day for a month or longer?	Do you smoke regularly (ie at least once in a day for a month or longer)
7b. If ***YES***, do you still smoke regularly?	If ***YES***, do you still smoke regularly?	If ***YES***, are you still a regular smoker?

8. What is your main occupation.	What is your main Job position?	What is your job title
9. How long have you done this job?	How long have you done this work	How long have you done this duty
10. How many hours per week do you normally work in this job?	How many hours do you put in a week normally in this job?	How many hours do you work in a week normally in this job
11. Does **average working day** in the job involve any of the following?	What does your average working day involve in the job?	Does your **average working day** involve any of the following in the job.
a. Use of a keyboard or typewriter for more than four hours in total?	Do you handle keyboard for more than four hours in total?	Do you make use of keyboard for more than four hours in total
b. Other tasks involving repeated movements of the wrist or fingers for more than four hours in total?	Other tasks involving repeated movements of the wrist or fingers for more than four hours in total?	Other tasks involving repeated movements of the wrist or fingers for more than four hours in total?
c. Repeated bending and straightening of your elbow for longer than one hour in total?	Repeated bending and straightening of your elbow for longer than one hour in total?	Repeated bending and straightening of your elbow for longer than one hour in total?
d. Working for longer than one hour in total with your hands above shoulder height	Do you work for longer than one hour in total with upper limb above shoulder position	Do you work more than one hour in total with hands above shoulder position
e. Lifting weights of 25 Kg (56 lbs) or more by hand?	Carrying weights of 25 Kg or more by the upper limb	Carrying of 25 Kg weight or more by the hands
f. Climbing up or down more than 30 flights of stairs a day?	To climb up or down more than 30 staircase a	Climbing up or down more than 30 staircases a day

	day	
g. Kneeling or squatting for longer than one hour in total?	Igbu ikpere n'ala ma ọ bu itụkwụ ala ogologo oge kariri otụ awa na ngụkọta?	I sekpu ala ma obu i tukwu ala ihe kariri otu awa na nchikota.
h. Piecework in which you are paid according to the number of articles or task you or your team make or finish in the day?	Piecework according to the number of task in which you are paid you or your team complete in the day?	Breakdown of work according to the number of task in which you are paid you or your team complete in the day
i. A target number of articles or tasks that you or your team are expected to make or finish in the day?	A target number of tasks that you or your team are expected to complete in the day	The target number of tasks you or your team are expected to complete in the day
j. Payment of a bonus if you make or finish more than an agreed number of articles/tasks in the day?	Bonus payment, if you complete more than an agreed number of tasks in the day?	Payment of a bonus if you complete more than an agreed number of tasks in the day
k. Working under pressure to complete tasks by a fixed time?	To work under pressure while doing tasks within fixed time?	To be working under pressure while doing tasks in a fixed time?
12. In your job, do you have a choice in deciding	In your work, do you have a choice in deciding	In your job, do you decide how you complete tasks
13. When you have difficulties in your work, how often do you get help and support from your colleagues or supervisor/manager?	When you confront difficulties in your work, how often do you get help and support from your colleagues, supervisor, or manager?	When you face difficulties in your work, how often do you get help and support from your colleagues, supervisor or manager?
14. How satisfied have you been with your job as a	How contempt have you been with your job as a	How happy have you been with your job as a whole, taking everything into

whole, taking everything into consideration?	whole, taking everything into consideration	consideration
15. How secure do you feel your job would be if you had a significant illness that kept you off work for three months?	How secure do you feel your job would be if you had a significant illness that kept you off work for three months?	How secure do you feel your job would be if you had a significant illness that kept you off work for three months?
16. Do you have any other job(s)? If yes, what are the other jobs?		Do you have any other work(s)? If yes, what are the other works?
17a. Have you had low back pain in the area shown below which lasted for more than a day at any time during the past 12 months? *(Do not include pain associated only with menstrual periods, pregnancy or during a course of a feverish illness.)*	Have you had lower back pain in the area shown below which lasted for more than a day at any time during the past 12 months? *(Do not include pain associated only with menstrual periods, pregnancy or during a course of a feverish illness.)*	Have you had lower back pain in the area shown below which lasted for more than a day at any time during the past 12 months? *(Do not include pain associated only with menstrual periods, pregnancy or during a course of a feverish illness.)*
17b. Within the past 12 months, has the pain ever spread down your leg(s) to below the knee (sciatica)?	During the past 12 months, has the pain ever spread down your leg(s) to below the knee (sciatica)	During the past 12 months, has your pain ever spread down the leg(s) to below the knee (sciatica)
17c. If you add together all the days on which you have had low back pain, during the past 12 months, how long a	If you add together all the days on which you have had lower back pain, during the past 12	If you add together all the days on which you have had lower back pain, during the past 12 months, how long a period would that make?

period would that make?	months, how long a period would that make?	
17d. Have you consulted a doctor or a medical person or alternative practitioner because of low back pain during the past 12 months?	Have you consulted a doctor or a medical person or alternative practitioner because of lower back pain during the past 12 months?	Have you consulted a doctor or a medical person or alternative practitioner because of lower back pain during the past 12 months?
17e. During the past 12 months on how many days did low back pain prevent you from going to work?	During the past 12 months on how many days did lower back pain prevent you from going to work?	During the past 12 months on how many days did lower back pain prevent you from going to work?
18. Do you expect that your back pain will be a problem in 12 months' time?	Do you expect that your back pain will be a problem in 12 months' time?	Do you expect that your back pain will be a problem in 12 months' time?
We are particularly interested in any back pain you may have had during the past month	**We are particularly interested in any back pain you may have had during the past month**	**We are particularly interested in any back pain you may have had during the past month**
19a. Have you had low back pain in the area shown below which lasted for more than a day at any time during the past month? *(Do not include pain associated only with menstrual periods, pregnancy or during a course of a feverish illness*	Have you had lower back pain in the area shown below which lasted for more than a day at any time during the past month? *(Do not include menstrual pain, pregnancy pain or pain during feverish illness*	Have you had lower back pain in the area shown below which lasted for more than a day at any time during the past month? *(Do not include menstrual pain, pregnancy pain or pain during feverish illness*
19b. Within the past month,	Within the past month,	Within the past month, has the pain

has the pain ever spread down your leg(s) to below the knee (sciatica)?	has the pain ever spread down your leg(s) to below the knee (sciatica)?	ever spread down your leg(s) to below the knee (sciatica)?
19c. If you add together all the days on which you have had low back pain, during the past month, how long a period would that make?	If you add together all the days on which you have had low back pain, during the past month, how long a period would that make?	If you add together all the days on which you have had low back pain, during the past month, how long a period would that make?
20. During the past month, has low back pain at any time made it difficult or impossible to do any of the following activities?	During the past month, has low back pain at any time made it difficult or impossible to do any of the following activities?	During the past month, has low back pain at any time made it difficult or impossible to do any of the following activities?
a. Cutting your toe nails	Cutting your toe nails	Cutting your toe nails
b. Getting dressed	Wearing clothes and shoes	Wearing clothes and shoes
c. Doing the jobs that you normally do around the house	Doing the normal house chores	Doing the routine house chores
21. Please think back to the last time that you were free from low back pain for a month or longer. When your most recent episode of low back pain then started, how did it begin?	Please think back to the last time that you were free from low back pain for a month or longer. When you experienced the most recent episode of lower back pain, how did it start?	Please think back to the last time that you were free from low back pain for a month or longer. When you experienced the most recent episode of lower back pain, how was the onset?
22a. Have you had pain in the neck in the area shown below which lasted for more than a	Have you had pain in the neck in the area shown below which lasted for	Have you had pain in the neck in the area shown below which lasted for more than a day at any time during

day at any time during the past 12 months?	more than a day at any time during the past 12 months?	the past 12 months?
22b. If you add together all the days on which you have had neck pain, in the past 12 months, how long a period would that make?	If you add together all the days on which you have had neck pain, in the past 12 months, how long a period would that make?	If you add together all the days on which you have had neck pain, in the past 12 months, how long a period would that make?
22c. Have you consulted a doctor or a medical person or alternative practitioner because of neck pain during the past 12 months?	Have you consulted a doctor or a medical person or alternative practitioner because of neck pain during the past 12 months?	Have you consulted a doctor or a medical person or alternative practitioner because of neck pain during the past 12 months?
22d. During the past 12 months on how many days did neck pain prevent you from going to work?	During the past 12 months on how many days did neck pain prevent you from going to work?	During the past 12 months on how many days did neck pain prevent you from going to work?
23. Do you expect that your neck pain will be a problem in 12 months time?	Do you expect that your neck pain will be a problem in 12 months time?	Do you expect that your neck pain will be a problem in 12 months time?
We are particularly interested in any neck pain you may have had during the past month	**We are particularly interested in any neck pain you may have had during the past month**	**We are particularly interested in any neck pain you may have had during the past month**

24a. Have you had pain in the neck in the area shown below	Have you had pain in the neck in the area shown below	Have you had pain in the neck in the area shown

which lasted for more than a day at any time during the past month?	which lasted for more than a day at any time during the past month?	below which lasted for more than a day at any time during the past month?
24b. If you add together all the days on which you have had neck pain, during the past month, how long a period would that make?	If you add together all the days on which you have had neck pain, during the past month, how long a period would that make?	If you add together all the days on which you have had neck pain, during the past month, how long a period would that make?
25. During the past month, has neck pain at any time made it difficult or impossible to do any of the following activities?	During the past month, has neck pain at any time made it difficult or impossible to do any of the following activities?	During the past month, has neck pain at any time made it difficult or impossible to do any of the following activities?
a. Getting dressed	Wearing clothes and shoes	Wearing clothes and shoes
b. Doing the jobs that you normally do around the house	Doing normal house chores	Doing routine house chores
26a. Have you had pain in the shoulder in the area shown below which lasted for more than a day at any time during the past 12 months?	Have you had pain in the shoulder in the area shown below which lasted for more than a day at any time during the past 12 months?	Have you had pain in the shoulder in the area shown below which lasted for more than a day at any time during the past 12 months?

26b. If you add together all the days on which you have had shoulder pain, in the past 12 months, how long a period would that make?	If you add together all the days on which you have had shoulder pain, in the past 12 months, how long a period would that make?	If you add together all the days on which you have had shoulder pain, in the past 12 months, how long a period would that make?
26c. Have you consulted a doctor or a medical person or alternative practitioner because of shoulder pain during the past 12 months?	Have you consulted a doctor or a medical person or alternative practitioner because of shoulder pain	Have you consulted a doctor or a medical person or alternative practitioner because of shoulder pain

	during the past 12 months?	during the past 12 months?
26d. During the past 12 months on how many days did shoulder pain prevent you from going to work?	During the past 12 months on how many days did shoulder pain prevent you from going to work?	During the past 12 months on how many days did shoulder pain prevent you from going to work?
27. Do you expect that your shoulder pain will be a problem in 12 months time	Do you expect that your shoulder pain will be a problem in 12 months time	Do you expect that your shoulder pain will be a problem in 12 months time
We are particularly interested in any shoulder pain you may have had during the past month	**We are particularly interested in any shoulder pain you may have had during the past month**	**We are particularly interested in any shoulder pain you may have had during the past month**
28a. Have you had pain in the shoulder in the area shown below which lasted for more than a day at any time during the past month?	Have you had pain in the shoulder in the area shown below which lasted for more than a day at any time during the past month?	Have you had pain in the shoulder in the area shown below which lasted for more than a day at any time during the past month?
28b. If you add together all the days on which you have had shoulder pain, during the past month, how long a period would that make?	If you add together all the days on which you have had shoulder pain, during the past month, how long a period would that make?	If you add together all the days on which you have had shoulder pain, during the past month, how long a period would that make?
29. During the past month, has shoulder pain at any time made it difficult or impossible to do any of the following activities?	During the past month, has shoulder pain at any time made it difficult or impossible to do any of the following activities?	During the past month, has shoulder pain at any time made it difficult or impossible to do any of the following activities?
a. Combing or brushing your hair	To use a brush for the hair	To brush your hair
b. Bathing/Showering	To wash the body with water	To take a shower
c Getting dressed	Wearing clothes and shoes	Wearing clothes and shoes

d. Doing the jobs that you normally do around the house	Doing normal house chores	Doing routine house chores
30a. Have you had pain in the elbow in the area shown below which lasted for more than a day at any time during the past 12 months?	Have you had pain in the elbow in the area shown below which lasted for more than a day at any time during the past 12 months?	Have you had pain in the elbow in the area shown below which lasted for more than a day at any time during the past 12 months?
30b. If you add together all the days on which you have had elbow pain, in the past 12 months, how long a period would that make?	If you add together all the days on which you have had elbow pain, in the past 12 months, how long a period would that make?	If you add together all the days on which you have had elbow pain, in the past 12 months, how long a period would that make?
30c. Have you consulted a doctor or a medical person or alternative practitioner because of elbow pain during the past 12 months?	Have you consulted a doctor or a medical person or alternative practitioner because of elbow pain during the past 12 months?	Have you consulted a doctor or a medical person or alternative practitioner because of elbow pain during the past 12 months?
30d. During the past 12 months on how many days did elbow pain prevent you from going to work?	During the past 12 months on how many days did elbow pain prevent you from going to work	During the past 12 months on how many days did elbow pain prevent you from going to work

31. Do you expect that your elbow pain will be a problem in 12 months time?	Do you expect that your elbow pain will be a problem in 12 months time?	Do you expect that your elbow pain will be a problem in 12 months time?
We are particularly interested in any elbow pain you may have had during the past month	We are particularly interested in any elbow pain you may have had during the past month	We are particularly interested in any elbow pain you may have had during the past month
32a. Have you had pain in the	Have you had pain in the	Have you had pain in the

elbow in the area shown below which lasted for more than a day at any time during the past month?	elbow in the area shown below which lasted for more than a day at any time during the past month?	elbow in the area shown below which lasted for more than a day at any time during the past month?
32b. If you add together all the days on which you have had elbow pain, during the past month, how long a period would that make?	If you sum up all the days on which you experienced elbow pain, during the past month, what is the duration?	If you summarize all the days on which you have had elbow pain, during the past month, what is the time frame?
33. During the past month, has elbow pain at any time made it difficult or impossible to do any of the following activities?	33. During the past month, has elbow pain at any time made it difficult or impossible to do any of the following activities?	During the past month, has elbow pain at any time made it difficult or impossible to do any of the following activities?
33a. Opening bottles, jars or taps	To open bottles, jars or taps	Opening bottles, jars or taps
33b. Getting dressed	Wearing clothes and shoes	To wear clothes and shoes
33c. Doing the jobs that you normally do around the house	Doing normal house chores	Doing the routine house chores
34a. Have you had pain in the wrist or hand in the area shown below which lasted for more than a day at any time during the past 12 months?	Have you had pain in the wrist or hand in the area shown below which lasted for more than a day at any time during the past 12 months?	Have you had pain in the wrist or hand in the area shown below which lasted for more than a day at any time during the past 12 months?
34b. If you add together all the days on which you have had wrist/hand pain, in the past 12 months, how long a period would that make?	If you summarize all the days on which you have had wrist/hand pain, in the past 12 months, how long a period would that make?	If you sum up all the days on which you have had wrist/hand pain, in the past 12 months, how long a period would that make?
34c. Have you consulted a doctor	Have you consulted a health	Have you consulted a

or a medical person or alternative practitioner because of wrist/hand pain during the past 12 months?	personnel or Traditional medicine practitioner for the wrist/hand pain during the past 12 months?	consulted a health workerl or Traditional medicine practitioner for the wrist/hand pain during the past 12 months?
34d. During the past 12 months on how many days did wrist/hand pain prevent you from going to work?	During the past 12 months on how many days did wrist/hand pain prevent you from going to work?	During the past 12 months on how many days did wrist/hand pain prevent you from going to work?
35. Do you expect that your wrist/hand pain will be a problem in past 12 months time.	Do you expect that your wrist/hand pain will be a problem in past 12 months time.	Do you expect that your wrist/hand pain will be a problem in past 12 month's time.
We are particularly interested in any wrist/hand pain you may have had during the past month	We are particularly interested in any wrist/hand pain you may have had during the past month	We are particularly interested in any wrist/hand pain you may have had during the past month
36a. Have you had pain in the wrist or hand in the area shown below which lasted for more than a day at any time during the past month?	Have you had pain in the wrist or hand in the area shown below which lasted for more than a day at any time during the past month?	Have you had pain in the wrist or hand in the area shown below which lasted for more than a day at any time during the past month?
36b. If you add together all the days on which you have had wrist/hand pain, during the past month, how long a period would that make?	36b. If you add together all the days on which you have had wrist/hand pain, during the past month, how long a period would that make?	36b. If you add together all the days on which you have had wrist/hand pain, during the past month, how long a period would that make?
37. During the past month, has wrist/hand pain at any time made it difficult or impossible to do any of the following activities?	During the past month, has wrist/hand pain at any time made it difficult or impossible to do any of the following	During the past month, has wrist/hand pain at any time made it difficult or impossible to do any of the following

	activities?	activities?
37a. Writing	To Write	To Write
37b. Locking and unlocking doors	To open or close doors	To close or open doors
37c Opening bottles, jars or taps.	Opening bottles, jars or taps.	Opening bottles, jars or taps.
37d. Getting dressed	Wearing clothes and shoes	To wear clothes and shoes
37e. Doing the jobs that you normally do around the house	Doing the jobs that you normally do around the house	Doing the jobs that you normally do around the house
38a. Have you had pain in the knee in the area shown below which lasted for more than a day at any time during the past 12 months?	Have you had pain in the knee in the area shown below which lasted for more than a day at any time during the past 12 months?	Have you had pain in the knee in the area shown below which lasted for more than a day at any time during the past 12 months?
38b. If you add together all the days on which you have had knee pain, in the past 12 months, how long a period would that make?	If you summarize all the days on which you have had knee pain, in the past 12 months, how long a period would that make?	If you sum up all the days on which you have had knee pain, in the past 12 months, how long a period would that make?
38c. Have you consulted a doctor or a medical person or alternative practitioner because of knee pain during the past 12 months?	Have you consulted a health personnel or Traditional medicine practitioner because of knee pain during the past 12 months?	Have you consulted a health personnel or Traditional medicine practitioner because of knee pain during the past 12 months?
38d. During the past 12 months on how many days did knee pain prevent you from going to work?	During the past 12 months on how many days did knee pain prevent you from going to work?	During the past 12 months on how many days did knee pain prevent you from going to work?
39. Do you expect that your knee pain will be a problem in 12 months time?	Do you expect that your knee pain will be a problem in 12 months time?	Do you expect that your knee pain will be a problem in 12 months time?
40a. Have you had pain in the	Have you had pain in the	Have you had pain in the knee

knee in the area shown below which lasted for more than a day at any time during the past month?	knee in the area shown below which lasted for more than a day at any time during the past month?	in the area shown below which lasted for more than a day at any time during the past month?
40b. If you add together all the days on which you have had knee pain, during the past month, how long a period would that make?	If you add together all the days on which you have had knee pain, during the past month, how long a period would that make?	If you add together all the days on which you have had knee pain, during the past month, how long a period would that make?
41. During the past month, has knee pain at any time made it difficult or impossible to do any of the following activities	During the past month, has knee pain at any time made it difficult or impossible to do any of the following activities	During the past month, has knee pain at any time made it difficult or impossible to do any of the following activities
41a.Walking up and down stairs	Walking up and down stairs	Walking up and down stairs
41b. Walking on level ground	Walking on level ground	Walking on level ground
41c. Getting dressed	Wearing clothes and shoes	To wear clothes and shoe
41d. Doing the jobs that you normally do around the house	Doing normal house chores	Doing routine house chores
42. Do you know anyone who has had low back pain in the past 12 months	42. Do you know anyone who experienced lower back pain in the past 12 months	42. Do you know anyone who experienced lower back pain in the past 12 months
42a. At work	At work	At work
42b. Outside work	Outside work	Outside work
43. Do you know anyone who has had neck pain in the past 12 months?	Do you know anyone who has had neck pain in the past 12 months?	Do you know anyone who has had neck pain in the past 12 months?
43a. At work	At work	At work
43b. Outside work	Outside work	Outside work
44. Do you know anyone who has had pain in the arm, shoulder or hand in the past 12 months?	Do you know anyone who has had pain in the arm, shoulder or hand in the past	Do you know anyone who has had pain in the arm, shoulder or hand in the past 12

	12 months?	months?
44a. At work	At work	At work
44b. Outside work	Outside work	Outside work
45. Do you know anyone who has had knee pain in the past 12 months?	Do you know anyone who experienced knee pain in the past 12 months?	Do you know anyone who experienced knee pain in the past 12 months?
45a. At work	At work	At work
45b. Outside work	Outside work	Outside work
46. Based on your own views and what the doctor or others may have told you about pain in the arm, shoulder or hands, how strongly do you agree with the following statements? *(Tick one box on each line.)*	Based on your own views and what the doctor or others may have told you about pain in the arm, shoulder or hands, how strongly do you agree with the following statements? *(Tick one box on each line.)*	Based on your own views and what the doctor or others may have told you about pain in the arm, shoulder or hands, how strongly do you agree with the following statements? *(Tick one box on each line.)*
For someone with this problem ..	*For someone with this problem ..*	*For someone with this problem ..*
Physical activity should be avoided as it might harm the arm	Physical activity should be avoided as it might harm the arm	Physical activity should be avoided as it might harm the arm
These problems usually get better within three months	These problems usually get better within three months	These problems usually get better within three months
Rest is needed to get better	Rest is needed to get better	Rest is needed to get better
Neglecting problems of this kind can cause permanent health problems	Neglecting problems of this kind can cause permanent health problems	Neglecting problems of this kind can cause permanent health problems
These problems are commonly caused by people's work	These problems are commonly caused by people's work	These problems are commonly caused by people's work
47. Based on your own views and	Based on your own views	Based on your own views and

what the doctor or others may have told you <u>about low-back pain,</u> how strongly do you agree with the following statements? *(Tick one box on each line.)*	and what the doctor or others may have told you <u>about lower back pain,</u> how strongly do you agree with the following statements? *(Tick one box on each line.)*	what the doctor or others may have told you <u>about lower back pain,</u> how strongly do you agree with the following statements? *(Tick one box on each line.)*
For someone with this problem	*For someone with this problem*	*For someone with this problem*
Physical activity should be avoided as it might harm the back	Physical activity should be avoided as it might harm the back	Physical activity should be avoided as it might harm the back
These problems usually get better within three months	These problems usually get better within three months	These problems usually get better within three months
Rest is needed to get better	Rest is needed to get better	Rest is needed to get better
Neglecting problems of this kind can cause permanent health problems	Neglecting problems of this kind can cause permanent health problems	Neglecting problems of this kind can cause permanent health problems
These problems are commonly caused by people's work	These problems are commonly caused by people's work	These problems are commonly caused by people's work
48. Have you ever heard or read about repetitive strain injury (RSI), work related upper limb disorder (WRULD) or cumulative trauma syndrome (CTS)? **[Appropriate terms may vary by country.]**	Have you ever heard or read about repetitive strain injury (RSI), work related upper limb disorder (WRULD) or cumulative trauma syndrome (CTS)?	Have you ever heard or read about repetitive strain injury (RSI), work related upper limb disorder (WRULD) or cumulative trauma syndrome (CTS)?
49. Below is a list of problems people sometimes have. Please read each one carefully and circle the number that best describes	Below is a list of problems people sometimes have. Please read each one carefully and circle the	Below is a list of problems people sometimes have. Please read each one carefully and circle the number that

HOW MUCH THAT PROBLEM HAS DISTRESSED OR BOTHERED YOU DURING THE **PAST 7 DAYS INCLUDING TODAY** *Circle only **one number** for each problem and do not skip any items*	number that best describes HOW MUCH THAT PROBLEM HAS DISTRESSED OR BOTHERED YOU DURING THE L**AST 7 DAYS INCLUDING TODAY** *Circle only **one number** for each problem and do not skip any items*	best describes HOW MUCH THAT PROBLEM HAS DISTRESSED OR BOTHERED YOU DURING LA**ST 7 DAYS INCLUDING TODAY** *Circle only **one number** for each problem and do not skip any items*
49a. Faintness or dizziness	Faintness or dizziness	Faintness or dizziness
49b. Pains in the heart or chest	Pains in the heart or chest	Pains in the heart or chest
49c. Nausea or upset stomach	Nausea or upset stomach	Nausea or upset stomach
49d. Trouble getting your breath	Trouble getting your breath	Difficulty breathing
49e. Numbness or tingling in parts of your body	Numbness or tingling in parts of your body	Numbness or tingling in parts of your body
49f. Feeling weak in parts of your body	Feeling weak in parts of your body	Feeling weak in parts of your body
49g. Hot or cold spells	Hot or cold spells	Hot or cold spells
50. These questions are about how you feel and how things have been with you **during the past month.** For each question, please give the one answer that best describes how things have been for you during the past month. How much of the time during the **past month**:	These questions are about how you feel and how things have been with you **during the past month.** For each question, please give the one answer that best describes how things have been for you during the past month. How much of the time during the **past month**:	These questions are about how you feel and how things have been with you **during the past month.** For each question, please give the one answer that best describes how things have been for you during the past month. How much of the time during the **past month**:

*Circle **one number** on each line*	*Circle **one number** on each line*	*Circle **one number** on each line*
50a. Were you a happy person?	Were you a happy person?	Were you a happy person?
50b. Have you felt calm and peaceful?	Have you felt calm and peaceful?	Have you felt calm and peaceful?
50c. Have you been a very nervous person	Have you been a very nervous person	Have you been a very nervous person
50d. Have you felt downhearted and low?	Have you felt downhearted and low?	Have you felt downhearted and low?
50e. Have you felt so down that nothing could cheer you up?	Have you felt so down that nothing could cheer you up?	Have you felt so down that nothing could cheer you up?
51. Over the past 12 months, on how many days in total have you been prevented from going to work because of	Over the past 12 months, on how many days in total have you been prevented from going to work because of	Over the past 12 months, on how many days in total have you been prevented from going to work because of
51a. A problem with your back, neck, shoulder, elbow, wrist, hand or knees	A problem with your back, neck, shoulder, elbow, wrist, hand or knees	A problem with your back, neck, shoulder, elbow, wrist, hand or knees
51b. other illness	other illness	other illness
Please fill in the date that you complete this form	***Kindly enter the date that you complete this form***	***Please write the date that you complete this form***
52. Please fill in your date of birth	Please fill in your date of birth	Please fill in your date of birth
53. *and* your sex	*and* your gender	*and* your gender
54a. Do you still have the same main job as when we last	Do you still have the same main job as when we last	Do you still have the same main job as when we last

questioned you about a year ago? If ***YES,*** please go to question 54. If ***NO,*** please continue	questioned you about a year ago? If ***YES,*** please go to question 54. If ***NO,*** please continue	questioned you about a year ago? If ***YES,*** please go to question 54. If ***NO,*** please continue
54b. Did you leave that job because of medical problems with your back, neck, shoulder, elbow, wrist, hand or knee?	Did you leave that job because of medical problems with your back, neck, shoulder, elbow, wrist, hand or knee?	Did you leave that job because of medical problems with your back, neck, shoulder, elbow, wrist, hand or knee?
54c. And do you have another job now?	And do you have another job now?	And do you have another job now?
55a. Have you had low back pain in the area shown below which lasted for more than a day at any time during the past month? *(Do not include pain associated only with menstrual periods, pregnancy or during a course of a feverish illness.)* If ***NO,*** please go to question 58. If ***YES***, please continue	Have you had low back pain in the area shown below which lasted for more than a day at any time during the past month? *(Do not include pain associated only with menstrual periods, pregnancy or during a course of a feverish illness.)* If ***NO,*** please go to question 58. If ***YES***, please continue	Have you had low back pain in the area shown below which lasted for more than a day at any time during the past month? *(Do not include pain associated only with menstrual periods, pregnancy or during a course of a feverish illness.)* If ***NO,*** please go to question 58. If ***YES***, please continue
55b. If you add together all the days on which you have had low back pain, during the past month, how long a period would that make?	If you add together all the days on which you have had low back pain, during the past month, how long a period would that make?	If you add together all the days on which you have had low back pain, during the past month, how long a period would that make?
56. During the past month, has low back pain at any time made it difficult or impossible to do any of the following	During the past month, has low back pain at any time made it difficult or impossible to do any of the following	During the past month, has low back pain at any time made it difficult or impossible to do any of the following

activities?	activities?	activities?
56a. Cutting your toe nails	Cutting your toe nails	Cutting your toe nails
56b. Getting dressed	Wearing clothes and shoes	To wear clothes and shoes
56c. Doing the jobs that you normally do around the house	Doing normal house chores	Doing routine house chores
57. During the past month on how many days has low back pain prevented you from going to work?	During the past month on how many days has low back pain prevented you from going to work?	During the past month on how many days has low back pain prevented you from going to work?
58. Within the past month, has the pain ever spread down your leg(s) to below the knee (sciatica)?	Within the past month, has the pain ever spread down your leg(s) to below the knee (sciatica)?	Within the past month, has the pain ever spread down your leg(s) to below the knee (sciatica)?
59a. Have you had pain in the neck in the area shown below which lasted for more than a day at any time during the past month? If ***NO*****,** please go to question 62. If ***YES***, please continue.	Have you had pain in the neck in the area shown below which lasted for more than a day at any time during the past month? If ***NO*****,** please go to question 62. If ***YES***, please continue.	Have you had pain in the neck in the area shown below which lasted for more than a day at any time during the past month? If ***NO*****,** please go to question 62. If ***YES***, please continue.
59b. If you add together all the days on which you have had neck pain, during the past month, how long a period would that make?	If you add together all the days on which you have had neck pain, during the past month, how long a period would that make?	If you add together all the days on which you have had neck pain, during the past month, how long a period would that make?
60. During the past month, has neck pain at any time made it difficult or impossible to do any of the following activities?	During the past month, has neck pain at any time made it difficult or impossible to do any of the following activities?	During the past month, has neck pain at any time made it difficult or impossible to do any of the following activities?

60a. Getting dressed	Wearing clothes and shoes	To wear clothes and shoes
60b. Doing the jobs that you normally do around the house.	Doing regular house chores	Doing routine house chores
61. During the past month on how many days has neck pain prevented you from going to work?	During the past month on how many days has neck pain prevented you from going to work?	During the past month on how many days has neck pain prevented you from going to work?
62a. Have you had pain in the shoulder in the area shown below which lasted for more than a day at any time during the past month? If ***NO***, please go to question 65. If ***YES***please continue	Have you experienced pain in the shoulder in the area shown below which lasted for more than a day at any time during the past month? If ***NO***, please go to question 65. If ***YES*** please continue	Have you experienced pain in the shoulder in the area shown below which lasted for more than a day at any time during the past month? If ***NO***, please go to question 65. If ***YES*** please continue
62b. If you add together all the days on which you have had shoulder pain, during the past month, how long a period would that make?	If you sum up all the days on which you have had shoulder pain, during the past month, how long a period would that make?	If you summarize all the days on which you have had shoulder pain, during the past month, how long a period would that make?
63. During the past month, has shoulder pain at any time made it difficult or impossible to do any of the following activities?	During the past month, has shoulder pain at any time made it difficult or impossible to do any of the following activities?	During the past month, has shoulder pain at any time made it difficult or impossible to do any of the following activities?
63a. Combing or brushing your hair	To brush the hair	To brush your hair
63b. Bathing/showering	To wash the body with water and soap	To wash the body with water and soap
63c. Getting dressed	Wearing clothes and shoes	To wear clothes and shoes
63d. Doing the jobs that you normally do around the house	Doing the normal house chores	Doing the routine house chores

64. During the past month on how many days has shoulder pain prevented you from going to work?	During the past month on how many days has shoulder pain prevented you from going to work?	During the past month on how many days has shoulder pain prevented you from going to work?
65a Have you had pain in the elbow in the area shown below which lasted for more than a day at any time during the past month? If ***NO,*** please go to question 68. If ***YES*** please continue.	Have you had pain in the elbow in the area shown below which lasted for more than a day at any time during the past month? If ***NO,*** please go to question 68. If ***YES*** please continue.	Have you had pain in the elbow in the area shown below which lasted for more than a day at any time during the past month? If ***NO,*** please go to question 68. If ***YES*** please continue.
65b. If you add together all the days on which you have had elbow pain, during the past month, how long a period would that make?	If you summarize all the days on which you have had elbow pain, during the past month, how long a period would that make?	If you sum up all the days on which you have had elbow pain, during the past month, how long a period would that make?
66. During the past month, has elbow pain at any time made it difficult or impossible to do any of the following activities?	During the past month, has elbow pain at any time made it difficult or impossible to do any of the following activities?	During the past month, has elbow pain at any time made it difficult or impossible to do any of the following activities?
66a. Opening bottles, jars or taps.	To open bottles, jars or taps.	To open bottles, jars or taps.
66b. Getting dressed	Wearing clothes and shoes	To wear clothes and shoes
66c. Doing the jobs that you normally do around the house	Doing the normal house chores	Doing the routine house chores
67. During the past month on how many days has elbow pain prevented you from going to work?	During the past month on how many days has elbow pain prevented you from going to work?	During the past month on how many days has elbow pain prevented you from going to work?
68a. Have you had pain in the	Have you had pain in the wrist	Have you had pain in the

wrist or hand in the area shown below which lasted for more than a day at any time during the past month? If ***NO,*** please go to question 71. If ***YES*** please continue	or hand in the area shown below which lasted for more than a day at any time during the past month? If ***NO,*** please go to question 71. If ***YES*** please continue	wrist or hand in the area shown below which lasted for more than a day at any time during the past month? If ***NO,*** please go to question 71. If ***YES*** please continue
68b. If you add together all the days on which you have had wrist/hand pain, during the past month, how long a period would that make?	If you add together all the days on which you have had wrist/hand pain, during the past month, how long a period would that make?	If you add together all the days on which you have had wrist/hand pain, during the past month, how long a period would that make?
69. During the past month, has wrist/hand pain at any time made it difficult or impossible to do any of the following activities?	During the past month, has wrist/hand pain at any time made it difficult or impossible to do any of the following activities?	During the past month, has wrist/hand pain at any time made it difficult or impossible to do any of the following activities?
69a. Writing	To write	To write
69b. Locking and unlocking doors	To close or open doors	To close or open doors
69c. Opening bottles, jars or taps	To open bottles, jars or taps	To open bottles, jars or taps
69d. Getting dressed	Wearing clothes and shoes	To wear clothes and shoes
69e. Doing the jobs that you normally do around the house	Doing the normal house chores	Doing the routine house chores
70. During the past month on how many days has wrist/hand pain prevented you from going to work?	During the past month on how many days has wrist/hand pain prevented you from going to work?	During the past month on how many days has wrist/hand pain prevented you from going to work?
71. Have you had pain in the knee in the area shown below which lasted for more than a	Have you had pain in the knee in the area shown below which lasted for more than a	Have you had pain in the knee in the area shown below which lasted for more than a

day at any time during the past month?	day at any time during the past month?	day at any time during the past month?
71a. Have you had pain in the knee in the area shown below which lasted for more than a day at any time during the past month? If ***NO,*** please go to question 74. If ***YES*** please continue	Have you had pain in the knee in the area shown below which lasted for more than a day at any time during the past month? If ***NO,*** please go to question 74. If ***YES*** please continue	Have you had pain in the knee in the area shown below which lasted for more than a day at any time during the past month? If ***NO,*** please go to question 74. If ***YES*** please continue
71b. If you add together all the days on which you have had knee pain, during the past month, how long a period would that make?	If you summarize all the days on which you have had knee pain, during the past month, how long a period would that make?	If you sum up all the days on which you have had knee pain, during the past month, how long a period would that make?
72. During the past month, has knee pain at any time made it difficult or impossible to do any of the following activities?	During the past month, has knee pain at any time made it difficult or impossible to do any of the following activities?	During the past month, has knee pain at any time made it difficult or impossible to do any of the following activities?
72a. Walking up and down stairs	To climb up and and down staircase	To climb up and and down stair
72b. Walking on level ground	Walking on level ground	Walking on level ground
72c. Getting dressed	Wearing clothes and shoes	To wear clothes and shoes
72d. Doing the jobs that you normally do around the house	Doing the jobs that you normally do around the house	Doing the jobs that you normally do around the house
73. During the past month on how many days has knee pain prevented you from going to work?	During the past month on how many days has knee pain prevented you from going to work?	During the past month on how many days has knee pain prevented you from going to work?
74. Below is a list of problems	Below is a list of problems	Below is a list of problems

people sometimes have. Please read each one carefully and circle the number that best describes HOW MUCH THAT PROBLEM HAS DISTRESSED OR BOTHERED YOU DURING THE **PAST 7 DAYS INCLUDING TODAY** *Circle only **one number** for each problem and do not skip any items*	people sometimes have. Please read each one carefully and circle the number that best describes HOW MUCH THAT PROBLEM HAS DISTRESSED OR BOTHERED YOU DURING THE **LAST 7 DAYS INCLUDING TODAY** *Circle only **one number** for each problem and do not skip any items*	people sometimes have. Please read each one carefully and circle the number that best describes HOW MUCH THAT PROBLEM HAS DISTRESSED OR BOTHERED YOU DURING THE **LAST 7 DAYS INCLUDING TODAY** *Circle only **one number** for each problem and do not skip any items*
a. Faintness or dizziness	Faintness or dizziness	Faintness or dizziness
b. Pains in the heart or chest	Pains in the heart or chest	Pains in the heart or chest
c. Nausea or upset stomach	Nausea or upset stomach	Nausea or upset stomach
d. Trouble getting your breath	Difficulty breathing	Difficulty breathing
e. Numbness or tingling in parts of your body	Lack of sensation in body parts	Lack of feeling in body parts
f. Feeling weak in parts of your body	Feeling weak in parts of your body	f. Feeling weak in parts of your body
g. Hot or cold spells	Hot or cold spells	Hot or cold spells
75. These questions are about how you feel and how things have been with you **during the past month.** For each question, please give the one answer that best describes how things have been for you during the past month. How much of the time during the **past month**:	These questions are about how you feel and how things have been with you **during the past month.** For each question, please give the one answer that best describes how things have been for you during the past month. How much of the time during the **past month**:	These questions are about how you feel and how things have been with you **during the past month.** For each question, please give the one answer that best describes how things have been for you during the past month. How much of the time during the **past month**:

*Circle **one number** on each line*	*Circle **one number** on each line*	*Circle **one number** on each line*
a. Were you a happy person?	Were you a happy person?	Were you a happy person?
b. Have you felt calm and peaceful?	Have you felt calm and peaceful?	Have you felt calm and peaceful?
c. Have you been a very nervous person?	Have you been a very nervous person?	Have you been a very nervous person?
d. Have you felt downhearted and low?	Have you felt downhearted and low?	Have you felt downhearted and low?
e. Have you felt so down that nothing could cheer you up?	Have you felt so down that nothing could cheer you up?	Have you felt so down that nothing could cheer you up?
76. Over the past 12 months, on how many days in total have you been prevented from going to work because of:	Over the past 12 months, on how many days in total have you been prevented from going to work because of:	Over the past 12 months, on how many days in total have you been prevented from going to work because of:
a. a problem with your back, neck, shoulder, elbow, wrist, hand or knees	A problem with your back, neck, shoulder, elbow, wrist, hand or knees	A problem with your back, neck, shoulder, elbow, wrist, hand or knees
b. other illness	other illness	other illness

Table 5: Summary of Words and Phrases Modified in Adapting the CUPID Q1 to Igbo culture and environment

Item	Original	Adapted
1	Please fill in	**Kindly write down**
2	**Sex**	**Gender**
3	ethnic origin	**Tribal identity**
4	How old were you and education	**Age and Schooling**
5	How tall are you	**What was your height**
6	Have you ever smoked regularly	Do you smoke regularly
7	What is your main occupation	What is your main Job position
8	Job	Work
9	normally work in this job	do you put in normally in this job
10	Use of keyboard	Handling of keyboard
11	hand	upper limb
13	Lifting	Carrying
14	Climbing flights of stairs	To climb staircase
15	Piecework and make or finish	Breakdown of work and complete
16	Working	To work
17	Choice in deciding	Do you decide
18	When you have difficulties in your work	When you **face** difficulties in your work
19	How satisfied	How contempt
20	Low back pain	Lower back pain
21	Getting dressed	Wearing clothes and shoes
22	Doing the jobs that you normally do around the house	Doing routine house chores
23	When your most recent episode of low back pain then started, how did it begin?	When you experienced the most recent episode of lower back pain, how was the onset?
24	Bathing/Showering	To wash the body with water and soap

25	Combing or brushing your hair	To use a brush for your hair
26	have had	experienced
27	how long a period would that make	what is the duration
28	add together	**Summarize**
29	a doctor or a medical person or alternative practitioner	consulted a health personnel or Traditional medicine practitioner
30	Writing	To write
31	Locking and unlocking doors	To close or open doors
32	PAST	L**AST**
33	Trouble getting your breath	Difficulty breathing
34	Numbness or tingling in parts of your body	Lack of sensation in body parts