An epidemiological investigation of low back pain in the white population of the greater eThekwini metropolitan area.

By

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Dissertation submitted in partial compliance with the requirements for the Master's Degree in technology: Chiropractic

Durban University of Technology

I, Brinique Ann Dyer, do declare that this dissertation is representative of my own work in both conception and execution (except where acknowledgements indicate to the contrary)

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19/03/12

Date

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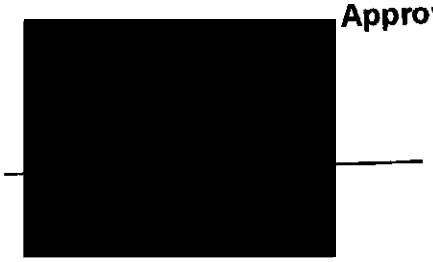

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DEDICATION

I dedicate this dissertation to
my parents,
Lynx, Jenny
and my brother Raefe Dyer.

Thank you for being my pillar of strength,
always believing that I could be anything and do anything
I put my mind to.
Through our journey together we have learnt - live like there is no tomorrow, never give up and have no regrets.

Thank-you, I am eternally grateful.

Acknowledgments

To my parents – thank you for all your love and support over the years. You are both such an inspiration to me and I could never have wished for better parents. I am the person I am today because of you and I will always be eternally grateful to have had you in my life. Thank you for your encouragement and devotion in everything I do.

To my brother Raefe – you are truly an amazing person who has protected and loved me unconditionally since the day you met me. I am so blessed to have you in my life.

To the love of my life Sean Dixon – you have stuck by my side through thick and thin. You have always believed I could succeed at anything I put my heart to. Your support and love has got me through - thank you.

To my family – I am the luckiest person in the world to have all of you. Thank you for your love and support. A special thanks to my Aunty Pat and Uncle Bruce, Arthur and Jill Mann, Beric Van Vliet, Dave and Aileen McHolm, Merle Hill, James and Barbara Dixon and Jessica Dicks.

My friends – I love you all dearly and I'm so glad I had a social network to keep me going throughout my course. The memories will be with me forever. You added colour and joy to my life.

Dr Charmaine Korporaal – thank you for all your guidance and assistance not only with my research but throughout my Chiropractic career. You have inspired me and I am extremely grateful to you for all the time you dedicated to me.

Dr Andrew Jones – for your time, effort, patience, guidance and from whom I have gained invaluable knowledge. Thank you.

Pat and Linda – thank you for guiding me through the clinic phase of my career, without you the clinic would just not have been the same.

Tonya Esterhuizen (Statistician) – your help with the statistical parts of my research has been amazing, thank you.

Thank you to those participants who willingly took part in my research.

Most importantly - I thank you God for all you love and guidance along the way, without you this journey would not have been possible.

Abstract

Background: Previous investigations on the epidemiology of low back pain (LBP) in South Africa where limited to black, indian and coloured populations to the exclusion of whites. Thus the aim of this study was to determine a LBP profile and an overview of risk factors in the white population in the eThekwini metropolitan area.

Objectives: These included documenting the point, period and lifetime prevalence of LBP, describing the characteristics of LBP, identifying the risk factors of LBP and assessing the effect on activities of daily living in the white population in the greater eThekwini metropolitan area.

Method: The three most densely populated white suburbs in the greater eThekwini metropolitan were chosen and classified according to income potential (high/middle/low income) to ensure a balanced sample. Six hundred white participants were used in the study having 200 white participants in each suburb. Statistical Program for the Social Sciences (SPSS) version 18.0 was used to analyse the data.

Results: The prevalence of LBP was recorded as follows: lifetime prevalence (48%), period prevalence from 0-3 months (21.3%), 6-12 months (18.3%), LBP longer than 12 months (7.8%) and lastly point prevalence was recorded at 34%. All prevalences were notably lower than international and previously published African norms. The majority of the participants who reported current LBP stated that their pain was moderate (54.3%) [only 14.9% had severe pain]. The worst pain occurred in the evening. Non-progression of LBP was reported by most participants (41%), while some participants reported worsening (35.2%) and only (18%) were getting better. Current pain with mild disability was most frequent at 51.8%, often associated with bending and lifting, which were reported as the highest offenders for causing LBP. Only 16.8% of all participants had to stay away from work due to LBP for any period. The demographics of the sample indicated that age had significant difference in predisposing to LBP (the high income (highest age) verse low income (lowest age)). The gender distribution showed higher prevalence of LBP in females (53.3%) and males (46.7%). The factors associated with LBP predisposition in some instances were at odds with the prevailing literature, indicating that further research is required on white population group in Africa.

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Definitions

Epidemiology

According to the Oxford Dictionary, (2003). This is the investigation of the prevelance, allotment, and management of infectious and non - infectious diseases in populations. For the purpose of this study the investigation involved determining the incidence and prevelance, and clinical characteristics of LBP in the white population of the greater eThekwini metropolitian area.

Incidence

Incidence is defined as the percentage of new people affected by a certain disease over a recent period of time by the Oxford Dictionary, (2003) so for the purpose of this study, this will represent recent low back pain (Haldeman, 2005).

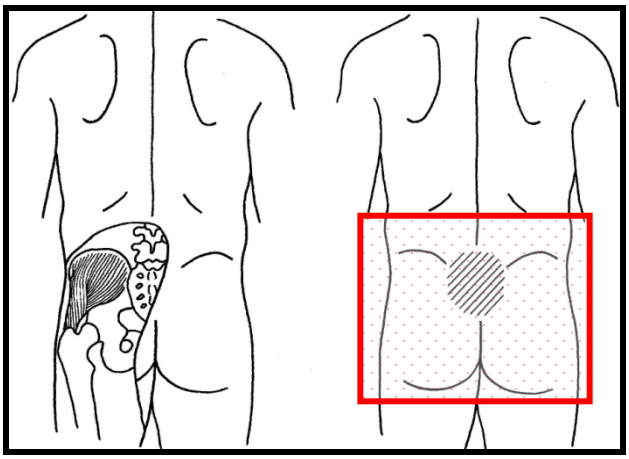
Low Back pain (LBP)

According to this study LBP is defined as “pain limited to the region between the lower margins of the 12th rib and the gluteal folds” (Galukande, Muwazi and Mugisa, 2005).

LBP definitions of high-quality studies

Author	**Definition of low back pain**
Dorland’s Illustrated Medical Dictionary	
Bezzaoucha 1992	Existence of pain in the lumbar region
Wallner-Schlotfedlt *et Al.,*2000	Pain in the lumbar region
Omokhodion 2002	Graphic representation of lumbar area
Govender 2004	Pain between the 12th rib and gluteal fold
Puckree *et al* 2004	Pain in specific region of the body
Prista *et al* 2004	Pain in the lumbar area

Fabunmi *et al* 2005	A condition of pain, aches, stiffness, or fatigue localized to lower back or lumbosacral region of spine
Jordaan *et al* 2005	Pain or discomfort in the lower part of your back
Bejia *et al* 2005	Mechanical pain of the lower part of your back
Galukande *et al* 2005	Pain limited to the region between the lower margins of the 12th rib and the gluteal folds
Bronfort *et al* 2010	Non- Specific LBP is defined as soreness, tension and/or stiffness in the lower back region for which it is not possible to identify a specific cause of pain.
Savigny *et al* 2009	Non- Specific LBP is defined as soreness, tension and/or stiffness in the lower back region for which it is not possible to identify a specific cause of pain.
(Adapted from Quinette *et al*., 2007 and Dorlands Illustrated Medical Dictionary, 1988).	



Gluteus1 [image], 1999. Available at: http://www.triggerpointbook.com/gluteu1.gif. [Accessed 8 September 2010]

Prevelance

The total percentage of persons affected by a certain disease in one population, therefore, for the purpose of this study this will represent the original LBP (Oxford Dictionary, 2003; Haldeman, 2005).

Point Prevelance

According to (Galukande, 2005), point prevelance is the measure of proportion of people in a population who have a disease / LBP condition at a particular time or present time. For, the purpose of this study has been researched in males and females.

1 Year / Period Prevelance

A proportion of a population with a given episode of LBP over a specific period of time/ 1 year period (Galukande , 2005). For the purpose of this study, data is obtained in males and females.

Life-time Prevelance

According to (Walker, 2000) lifetime prevelance is at least one episode of LBP in a lifetime in a specific population, for the purpose of this study this has been research in males and females.

Naprapathy

A Naprapath is a practitioner who is responsible for the evaluation of patients with connective tissue disorders through the use of a case history and palpation techniques. Treatment used by Naprapaths consist of connetcive tissue manipulation, therapeutic and reabiltative exercise, postural counselling, nutritionall counselling and the use of various physical modalities (eg hot, cold). In addition assisted devices for the purposes of preventing, correcting or aleviating physical disability maybe used.

(American Naprapathic Association, 2011)

Chapter One: Introduction

1.1 Introduction

LBP is a common musculoskeletal condition representing a global public health and socio-economic burden (Woolf and Pfleger, 2003; Dagenais *et al.*, 2008; Chen *et al.*, 2009; Coole *et al.,* 2010).

Nevertheless, a systematic review of the global LBP prevalence concluded that only 8% of studies were conducted in developing countries, of which only one was carried out in the 1990's Africa (Mulimba, 1990). This was noted as a result of the emphasis on infective disorders of the spine within the African context (Mulimba, 1990 and Walker, 2000). Since this date, a further study has been done at Mulago Hospital in Uganda that looked at prevalences and found that out of 204 patients, 62% had simple mechanical LBP with no other definable causative factors identifing the reason for LBP (Galukande *et al.*, 2005).

Table 1.1 Review of the epidemiology of LBP

Authors	Study type	Prevalence		Industrialised (developed) / Non industrialised (developing)	Region / Population
Frank *et al.,* (1998)	Epidemiological study	Lifetime	50% - 80%	Industrialised (developed)	General
Bovenzi (1996)	Intervention study	Lifetime	66.4% - 83.8%	Unknown	Country not specified tractor drivers and control drivers
		12 month	65.5 – 82.9 %		
		7 day	45.6% - 62.4%		
Hillman *et al.,* 1996)	Epidemiological study	Lifetime	59%	Unknown	Country not specified General*
		1-year	39%		
		Point	19%		
Van Der Meulen (1997)	Epidemiological study	Life time	57.6%	Non industrialised (developing)	South Africa
Cassidy *et al.,* (1998)	Epidemiological study	Lifetime	84%	Industrialised (developed)	Saskatchewan / Canada General
		6-month	69%		
		Point	29%		
Loney and Stratford (1999)	Review of literature	Lifetime	59% - 84%	Industrialised (developed)	Global General
		Point	14% - 29%		

Table 1.1 continued Review of the epidemiology of LBP (adapted from Raad, 2011).					
Authors	Study type	Prevalence		Industrialised (developed) / non industrialised (developing)	Region / population
Docrat (1999)	Epidemiological study	Lifetime	76.6% / 78.2%	Non industrialised (developing)	South Africa – Coloured and Indian populations respectively
Walker (2000)	Review of literature	Lifetime 11%-84%	1 Year 22-65%	Point 12%-33%	Investigate data homogeneity and appropriateness for pooling
Picavet and Schouten (2002)	Epidemiological study	12-month	44.4%	Industrialised (developed)	Netherlands Population unspecified
Waddell (2004)	Epidemiological study	Lifetime	50% - 80%	Industrialised (developed)	USA General
Galukande *et al.*, (2005)	Incidence study	Point	20%	Non industrialised (developing)	Uganda Hospital based
Van Vuuren *et al.,* (2005)	Epidemiological study	Lifetime	64%	Non industrialised (developing)	South Africa
		1-year	56%		
		Point	36%		
Ghaffari (2006)	Epidemiological study	1-year	65% and 46% respectively	Industrialised (developed)	UK / Sweden General
Louw, Morris and Grimmer-Somers (2007)	Review of literature	Lifetime	36% - 62%	Non industrialised (developing)	African (general)
		1-year	14% - 72 %		
		Point	32%		
Dagenais *et al.*, (2008)	Review of literature	Lifetime	5% - 65%	Industrialised (developed)	Global General
		2- week	15%		
Bell and Burnett (2009)	Review of literature	Lifetime	60% - 90%	Industrialised (developed)	Global Specific occupations, mostly labour intensive
Helfenstein Junior *et al.,* (2010)	Review of current knowledge of LBP	Lifetime	50% - 80%	Industrialised (developed)	General Population

Thus, the data currently available seems to suggest that there are differences in prevalence figures between developed and developing countries (Table 1.1), with the developing countries seeming to have a slightly lower prevalence at the various time points than developed countries. However with the paucity of literature available on LBP in developing countries (Morris, 2006), it is difficult to draw a strong comparison.

Therefore, it cannot be assumed that the prevalence of LBP in the white population of South Africa is similar to established global trends.

In South Africa Shierhout *et al*., (1993) and Jordaan *et al*., (2005) [cited in Table 1.1. under the systematic review by Louw *et al*., 2007], indicated similar prevalences of LBP when compared to studies isolated to the greater eThekwini metropolitian area (van der Meulen, 1997; Docrat, 1999). The first of these studies was conducted by van der Meulen (1997) who found that the lifetime incidence of LBP in the black population of Chesterville was 57.6%. In the second study conducted by Docrat (1999), a comparison in the prevelance of LBP in the coloured (76.6%) and indian (78.2%) communites of eThekwini revealed that LBP was experienced in more than three quarters of that population. These limited studies demonstrate a paucity of literature with respect to LBP and its attributes within the South African context; and seem to suggest that the even though there is evidence to suggest a lower prevalence rate on the African continent, it has been indicated that LBP (Woolf and Pfleger, 2010) has a greater prevalence and incidence in Africa.

This contrast between developed and non-developed countries has an impact on the expediture metered out on LBP in the general health care system globally. (Bildt Thorbjornsson *et al*., 2000). This expenditure was observed in the Netherlands (2001) in which musculoskeletal conditions were rated as the most expensive condition relating to work absenteeism which amounted to a cost of US$3.1 billion and a disablement cost of US$1.5 billion, indicating this condition cost the Netherlands government US$4.6 billion. This is in agreement with Hart *et al*., (1995), Woodwell and Cherry (2004) who noted LBP as the third most commonly reported symptom, the second most frequent cause of worker absenteeism (Guo *et al*., 1999) and the most costly ailment of working age adults in the United States of America. There is limited research in South Africa pertaining to the cost of musculoskeletal conditions, and no research has highlighted ethnic differences in the cost of LBP.

Therefore, this study aimed to determine the prevalence and risk factors of LBP in the white population of greater eThekwini metropolitan area.

Within the context of LBP literature predisposing factors influence the nature of this musculoskeletal condition. Research conducted by Mirtz and Greene (2005) suggest that individuals with a Body Mass Index (BMI) of less than 30 have a minimal chance of developing LBP, while individuals with a BMI of greater than 30 have a greater chance. If individuals have a BMI of greater than 40, LBP and osteoarthritis are strongly indicated sequelae (Melissas, 2003). Therefore, assessing weight verses height gives a clear indication of the magnitude of increased BMI and the possibility of this phenomenon predisposing individuals to LBP. Obesity has become an epidemic worldwide and has a strong link to coronary heart disease and diabetes mellitus. According to Buckwalter, Goldberg and Woo (1993) the aging process and obesity causes a deterioration of the pathophysiology of ligaments and tendons therefore leading to LBP. Research carried out by Wulan *et al*., 2010, compared metabolic differences and abdominal obesity in indian and white adolescents and found osteoarthritis relating to neck pain was more prevalent in the indian population. Therefore, this study aims to determine if this risk factor is identical in LBP in the white population of greater eThekwini metropolitan area.

The prevalence and development of LBP in women in the postpartum period has increased due to epidural anaesthesia (Macleod *et al*., 1995), but according to (Groves *et al*., 1995) there was no significant relationship. Thus, this research aims to further study this phenomenon in the white population of the greater eThekwini metropolitan area.

Smoking is another significant risk factor related to LBP (Harreby *et al*., 1996; Vindigni *et a*l., 2005; Skillgate *et al.,* 2007). Frymoyer *et al*., (2011), found that 39.6% of asymptomatic men and 53.0% of LBP individuals were cigarette smokers.

Coughing was reported to be linked to LBP as it increased the intra-discal pressure and smoking had a physiological effect on the spine (Frymoyer *et al*., 2011). This study aims to investigate if smoking predisposes to LBP in the white population of greater eThekwini metropolitan area.

Physical load while lifting, carrying, bending and twisting, age, whole body vibration and education were indicated as influencing LBP (Burdorf and Sorock, 1997). Bildt Thorbjornsson *et al.*, (2000), found that over a 24 year time frame social relations, sedentary work and physical load had a strong link to the prevalence of LBP in both genders. In addition, research done by Crook *et al.*, (2002), found that a history of LBP due to work occupation was a risk factor for the increase in disability and future occurrences of LBP. Further literature is essential to establish preceding injury profiles as this is a contributing factor to LBP (Dempsey *et al.,* 1997).

The risk factors listed above have been researched in other ethnic groups within the South African context but no literature has been recorded in the white population of South Africa. According to Green *et al*., (2003) and Portenoy (2004), different ethnic groups experience pain differently and it is for this reason, that the current study has been proposed. Prevalence of LBP in black South Africans in the town of Chesterville recorded (53,1%), indian South Africans (45,0%) and the coloured South African ethnic groups (32,6%) validate that there may be a difference compared to the white population of greater eThekwini metropolitan area.

1.2 Aims and Objectives of the study

The aim of this study was to determine the prevalence of and risk factors for LBP in the white population of the greater eThekwini metropolitan area.

The following were the objectives for the study:

- To determine the point, period and lifetime prevalence of LBP in the white population of greater eThekwini metropolitan area.
- To describe the characteristics of LBP in this population.
- To identify the risk factors that influences the prevalence of LBP in this population.
- To assess the effect of LBP on activities of daily life and productivity in this population.

1.3 Rationale for the study

There is a paucity of literature documenting LBP in the assessed white adult population in Africa, with:

- Schierhout *et al*., (1993) researched factory workers.
- van der Meulen (1997) observed the indigenous South African population.
- Docrat (1999) investigated the coloured and indian South African populations.
- Jordaan *et al*., (2005) having looked at scholars.

In addition to the above there is a paucity of literature regarding prevalence of LBP in developing countries (Table 1.1), Morris (2006) and Shola Orloff, (1993), seem to indicate that industrialisation and increased automation has a negative impact on LBP and its presentation, due to the increased need for people to be less active and mobile. There is insufficient data documented in the white population and their demographics - It therefore, cannot be assumed that the results obtained from the white population in greater eThekwini metropolitan area would be identical to those from populations outside eThekwini.

Therefore research such as this begins to provide empirical evidence of the prevalence and risk factors regarding LBP within the context of one ethnic group (white population) within one African city in the greater eThekwini metropolitan area.

The data developed through this research would therefore assist in determining the prevalence, risk factors and characteristics of LBP in the white population in the greater eThekwini metropolitan area. This will help the health care sector by providing a profile on LBP (Dagenais *et al*., 2008). Furthermore, this study will benefit healthcare practitioners in understanding the predisposing factors for LBP in the white population and thus highlight the enormity of the problem to Department of Health, in the hopes that increased funds can be released to further prevent the progression of LBP (Woolf and Pfleger, 2003; Dagenais *et al.*, 2008; Chen *et al.*, 2009; Coole *et al.,* 2010).

1.4 Limitations of the study

Participants in this study were asked to be honest and open when answering the questionnaire to help reflect the true nature of their LBP ((Mouton 1996; Dyer 1997). However, it is recognised that the participants may also suffer from “memory decay” (Mouton 1996; Dyer 1997; Mouton 2002), which could have negatively impacted on the results of this study

1.5 Conclusion

Following this introduction, Chapter Two will highlight the literature review reflecting the background of LBP. Chapter Three will present the research design which consists of data collection, method and data analysis. The statistical findings and the discussion surrounding this research will be covered in Chapter Four. Chapter Five will cover the conclusion to this research.

Chapter Two: Literature Review

2.1 Introduction of the lumbar spine

This chapter highlights the functional anatomy of the lumbar spine and provides a summary of LBP in the various populations. The functional anatomy will include osseous structures, articulations and ligaments, neural structures, blood supply and muscle distribution. The summary of LBP will present epidemiology, aetiology, presentation, treatment and management.

2.2 Anatomy of the lumbar spine

Anatomically, the extent of the back comprises of the posterior aspect of the trunk, inferior to the neck and superior to the buttocks (Moore and Dalley, 1999). In contrast, the gluteal region extends from the superior buttocks (level of the iliac crests to the gluteal fold (which separates the thigh from the buttock inferiorly) (Moore and Dalley, 1999; Standring, 2008). Considering these two anatomical definitions, the clinical definition for the low back is that which lies between the 12^{th} rib superiorly and the inferior gluteal fold, thus incorporating the inferior aspects of the back and the entire gluteal region (Anderson, 1997; Galukande *et al*., 2005).

2.2.1 Osseous structures

In the low back region the skeletal structure of the low back consists of five lumbar vertebrae, the sacrum, the coccyx as well as the two os coxa (consisting each of the ischium, ilium and pubis) (Standring, 2008).

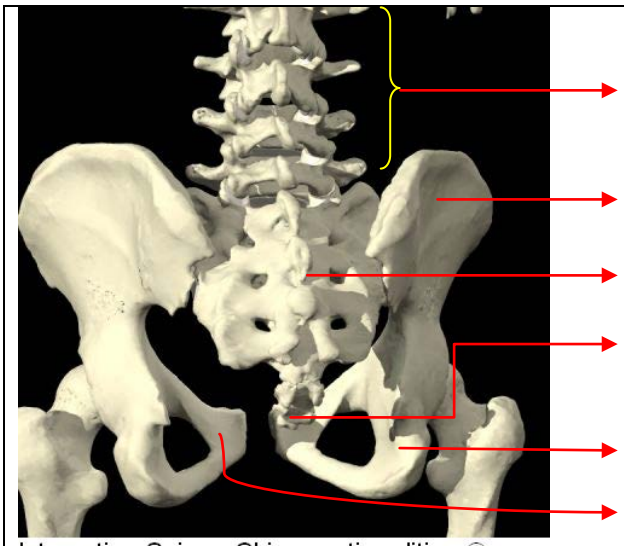


Figure 2.1. Osseous structures of the low back (Reprinted with permission from Primal Pictures, 2003).

2.2.1.1 Lumbar vertebrae

These are composed of anterior and posterior (neural arch) vertebral elements (Bogduk and Twomey, 1987; Haldeman, 2005). The anterior elements include the vertebral body and the bilateral pedicles, whereas the posterior elements consist of the bilateral transverse processes, laminae, superior and inferior articular processes as well as centrally placed spinous process (Bergmann *et al*., 1993; Clancy and McVicar, 2002; Standring, 2008; Beck, 2009; Bergmann and Peterson, 2011).

Of the posterior elements, the spinous process is a broad short centrally bony process that is formed by the union of the two laminae. Its main function is to act as a lever in terms of spinal motion and secondly it serves as a point of attachment for many of the back muscles (see table 2.2.3) (Bergmann *et al*., 1993; Morris, 2006; Bergmann and Peterson, 2011). The laminae are thick, broad bony connectors between the bases of the transverse processes and the pars interarticularis and the spinous process. They are divided into two parts, the caudal portion to which the superior aspect of ligamentum flavum attaches and the cephalad portion to which the inferior portion of ligamentum

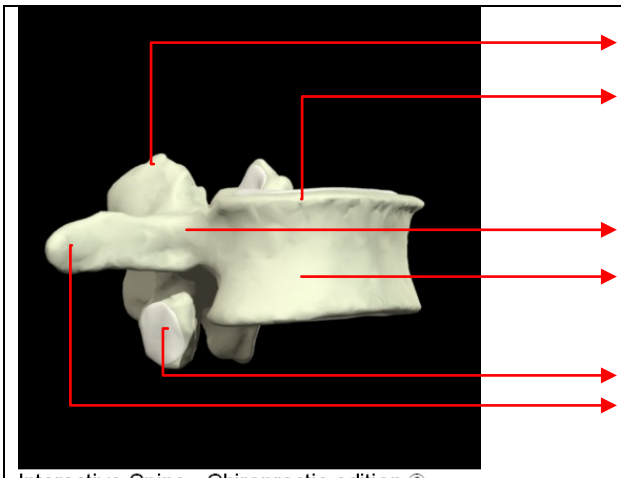
flavum attaches. Anteriorly, the laminae are continuous with the respective pars interarticularis / isthmus which are located bilaterally postero-inferiorly to the pedicle and between the superior and inferior articular processes (Bergmann *et al*., 1993; Marchiori, 1999; Morris, 2006; Bergmann and Peterson, 2011).

The articular processes are divided into superior articular surface (superior to the pars interarticularis) that has a concave inferior articulating facet facing postero-medially, whereas the inferior articular surface has a convex and antero-laterally inclined superior articulating facet (Ebraheim *et al*., 2004; Haldeman, 2005; Morris, 2006).

The connector between the posterior and anterior elements of the lumbar vertebrae are the short pedicles, which are inclined medially are increasingly consistent in size from L1 - L5, as the weight bearing function of the vertebral structures increases (Marchiori, 1999; Ebraheim *et al*., 2004).

In terms of the anterior elements of the lumbar vertebrae, the lumbar vertebral bodies are significantly heart-shaped and the superior surface is wider transversely and its spinal canal progresses to a triangular shape at the level of L5 (Moore and Dalley, 2005). Similarly the progression from L1 - L5 indicates increased weight bearing as the L1 is the smallest of the vertebrae and L5 is the largest (Marchiori, 1999; Morris, 2006).

Based on the above description the lumbar spine is the largest and most movable of the spine (Ebraheim *et al*., 2004).



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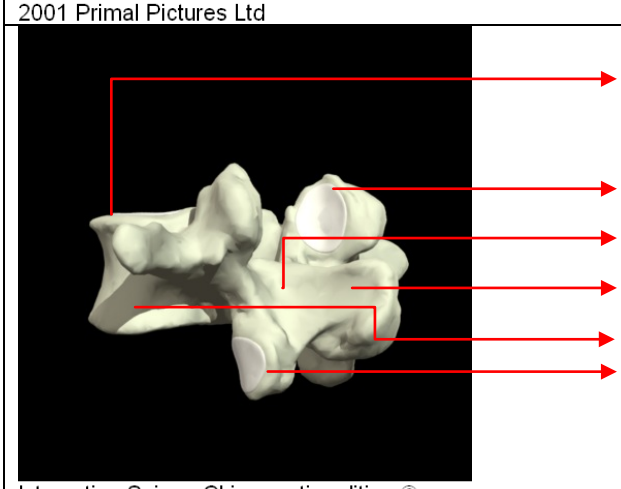
Superior articulating process

Superior surface of the vertebral body

Region of the pars
Vertebral body

Inferior articulating process
Transverse process



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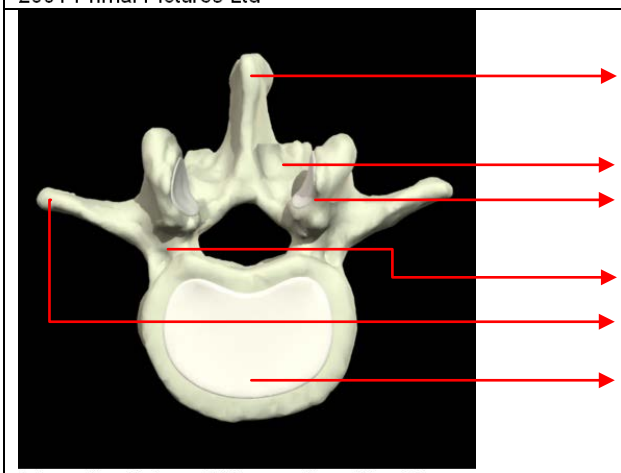
Superior surface of the vertebral body

Superior articulating facet
Lamina

Spinous process
Vertebral body
Inferior articulating facet



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Spinous process

Lamina
Superior articulating facet

Pedicle
Transverse process

Region of the disc on the vertebral body

Figure 2.2. Lumbar vertebrae : Osseous structure. (Adapted from Ebraheim *et al*., 2004; Primal Pictures, 2001).

2.2.1.2 The Sacrum

This is a triangularly shaped bone that is found at the base of the spine (Harrison, Harrison and Troyanovich, 1997), where it is wedged between the ischial portions of the os coxae bilaterally (Bergmann, 1993; Marchiori, 1999; Morris, 2006; Bergmann and Peterson, 2011). In this position the base of the sacrum articulates with the L5 vertebral body and L5 inferior articulation processes, whereas its apex articulates with the coccyx inferiorly. It is characterized by the fusion of the five sacral vertebral bodies, and therefore, usually has four sacral foramina on each side of the centrally placed median sacral crest (rudimentary spinous processes). The last foramen (bilaterally) may be formed by a combination of the superior coccygeal cornua as they approximate the sacrum inferiorly and the inferior aspect of the sacrum (inferior sacral cornua) (which is variable as the size and shape of the cornua vary from person to person) (Marchiori, 1999; Moore and Dalley, 1999; Morris, 2006). There is also a sacral foramen at the apex of the sacrum (Bergmann *et al*., 1993; Bergmann and Peterson, 2011).

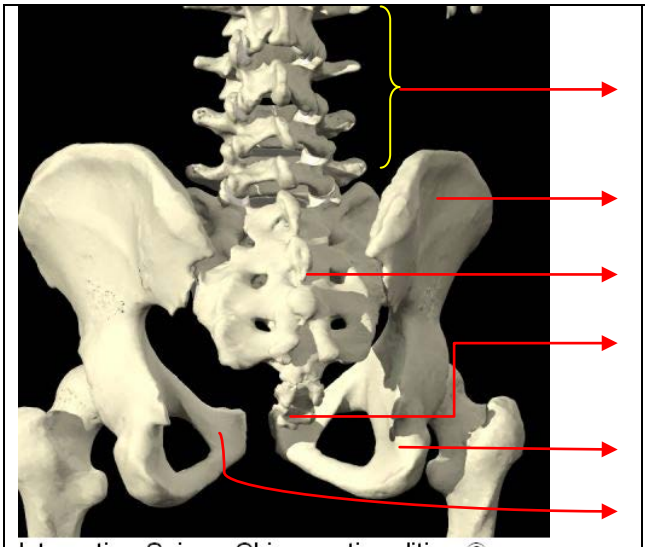


Figure 2.3. Osseous structures of the low back. (Reprinted with permission from Primal Pictures, 2003).

2.2.1.3 The Os coxae

These are the two “pelvic bones” or innominate bones (Bergmann *et al*., 1993; Bergmann and Peterson, 2011) that are found on either side of the sacrum and are constituted by the ilium, ischium and pubic bones (Moore and Dalley, 1999; Morris, 2006; Standring, 2008). Their function is to transfer the weight of the body from the spine to the femoral bones bilaterally (Bergmann *et al*., 1993; Bergmann and Peterson, 2011). To this end:

- the ilium is responsible for muscle attachments and stabilization of the of the pelvic ring as well as the initial transfer of weight from the spine to the pelvis, via the sacroiliac joint (Moore and Dalley, 1999; Morris, 2006);
- the ischium is responsible for the transfer of weight from standing to sitting, as well as being an attachment for the lower limb muscles and (Moore and Dalley, 1999; Morris, 2006);
- the pubic bones close the pelvic ring and ensure pelvic stability as well as being an attachment point for several of the lower limb muscles (Moore and Dalley, 1999; Morris, 2006).

All three (the ilium, ischium and pubis) meet to form the acetabulum or acetabular fossa (one on each side), for articulation with the femur to form the anatomical hip joint (Standring, 2008). This combination is for the transfer of weight from the spine through the ilium to the femur (standing), from the ischium to the femur (sitting) and from the pubis to the femur (in instances such as pregnancy) (Bergmann *et al.,* 1993; Hendler *et al.*, 1995; Bergmann and Peterson, 2011).

2.2.2 Articulations and Ligaments

2.2.2.1 Three joint complex

Structures within the three joint complex of the lumbar spine include the intervertebral disc (IVD) and the two zygopophyseal joints that are found between each of two successive vertebrae (Gatterman, 1995) otherwise known as a motion segment (Haldeman, 2005) or functional unit (Bergmann *et al.,* 1993; Bergmann and Peterson, 2011). Firstly, the IVD is an avascular structure that contains a central nucleus pulposus and annulus fibrosis and is thus well suited for both weight bearing as well as mobility (Bergmann *et al*., 1993; Bergmann and Peterson, 2011). The nucleus pulposus is made up of 70-90 percent mucoid substance allowing it to be the shock absorber in the disc (Bergmann *et al.,* 1999; Bergmann and Peterson, 2011), whereas the lamellae are responsible for restricting motion of the motion segment due to their orientation (Bogduk and Twomey, 1987; Moore and Dalley, 1999, Leach, 2004; Ebraheim *et al*., 2004). The intervertebral disc is re-inforced anteriorly by the anterior longitudinal ligament and posteriorly by the posterior longitudinal ligament (Moore and Dalley, 1999; Ebraheim *et al*., 2004; Standring, 2008).

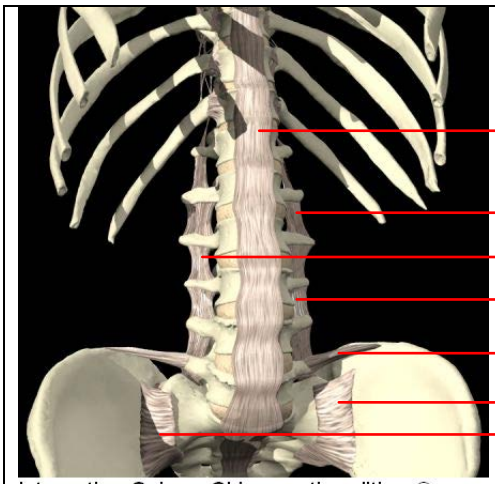


Figure 2.4. Ligamentous structures of the low back : anterior. (Reprinted with permission from Primal pictures, 2003).

The second part of the three joint complexes, are the zygopophyseal or facet joints (Bergmann *et al*., 1993; Haldeman, 2005; Bergmann and Peterson, 2011). These synovial joints are characterized by a synovial capsule, synovial membrane, synovial fluid and hyaline cartilage, which covers the articular surfaces and may or may not contain meniscoids or menisci (Moore and Dalley, 1999; Standring, 2008). These characteristics make the joint suitable for movement in any of the cartesian planes (Bergmann *et al.,* 1993; Bergmann and Peterson, 2011), limited only by the facet structure and bony development of the joint. The capsule is re-inforced anteriorly by the ligamentum flavum (Ebraheim *et al*., 2004) and posteriorly there is no re-inforcing ligamentous structure, although stretch of the capsule is limited by the supraspinous and interspinous ligaments (Moore and Dalley, 1999; Ebraheim *et al*., 2004)

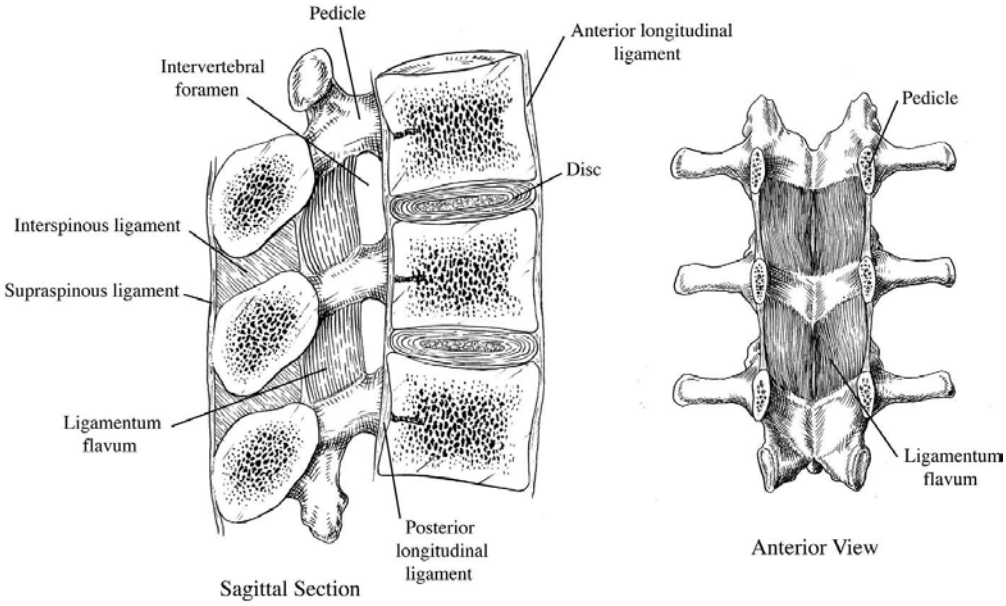


Figure 2.5. The sagittal section and anterior view of the lumbar ligaments. (Adapted from Ebraheim *et al.,* 2004).

The sacroiliac joint, however, is supported by the anterior and posterior sacroiliac ligaments (Hendler *et al.,* 1995; Harrison, Harrison and Troyanovich, 1997) as well as interosseous ligaments that lie within the joint (Kirkaldy Willis and Burton, 1992; Harrison, Harrison and Troyanovich, 1997; Moore and Dalley, 1999). At the inferior

most point or sacral apex, the coccyx is stabilized by the anterior and posterior sacro-coccygeal ligaments (Moore and Dalley, 1999; Standring, 2008).

The base of the spine is stabilized on the sacrum by the iliolumbar ligaments, a bilateral ligament that runs from the transverse process of L5 to the ilium (iliac crest) and blending inferiorly with the anterior sacroiliac ligament (Kirkaldy Willis and Burton, 1992; Standring, 2008). Inferiorly, the sacrum is tethered by the sacrotuberous and the sacrospinous ligaments, which anchor themselves on the ischial tuberosity and the ischial spine respectively (Moore and Dalley, 1999; Standring, 2008). The last stabilizer of the pelvic ring is the pubic symphysis that connects the pubic rami from each of the two os coxae, ensuring that the pelvis ring is closed (Standring, 2008). All ligaments serve to stabilize the pelvic ring in order to facilitate its main function of weight transfer and an anchor for the movement of the lower limbs and the trunk (Snijders, Vleeming and Stoeckart, 1993; Harrison, Harrison and Troyanovich, 1997).

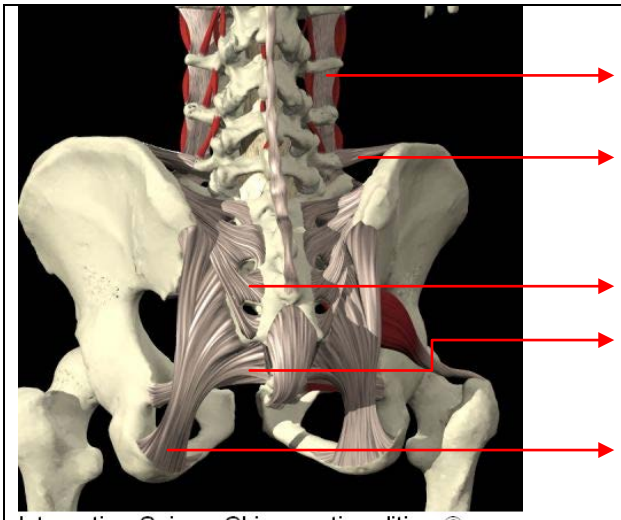


Figure 2.6. Ligamentous structures of the low back: posterior (Reprinted from Primal pictures, 2003).

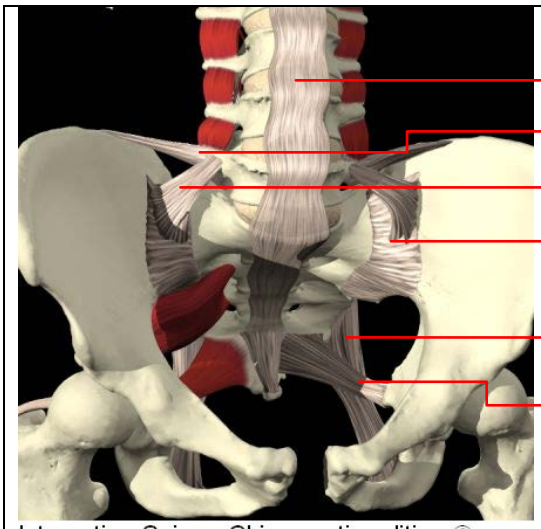


Figure 2.7. Ligamentous structures of the low back: pelvic. (Reprinted with permission from Primal pictures, 2003).

2.2.3 Muscles of the low back

Table 2.1: Muscles influencing the lumbar spine

MUSCLE	ORIGIN	INSERTION	INNERVATION
External Oblique	External surfaces and inferior borders of 5^{th}-12^{th} ribs.	Linea alba in midline, pubic tubercle and anterior half of iliac crest.	Inferior 6 thoracic nerves and subcostal nerve.
Internal Oblique	Lateral half of the inguinal ligament, the anterior two-thirds of the iliac crest and thoracolumbar fascia.	Cartilages of the 10^{th}-12^{th} ribs, linea alba and pubis through the conjoined tendon.	Ventral rami of inferior 6 thoracic nerves and the first lumbar nerves.
Multifidus	Base of a vertebral spinous process	Fibers cross 2-4 segments throughout the thoracic and lumbar spine and attach to a transverse process.	Dorsal primary rami of spinal nerves. The lumbar multifidi are arranged so that fibres moving a particular segment are innervated by the nerve of that segment.
Rectus Abdominus	Pubic crest and pubic symphysis.	Costal cartilage of the 5^{th}-7^{th} ribs and xiphoid process.	Ventral rami of inferior 6 thoracic nerves.
Quadratus lumborum	Medial half of inferior border of 12^{th} rib and the tips of the first four lumbar transverse processes.	Internal lip of iliac crest and iliolumbar ligament.	Branches of lumbar plexus arising from T12 and L1-L4 spinal nerves.
Transversus abdominus	Lateral third of the inguinal ligament, iliac crest, thoracolumbar fascia and the internal surfaces of 7^{th}-12^{th} costal cartilages.	Midline linea alba via the rectus sheath and to the pubis through the conjoined tendon.	Branches from the 8^{th}-12^{th} intercostals nerves innervate the transversus abdominus as well as the first lumbar nerves.

(Table 2.2. Compiled from Moore and Dalley, 1999; Travell and Simons, 1999; Campbell, 2007).

Below Mior, Ro and Lawrence (1999) and Matkovich (2004) divided the muscles responsible for stabilising the sacroiliac joint into three main groups:

Table 2.2

MUSCLES	ORIGIN	INSERTION	CAUSING MOVEMENT OF	RESULTANT SACROILIAC MOVEMENT
Group One: Erector spinae, Multifidus, Rectus abdominus.	*Erector spinae* The anterior surface of a thick tendon is attached to the - medial aspect of the sacrum; - spinous processes of the eleventh and twelfth thoracic and upper lumbar vertebrae and the supraspinous ligament - posterior aspect of the inner lip of the iliac crests and - sacrum, where it blends with the sacrotuberous and posterior sacroiliac ligaments.	It inserts through musculo-tendinous fibres into the - upper four lumbar and lower eight thoracic vertebrae. The superficial part corresponds to the iliocostalis lumborum and upper part of the longissimus thoracis. The deep part corresponds to the lower part of the longissimus thoracis.	Vertebral column (involvement of each of the three axis reference points).	Sacral motion.
	Multifidus muscle originates at the base of the vertebral spinous process.	Fibers cross 2-4 segments in the thoracic and lumbar spines and attach to a transverse process.		
	The *rectus abdominus* inserts into the pubic symphysis/pubic crest inferiorly.	Inserts into the xiphisternum / xiphoid process and lower costal cartilages (5–7th) superiorly.		
Group Two: Iliopsoas, Gluteus maximus, Piriformis, Hamstrings Sartorius.	*Illiopsoas* is made up of 3 portions. *Psoas major* originates along the lateral surfaces of the vertebral bodies of T12 and L1-L5 and their associated intervertebral discs. The *Psoas minor* originates at the transverse processes of L1-L5. The *Iliacus* originates in the Iliac fossa of the false pelvis.	*Psoas major* unites with *iliacus* at the level of the inguinal ligament and crosses the hip joint to insert on the lesser trochanter. The *Psoas minor* inserts at the iliopectineal arch (the thickened band at the iliac fascia which separates the muscular lacuna from the vascular lacuna femoral nerve, L1, L2).	Ipsilateral thigh.	Iliac motion.

MUSCLES	ORIGIN	INSERTION	CAUSING MOVEMENT OF	RESULTANT SACROILIAC MOVEMENT
Group Two: Iliopsoas, Gluteus maximus, Piriformis, Hamstrings Sartorius	*Gluteus maximus* muscle arises from the posterior aspect of the ilium lower down from the posterior aspect of the sacrum.	It inserts at the gluteal tuberosity of the femur and iliotibial band (ITB).	Ipsilateral thigh.	Iliac motion.
	Piriformis arises from the anterior aspect of the sacrum and the superior margin of the greater sciatic notch.	It exits the pelvis through the greater sciatic foramen to insert on the greater trochanter.		
	Hamstrings / Sartorius. The hamstrings are comprised of three muscles. *Semitendinosus* muscle and the *Semimembranosus* muscle attach proximally to the ischial tuberosity. The *Biceps Femoris* attached to the Long head: ischial tuberosity, Short head: linea aspera and lateral supra condylar line of the femur.	*Semitendinosus* attaches to the medial surface of the superior part of the tibia. *Semimembranosus* attaches to the posterior part of the medial condyle of the tibia; reflected forms oblique popliteal ligament (to lateral femoral condyle). *Biceps Femoris* - lateral side of the head of the fibula; tendon is split at this site by fibular collateral ligaments of the knee.		
Group Three: Erector spinae, Rectus abdominus.	As above.	As above.	Pelvis (x-axis rotation).	Iliac motion.
Group Three: Erector spinae, Multifidus.	As above.	As above.	Pelvis (z-axis rotation).	

2.2.4 Blood Supply and neural structures / innervation of the motion segment

2.2.4.1 The motion segments of the lumbar spine

The motion segment (Bergmann *et al.,* 1993; Haldeman, 2005; Bergmann and Peterson, 2011) is supplied by the segmental branches of the spinal cord, known as nerve roots. These nerve roots exit the vertebral canal through the intervertebral foramen of the motion segment that they supply. The anterior elements of the motion segment are supplied by the anterior or ventral ramus whereas the posterior elements are supplied by the posterior or dorsal ramus (Moore and Dalley, 1999; Cramer and Darby, 2010).

The lumbar zygopophyseal joints' innervation comes from the medial branch of the dorsal primary rami of the spinal nerves (Cramer and Darby, 2010). Each articular branch supplies two adjacent joints, thereby supplying each joint with two nerves (Giles and Singer, 1997; Moore and Dalley, 1999). Based on Hilton's law, the related connective tissue, muscles, skin and ligaments over a joint are supplied by the nerves to that joint. This implies that the neurological input and output of the joint will affect the surrounding structures and vice versa (Giles and Singer, 1997; Cramer and Darby, 2010). This is supported by the fact that the median and lateral branches of the dorsal primary ramus supply the overlying musculature of the back, associated ligaments and vascular structures (Moore and Dalley, 1999; Standring, 2008; Cramer and Darby, 2010).

With this innervation, the zygopophyseal joints have four types of sensory receptors (Leach, 1994; Gatterman, 1995; Leach, 2004; Cramer and Darby, 2010):

Type: I Globular corpuscles in the outer layers of the fibrous capsule. Very sensitive static and dynamic mechanoreceptors that continually fire even when the joint is not moving.

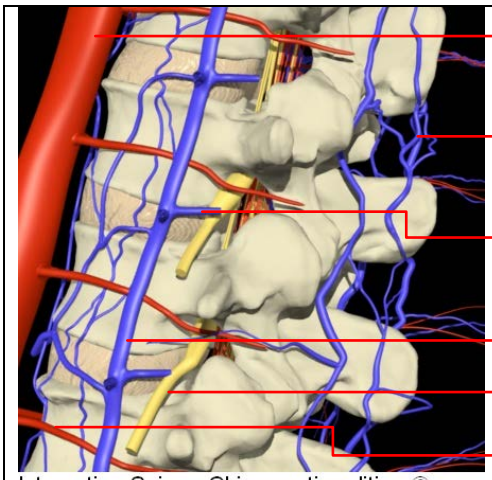
Type: II Conical corpuscles in the deeper layers of the fibrous capsule. Less sensitive mechanoreceptors that fire only during movement.

Type: III Larger corpuscles on the surface of the joint ligaments, thinly encapsulated mechanoreceptors.

Type: IV Unmyelinated nerve fibers that weave throughout the capsule. Slow conducting nociceptive mechanoreceptors.

Unlike the anterior and posterior elements discussed at the beginning of this Chapter, the internal structures within the motion segment (viz. those within the vertebral canal) are usually supplied by the recurrent meningeal nerve / sinuvertebral nerve, which is a branch of the nerve root as it exits through the intervertebral foramen (Moore and Dalley, 1999; Cramer and Darby, 2010).

All these neurological structures and their receptors are often thought to be the origin of LBP, especially when they are stimulated by noxious stimuli (Kirkaldy Willis and Burton, 1992; Standring, 2008; Cramer and Darby, 2010). The blood supply and venous drainage of the motion segment are directly from the aorta or to the inferior vena cava by means of the lumbar arteries and veins respectively (Moore and Dalley, 1999; Standring, 2008). Each of these arterial and venous systems have vessels that run with the nerves that supply the various structures of the motion segment (Standring, 2008).



Aorta

External vertebral venous plexus

Lumbar vein

Ascending lumbar vein

Segmental radicular nerve (spinal nerve)

Lumbar artery

Figure 2.8 Arterial and venous structures. (Reprinted with permission from Primal pictures, 2003).

2.2.5 The innervation of sacroiliac joints

The articular branches to the sacroiliac joints are derived from the superior and inferior gluteal nerves bilaterally, the sacral plexus and the dorsal rami of S1 and S2 (Ombregt, *et al.,* 1995; Moore and Dalley, 1999; Standring, 2008). The posterior aspect of the sacroiliac joint is principally supplied by branches originating from the posterior primary rami of the L4-S2 spinal nerves (Kirkaldy-Willis and Burton, 1992; Standring, 2008), whereas the anterior aspect of the sacroiliac joint is innervated by the posterior branches from the L3-S2 nerve roots and the superior gluteal nerve L5-S2 (Standring, 2008). Therefore the sacroiliac joint has multiple and varied innervation (Indahl *et al.,*1999; Suter *et al.,* 2000; Maitland *et al.*, 2001; Murata *et al.,* 2001).

Within the context of this innervation, mechanosensitive afferent units have been identified within the sacroiliac joint and its related tissues (Mooney, 1997; Sakamoto *et al.,* 2001). These nociceptive receptors are thought to be the origin of LBP when stimulated by noxious stimuli (Hillermann *et al.,* 2006). However, the vast innervation that is seen in the sacroiliac joint makes the presentation of sacroiliac syndrome particularly difficult to identify clinically (Morris, 2006).

Similar to the motion segments of the spine, the blood supply and venous drainage of the sacroiliac joint are directly from the aorta, common iliac arteries and internal iliac arteries or to the common iliac veins, internal iliac veins and inferior vena cava by means of the sacral arteries and veins respectively (Moore and Dalley, 1999; Standring, 2008). Each of these arterial and venous systems have vessels that run with the nerves that supply the various structures of the motion segment (Standring, 2008).

Given the structure, function and innervation of the lumbar vertebrae, the associated motion segments as well as the sacroiliac joint; shows evidence that LBP can be as a result of many of the tissues within the anatomical area noted as the low back and may be affected by many different aetiological factors (Frymoyer *et al*., 1983; Buckwalter *et al*., 1993; Groves *et al*., 1995; Macleod *et al*., 1995; Burdorf and Sorock, 1997; Dempsey *et al.,* 1997; Bildt Thorbjornsson *et al.*, 2000; Crook *et al.*, 2002; Green *et al*., 2003; Melissas, 2003; Portenoy, 2004; Mirtz and Greene, 2005; Wulan et al., 2010); therefore the next section will aim to delineate the epidemiology of LBP, its causes and risk factors before touching on treatment methods and the cost of LBP to society.

2.3 Epidemiology of LBP

2.3.1 Prevalence and incidence of LBP

The incidence and prevalence of LBP is high and of increasing international concern (Dagenais e*t al.,* 2008; Bronfort *et al.*, 2010). However there is significantly more literature on prevalence than incidence, based on the fact that the research parameters utilized to establish incidence values are a lot more time consuming, costly and tedious than measurement of prevalence values (Hoy *et al.*, 2010).

Of the few studies noted (Hoy *et al*., 2010), the ***annual incidence*** (first time reporting of LBP) has been noted as:

- 6.3% (Biering-Sörensen, 1982) - Denmark
- 15.4% (Croft *et al.,* 1999) - United Kingdom
- 7.5% (Mustard *et al*., 2005) - Canada

In contrast the ***life time incidence*** of LBP (Hoy *et al.*, 2010) was noted as:

- 85% by Von Korff *et al.,* (1988) - United States of America
- 36% by Croft *et al.,* (1999) - United Kingdom
- 19.3% by Hestbaek *et al.,* (2003) - Denmark
- 1.5% by Al-Awadhi *et al.,* (2005) - Kuwait
- 18.9% by Cassidy *et al.,* (2005) - Canada
- 18.4% by Jacob *et al.,* (2006) - Israel

The variances in these incidences were attributed by Hoy *et al.*, (2010) to the amount of perceived bias in the data collection of the incidence values. This study seems to indicate that those studies with higher tendency to having been influenced by bias are those that reported a lower incidence, whereas those with lower bias tended to indicate higher incidence values (Hoy *et al*., 2010).

To supplement the above data, it is noted in the work of Hillman *et al.,* (1996), that the average annual incidence for LBP is 47/1000 (with a range of 38-58/1000) a study undertaken in the United Kingdom. Specific to gender the average annual incidence for LBP is noted as 40.5 (range: 29-55/1000) for men and 54 (range: 40-41/1000 for women (Hillman *et al.*, 1996). These ranges seem to be a more accurate reflection of the incidence of LBP as compared to percentages noted in the studies discussed in Hoy *et al.,'s* (2010) systematic review.

Accumulative research (refer Table 2.2) suggests that there is a 60-90% ***lifetime prevalence*** of LBP. For persons older than 45 years of age, mechanical LBP represents the third most common cause of disability and it is the most common cause of disability in persons younger than 45 years in the United Kingdom (Manga *et al.,* 1993; Bronfort *et al.*, 2010).

The lifetime prevalence of LBP was recorded in the United States of America (USA) and Australia in a range from 26.4% - 79.2% (Cherkin *et al*., 2006 and Walker *et al*., 2004). Whereas, the general population of France (Rossignol *et al*., 2009) and The People's Republic of China (Jin *et al*., 2004) were estimated to have a LBP prevalence of 50%. These figures concur with those found by Docrat (1999), who reported that a comparison in the lifetime prevelance of LBP between the Coloured and Indian communites of South Africa revealed that LBP was experienced in more than three quarters of the population (76.6% in coloureds and 78.2% in indians respectively). Towards the lower end of the above outcomes, LBP lifetime prevalence in Uganda was reported to be 62% (Galukande *et al*., 2005). These figures need to be observed with caution, however, figures maybe unnaturally high in that these participants were hospital admission patients at the time of data collection. This would therefore, concur with Van der Meulen (1997), who found that the lifetime prevalence of LBP in Chesterville in Durban was 57.6% in the black population. These statistics, although high, seem to suggest that the average prevalence measures for black populations seem to be lower than the international trends. This is confirmed by Louw *et al.,* (2007)

in their systematic review of the prevalence of LBP in Africa, in which their findings indicate that LBP among africans is rising and is of global concern. Therefore, the data currently available seems to suggest that there are differences in prevalence figures between developed and developing countries (Table 1.1 Chapter One), with the developing countries seeming to have a slightly lower prevalence rates at the various time points than developed countries. Thus, these collective studies and review seem to suggest that there is evidence to suggest a lower lifetime prevalence rate in Africa. This, however, contradicts the premise that Africa has greater predisposing factors for LBP (Woolf and Pfleger, 2010) and therefore, it would seem that Africa should have a greater lifetime prevalence and incidence of LBP.

According to Hart *et al.,* (1995); Guo *et al*., (1999); Woodwell and Cherry, (2004); Dagenais *et al.*, (2008); Chen *et al.*, (2009); Bronfort *et al.*, (2010); Coole *et al.,* (2010) and Woolf and Pfleger, (2010), developing countries would financially benefit from a reduced prevalence of LBP because of the costs involved (loss of work force, absenteeism, medical costs) in treating patients with LBP (Manga *et al.,* 1993; Ekman *et al.*, 2001; Wasiak *et al.*, 2006).

Table 2.2. INTERNATIONAL PREVALENCE OF LBP						Point %	One year %	Life %
AUTHOR	**DATE**	**COUNTRY**	**TYPE OF STUDY**	**POPULATION FOCUS**				
Mulimba	1990	East Africa	Orthopedic based	-		10		
Bwanahali *et al.,*	1992	Zaire	Rheumatology based	-		47		
Harris	1993	-	Cricketers	-		62		
Hillman *et al.,*	1996	United Kingdom - Bradford	National	Societal		19	39	59
Van der Meulen	1997	South Africa	Ethnic group specific	-		-	-	57.6
Rizzo *et al.,*	1998	United States of America	National	Indirect only	Societal	22	-	-
Watson *et al.,*	1998	Isle of Jersey	National	Indirect only	Societal	6	-	-
Docrat *et al.,*	1999	South Africa	Ethnic group specific	Indian population		-	-	78.2
				Coloured population		-	-	76.6
Maniadakis *et al.,*	2000	United Kingdom	National	Direct and indirect.	Societal [1]	-	36	-
Worku	2000	Lesotho	National	-		10	-	-
Ekman *et al.,*	2001	Sweden	National	Direct and indirect.	Societal	16	-	-
Stewart *et al.,*	2003	Unites States of America	National	Indirect only	Societal	5	-	-
Bingefors *et al.,*	2004	Sweden	National	Gender study		22.7	-	-
Luo *et al.,*	2004	United States of America	National	Indirect only	Societal	15	-	-
Jin *et al.,*	2004	Shanghai	National	Societal		-	40-74	50-79
Walker *et al.,*	2004	Australia	National	Direct and indirect	Societal	-	-	65
Adedoyin *et al.,*	2005	-	Computer users	-		74	-	-
Boonen *et al.,*	2005	Netherlands	National	Direct and indirect	Societal	-	21	-
Galukande *et al.,*	2005	Africa - Uganda	National	Societal		20	-	62.3
Van *et al.,*	2005	Belgium	National	Direct and indirect	Societal	6	-	-
van Vuuren *et al.,*	2006	South Africa	Manganese industry	-		37.6	69.8	71.6
Van Vuuren *et al*	2007	South Africa	Steel Industry			36	56	64
Koley *et al.,*	2008	India - Punjab	National	Societal		-	-	60
Dagenais and Haldeman	2012	-	International	Direct and indirect	Societal	25	50	85

2.4 Causative factors of LBP

According to Dagenais and Haldeman (2012), sociodemographic factors (viz. gender, age, education/ income, marital status and ethnictiy/ race) have all been implicated as risk factors for the development of LBP. Dagenais and Haldeman (2012) further state that income levels, litigation circumstances, disability or other insurance covers for the patient as risk factors for LBP. Additionally Wasiak *et al.,* (2003) and Morris (2006) also indicate that sociodemographic factors that should be included in the evaluation of LBP are:

- care based (access options for health care for LBP),
- disability based claims (injury on duty) that inlfuence LBP reporting and
- claims based reporting (health management organisation or medical aid based claims), which affects the care seeking options for LBP.

From an occupational vantage point, factors such as work satisfaction, autonomy, supervisor empathy, task repitition (Wai *et al*., 2010b), exposure to heavy manual labour (Wai *et al.,* 2010a; Roffey *et al.,* 2010d) and occupational postures (Roffey *et al.*, 2010c) should be considered (Dagenais and Haldeman, 2012).

Whereas from a general health vantage point, the following factors have been identified as factors associated with LBP; tabacco use / smoking, body weight, physical activity / exercise (Roffey *et al.*, 2010a; Roffey *et al.*, 2010b), presence of physical or psychological comorbidities as well as genetic factors (Dagenais and Haldeman, 2012).

2.4.1 Sociodemographic factors

2.4.1.1 Gender:

Valkenburg *et al.,* (1982), Fairbank *et al.,* (1984); Salminen *et al.,* (1984), Svensson *et al.,* (1988) and Balague *et al.,* (1994) highligted that research on both genders showed on average a higher prevelance of LBP in women (of greater than 6%) than men. Similarly, Jin *et al*., (2004) found that females had a higher prevelance (54.2%) than males (45%). This concurs with studies by Viikari-Juntura *et al.,* (1991); Balague *et al.,* (1994); Brattberg (1994); Salminen *et al.,* (1994); Troussier *et al.,* (1994) and Harreby *et al.,* (1999). However this is in contrast to Biering-Sörensen (1989); Olsen *et al.,* (1992); Burton *et al.,* (1996); Newcomer *et al.,* (1996); Gunzburg *et al.,* (1999) and Feldman *et al.,* (2001). The smallest difference is seen in the Biering-Sörensen (1989) study, where it was found that 61.4% of women and 62.6% men in the general adult population were found to suffer from LBP.

In contrast, Walsh *et al.,* (1992), found men and women in Britian to have the same prevelance rate of 58.3% with regards to LBP. The latter concurs with a later study by Papageorgiou *et al*., (1995), who in a general population study found a 59% prevalence rate in both men and women. These latter two studies also concur with and are supported by the findings by Heliövaara (1989); Battie *et al.,* (1990); Liira *et al.,* (1996) and Burdorf and Sorock (1997).

Some of the variances in the prevalence percentages above and in Table 2.2, may be attributed to the population(s) under study, as can be seen in :

- The adolescent population researched by Olsen *et al.,* (1992), who found the prevelance of LBP in female population was lower with 48.4% than that for males. Therefore the sample population under study plays a role in detemining gender prevelances (Morris, 2006).

- The proportion of ratio of female to male in Nairobi, Kenya was recored as 2:1 (Mulimba, 1988) in the general population, whereas other studies report no differences in the general population being studied and thus the effect of the population demographics confound LBP data as they show no significant gender differences (Waddell, 1994 and Reigo *et al*., 1999).
- Possible association between the prevalence and development of LBP in women in the postpartum period linked anecdotally to epidural anaesthesia (Groves *et al*., 1995; Macleod *et al*., 1995) and / or the physiological changes that a woman's body undergoes during pregnancy (Clancy and McVicar, 2002). It can be seen in the literature that there is a higer prevelance of LBP in women in the general population (Biering-Sörensen 1989; Svensson *et al.,* 1988; Valkenburg *et al.,* 1982) and this may have a connection to development of LBP through pregnancy (Svensson *et al.,* 1988; Ostgaard *et al*., 1991; Orvieto *et al*., 1994).
- Body weight has also been implicated in being a predictor of LBP in women (Battie *et al.,* 1990) and, therefore, population characteristics with regard to weight may affect gender prevalences.
- Lastly, it is also possible that men tend to suffer more disabling pain than women (Hurwitz and Morgenstern, 1997; Power *et al.,* 2001) and women suffer more non-disabling pain according to Hurwitz and Morgenstern (1997).

In the literature it seems to be generally accepted that LBP is more common in women than men (Andersson, 1999; Morris, 2006), even though over a 24 year period, Bildt Thorbjornsson *et al.*, (2000), found that social relations, sedentary work and physical load had a strong links to the prevalence of LBP in both genders.

Table 2.3: Gender Prevalences									
					PREVELANCE %		STUDY GROUP		
STUDY	YEAR	TYPE OF STUDY	COUNTRY	LIFETIME PREVELANCE %	POINT	PERIOD	NUMBER	AGE (YEARS)	GENDER (M/F)
Hult *et al.,*	1954	General population	United Kingdom	60			1193	25-59	Male
Hirsch *et al.,*	1969	General Population	Sweden	48.8			692	15-72	Female
Gyntelberg *et al.,*	1974	General population	Copenhagen			25		40-59	Male
Valkenburg *et al.,*	1982	General population	Netherlands	51.4	22.2		3091	>20	Male
				57.8	30.2		3493	>20	Female
Svensson *et al.,*	1982	General population	Sweden	61		31	716	40-47	Male
				67		35	1640	38-64	Female
Frymoyer *et al.,*	1983	General population	United Kingdom	69.9			1221	28-55	Male
Biering-Sörensen *et al.,*	1989	General population	Denmark	62.6	12		449	30-60	Male
				61.4	15.2		479	30-60	Female
Papageorgiou *et al.,*	1995	General population	United Kingdom	59		35	1884	>18	Male
				59		42	2617	>18	Female
Mendes de Leon *et al.,*	1995	General population	New Haven and North Carolina	32.2			2576	65-80+	Male
				48.6			4246	65-80+	Female
Hillman *et al.,*	1996	General population	United Kingdom	40.5			1437	25-64	Male
				54			1747	25-64	Female
Han *et al.,*	1997	General population	Netherlands	46			5887	20-60	Male
				52			7018	20-60	Female
Van Der Meulen	1997	Black population	South Africa - Chesterville	51.8					Male

Table 2.3 continued GENDER					**PREVELANCE %**		**STUDY GROUP**		
STUDY	YEAR	TYPE OF STUDY	COUNTRY	LIFETIME PREVELANCE %	POINT	PERIOD	NUMBER	AGE (YEARS)	GENDER (M/F)
Picavet *et al.,*	1999	General population	Netherlands	50		45.1	6317	20-59	Male
				50		51.6	7505	20-59	Female
Docrat	1999	Indian population	South Africa - Durban	45.4			227		Male
		Coloured population		42.2			211		Male
		Indian population		54.6			273		Female
		Coloured population		57.8			289		Female
Picavet *et al.,*	2002	General population	Netherlands	50.4				25-65	Male
				49.6				25-65	Female
Jin *et al.,*	2004	General population	China - Shanghai	45			169	20-50	Male
				54.2			214	20-50	Female
Bingefors *et al.,*	2004	General population	Sweden	20.9					Male
				24.3					Female
Vindigni *et al.,*	2005	General population	Australia	46			87	15-56+	Male
				53			102	15-56+	Female
Koley *et al.,*	2008	General population	India - Punjab	48.32			149	40-65	Male
				53.64			151	40-65	Female
Freburger *et al.,*	2009	General population	USA - North Carolina	1992- 2.9					Male
				1992- 4.8					Male
Ferreira *et al.,*	2010	General population	Brazil	43				20-69	Male
				57				20-69	Female

2.4.1.2 Age

LBP has a much higer prevelance and incidence from 40-60 years of age (The Editors, 1995). According to Leboeuf-Yde *et al.,* (2009) and Plouvier *et al.,* (2011) increasing age (older individals) is directly equivalent to an increase in the prevelance of LBP. Therefore, age has been identified by Dagenais and Haldeman (2012) and Morris (2006) as a prognositic factor for the development of LBP. It would seem from the literature that the consensus regarding age, follows the algorythm of increasing age being related to increasing likelihood of LBP (Deyo *et al.,* 1987; Heliövaara, 1989; Mierau *et al.,* 1989; Svensson and Andersson, 1989; Skovron *et al.,* 1994; Heliövaara *et al.,* 1991; Riihimaki, 1991, Olsen *et al.,* 1992; Balague *et al.,* 1994; Troussier *et al.,* 1994; Burton *et al.,* 1996; Kristjandottir, 1996; Newcomer *et al.,* 1996; Hurwitz and Morgenstern, 1997; Taimela *et al.,* 1997).

However, in contrast to the above, Daltroy *et al.,* (1991) indicated that decreasing age (younger individuals) it was related to increasing LBP and that increasing age was protective of LBP. Biering-Sörensen (1983); Battie *et al.,* (1990) and Burdorf and Sorock (1997) however seem to indicate that age has no relationship with the onset and progression of LBP. In an African continent study done by Louw *et al*., (2007), the trendline suggested that lifetime LBP potentially increased with age.

2.4.1.3 Education / Income

In terms of education it has been noted by Biering-Sörensen (1983); Deyo *et al.,* 1987: Heliövaara (1989); Bergenudd and Nilsson (1988); Viikari-Juntura *et al.,* (1991) and Dionne *et al.,* (1997) that poor education predisposed people to an increased likelihood of LBP. Hurwitz and Morgenstern (1997) and Deyo *et al.,* (1987) indicated that in the above context, poor education also predisposes the patient to a greater likelihood of disabiling pain. This is also applicable to adolescents who have been reported to suffer

more with LBP in situations where the family education level has been low (Salminen, 1984).

Whereas and in contrast to the above it has been indicated by Riihimaki *et al.,* (1989); Bigos *et al.,* (1986) and Power *et al.,* (2001) that there is no considered relationship between education levels and the increased or decreased likelihood of LBP.

The levels of education may, therefore, also be related to the relationship that has been found between increased umemployment and the associated increased likelihood of LBP (Volinn *et al.,* 1988; Cheadle *et al.,* 1994; Hurwitz and Morgenstern, 1997); which contrasts findings in the literature that indicates that LBP is more common among high income country populations as compared to low income country populations and urban versus rural areas (Volinn, 1997). But, the latter needs to be read with caution as little research has been done to effectively compare these different population groups within the same countries. Volinn (1997) states that there are higher likelihoods for LBP in “enclosed workshops” in low income countries which may not be adequately reflected in the literature do to the lack of selectivity of participiants in different studies.

2.4.1.4 Marital status

Reisbord *et al.,* (1985) was the first to note that there was a higher prevalence of LBP in unmarried persons as compared to married persons, this is supported by Biering-Sörensen *et al.,* (1986), who noted that unmarried men, living alone were more likely to suffer from LBP. In addition, Cats-Baril *et al.,* (1991) later found that divorced persons or those who had been left widowed were also more likely to suffer from LBP.

2.4.1.5 Ethnicity / race

In terms of the prognostic factors for LBP related to ethnicity, it is noted in the literature that there is an increased likelihood for LBP in ethnic groups that are non-white (Hurwitz and Morgenstern, 1997). This is thought to be related to the cultural influencers related to ethnic groups, where the white ethnic groups are more likely to access care for LBP and, therefore, be part of a reporting system for LBP and its prevalences (Deyo *et al.,* 1987; Heliövaara, 1989; Hurwitz and Morgenstern, 1997; Dagenais and Haldeman, 2012). This is supported by the fact that different ethnic groups experience pain differently (Green *et al*., 2003; Portenoy 2004). Prevalence of LBP in black South Africans (531.%) (Van der Meulen, 1997), Indian South Africans (45.0%) and the coloured South African ethnic groups (32,6%) validate that there may be a difference compared to the white population of greater eThekwini metropolitan area. This is further suggested by Volinn (1997), who recommends that further research in this area is necessary.

2.4.1.6 Medical insurance

In terms of the literature, there was a paucity of information regarding the effect of medical insurance cover / insurance claims and the effect on low back pain.

2.4.2 General health and physical factors

2.4.2.1 Smoking and alcohol consumption

According to Frymoyer *et al*., (2011), smoking is significant risk factor to LBP. It was found that 39.6% of asymptomatic men and 53.0% of LBP individuals were cigarette smokers. The authors hypothesised that coughing could be the reported link to LBP as it increased the intra-discal pressure. Additionally, it was suggested that smoking has a physiological effect on the spine, which may be associated with its appropriate

mineralisation and nutrition, which if decreased when smoking may result in increased rate of degeneration (Frymoyer *et al*., 2011).

These outcomes concur with Battie *et al.,* (1989); Deyo *et al.,* (1989); Heliövaara *et al.,* (1991); Pietri *et al.,* (1992); Boshuizen *et al.,* (1993); Ready *et al.,* (1993); Toroptsova *et al.,* (1995); Harreby *et al.,* (1996) and Vindigni *et al*., (2005) who indicate that smoking is an equally prevalent predisposing factor for LBP amoung both genders. Based on these studies, this phenonmenon (smoking increasing the likelihood of LBP) may be linked to lifestyle and sociodemographic factors that are seen in people who smoke, which further enhances the prevelance of LBP in smokers (The Editors, 1995; Heneweer *et al.,* 2010). To this end, Skillgate *et al.,* (2007) conducted a study comparing the effects of smoking and alcohol on LBP, where it was found that alcohol decreased the risk of LBP and smoking increased the predisposition to LBP. This affirms an earlier study by Walker *et al.,* (2004) who indicated that there was an increase in LBP in current Australian indigenous smokers aged 18 years of age compared to 18 year old non-indigenous smokers. In addition the study also showed the consistent effect of obesity and inactivity in the indigeous people of Australia and its effect on LBP.

In contrast to the above discussion, Leino (1993); Manninen *et al.,* (1995); Hurwitz and Morgenstern (1997) indicated in their studies that there was a limited or no association between smoking and the development of LBP.

When considering alcohol use, the literature indicated that Skillgate's *et al.,* (2007) results where that there was no relationship between alcohol use and the increased likelihood of developing LBP. However, this is in contrast to Vallfors (1985) and Heliövaara *et al.,* (1991) who indicated that there is a positive relationship between increased alcohol consumption and the development or increased likelihood of LBP.

2.4.2.2 Activity / exercise

Generally there is an agreement that activity is protective of pain, in particular LBP (Haldeman, 2005; Morris, 2006; Dagenais and Haldeman, 2012). There is a however debate when one considers the literature in that:

- Cady *et al.,* (1985); Riihimaki (1991); Leino (1993); Salminen *et al.,* (1995); Harreby *et al.,* (1996); Heistaro *et al.,* (1998) seem to agree that sedentary lifestyles predispose people to LBP.
- Whereas Troup *et al.,* (1981); Battie *et al.,* (1989); Riihimaki *et al.,* (1989); Holmstrom *et al.,* (1992); Magnusson *et al.,* (1992); Mortimer *et al.,* (2001); Power *et al.,* (2001) seem to disagree with the previous authors and indicate that there is no association between LBP and various levels of activity.

More recently, a systematic review by Heneweer *et al.,* (2010) indicated that home do-it-yourself activities and high load activities, were predictive of LBP and strongly linked to LBP development (Hoogendoorn *et al.,* 2000; Heneweer *et al.,* (2010). This was particularly true of women, where it was noted that high intensity physical activity seemed to predispose females to higher likelihood of LBP presentations (Heneweer *et al.,* (2010).

2.4.2.3 Height / weight / BMI[2]

Obesity has become an epidemic worldwide and has a strong link to coronary heart disease and diabetes mellitus. According to Buckwalter, Goldberg and Woo (1993), the aging process and obesity causes a deterioration of the pathophysiology of ligaments and tendons, therefore, leading to LBP. A study complied by Wulan *et al*., 2010, compared metabolic differences and abdominal obesity in indian and white adolescents

[2] Body mass index (BMI) is measured by dividing the individuals weight in kilograms (kg) and height squared, measured in metres to obtain a figure in metres squared (kg/m^2) (Hodge *et al*., 1994)

(viz. for the same BMI as whites the body fat percentage in Indians is 5-7% higher) and found osteoarthritis relating to neck pain was more prevalent in the Indian population.

In light of the above, O'Niel *et al*., (1999) researched osteophytosis in a population survey and found a strong link to increased BMI. This is in contrast with the systematic review conducted by Leboeuf-Yde (2003), on the association of body weight (BMI) verses prevelance of LBP in 65 epidemilogical studies, where it was concluded that there was a very poor asssociation between the two phenonmenon. Subsequently, Kostova (2001) researched musculoskeletal conditions and how they related to men over 40 who were obese and smoked, found that LBP predisposition increased when related to these factors. It was also concluded that both genders over the age of 40 had a much higher chance of decreased daily activities due to LBP. This concurs with the study comliped of Mirtz *et al*., (2005), who concluded that an individual with a BMI under 30 had a decreased chance of developing a musculoskeletal disorder like LBP, whereas, if the subjects were in range of 40 BMI there was a high risk of being predisopsed to LBP. Thus, it would seem that increased BMI, in addition to other lifestyle factors, may be among the predisposing precursors for LBP (Heneweer *et al.,* 2010).

This concurs with the research conducted by Mirtz and Greene (2005), who suggest that individuals with a BMI of < 30 have a small chance of developing LBP and those with a BMI of > 30 have a greater chance. If individuals have a BMI of > 40, LBP and osteoarthritis are strongly indicated sequelae (Melissas, 2003). Therefore assessing weight verses height gives a strong indication of the magnitude of increased BMI and the possibility of this phenomenon predisposing individuals to LBP.

2.4.2.4 Posture

In the work of Hoogendoorn *et al.,* (2000) and Heneweer *et al.,* (2010), that flexed (McGill *et al.,* 2000; Nazari *et al.,* 2011) and rotated positions alone and in combination (Frymoyer *et al.,* 1983; Potvin *et al.,* 1991; Roffey *et al.,* 2010c), for increased durations and / or repetitive actions can be responsible for significant increases in the likelihood of developing LBP. In addition, it is noted in the literature that prolonged standing has the ability to increase the likelihood of LBP (Pope *et al.,* 2002; Anderson *et al.,* 2007; Wai *et al.,* 2010a). In contrast, Magora (1972) and Magora (1974) indicated that prolonged sitting can increase the chances of LBP, which is supported by the work of Tissot *et al.,* (2009) and Roffey *et al.,* (2010b).

2.4.2.5 Biomechanical aberrations / strength / flexibility

Chaffin *et al.,* (1978) found that those participants with less muscle strength had three times the possibility of developing LBP. However, the increased incidence of LBP has also been related to:

- Minor tasks with low motor force, but excessive functional spinal unit loading (Cholewicki and McGill, 1996; Chung *et al.,* 2005);
- Decreased muscle response times in relation to required activities (Magnusson *et al.,* 1996);
- Co-ordination of muscle activity (Krajcarski *et al.,* 1999; Nelson-Wong *et al.,* 2008) / changes in muscle recruitment patterns (Potvin and O'Brien, 1998; Nelson-Wong and Callaghan, 2009; Nelson-Wong and Callaghan, 2010) and / or
- Muscle endurance or increased likelihood for fatigability (McGill *et al.,* 1995; McGill *et al.,* 1999).

As a result of the above suggestions in the literature, Morris (2006) points out the debate as to whether the strength and flexibility of muscles play a significant role in the

development of LBP as there are authors who support this theory (Leino *et al.,* 1987; McNeill *et al.,* 1980; Kujala *et al.,* 1996) and in contrast, some authors do not support the role that muscle strength and flexibility has on the predisposition of patients who present with LBP (Biering-Sörensen, 1983; Mostardi *et al.,* 1991; Leino, 1993).

These muscle changes, however, do not necessarily occur in isolation and may be related to skeletal aberrations (Norman *et al.,* 1998; Morris, 2006), which include but may not be limited to disproportionate height (Heliövaara*,* 1987; Battie *et al.,* 1990; Heliövaara *et al.,* 1991); leg length inequalities (Rowe, 1971; Giles and Taylor, 1981; Friberg, 1983; Friberg 1992) and spondylolisthesis (Bigos *et al.,* 1986; Virta *et al.,* 1993). Thus, it would seem that biomechanical factors associated with the musculoskeletal system are strongly associated with LBP (Norman *et al.,* 1998).

This is, however, contested by Biering-Sörensen (1984), Burdorf and Sorock (1997), Power *et al.,* (2001) in terms of the disproportionate height of persons; Biering-Sörensen (1984), Soukka *et al.,* (1991) and Magnusson *et al.,* (1996) in terms of leg length and Heliövaara (1989) and Holmstrom *et al.,* (1992) with regards to patients presenting with spondylolisthesis. In addition, no association has been found with LBP and the presence of scoliosis of the spine according to Bergenudd and Nilsson (1988), Holmstrom *et al.,* (1992) and Burdorf and Sorock (1997).

2.4.2.6 Psychological / stress

According to Heneweer *et al.,* (2010), there is robust evidence suggesting that psychological factors (such as stress, depression) are related to future episodes of LBP and related disability levels (Bongers *et al.,* 1993; Hoogendoorn *et al.,* 2000; Linton and Ryberg, 2000; Heneweer *et al.,* 2010). This may be linked to apprehension about a previous injury or increased perceived damage to the low back with a subsequent injury (Morris, 2006).

2.4.2.7 Work related / occupational factors

Physical load while lifting, manual handling (Hoogendoorn *et al.,* 2000; Jansen *et al.,* 2004; Roffey *et al.,* 2010d; Heneweer *et al.,* 2010; Plouvier *et al.,* 2011), carrying, pulling (Ayoub and McDaniel, 1974; Pope *et al.,* 2002; Roffey *et al.,* 2010a), pushing (Ayoub and McDaniel, 1974; Pope *et al.,* 2002; Roffey *et al.,* 2010a), bending and twisting (Wai *et al.,* 2010b), tiring / repetitive positions (Roffey *et al.,* 2010c; Plouvier *et al.,* 2011) and whole body vibration (Hulsof and van Zanten, 1987; Bovenzi 1996; Bovenzi and Hulshof, 1998; Chung *et al.*, 2005) were indicated to increase the likelihood of LBP (Burdorf and Sorock, 1997). In addition, increased lifting, repetitive tasks and accumulation of loads increases the likelihood of LBP (Hoogendoorn *et al.,* 2000; Heneweer *et al.,* 2010). Also, increased periods of driving / vibration have been linked to an increased likelihood of LBP in time (Hoogendoorn *et al.,* 2000; Vingard *et al.,* 2000; Krauser *et al.,* 2004; Heneweer *et al.,* 2010). Further possible work related activites are outlined in Table 2.4.

This high load, high repetition as well as sedentary work (Roffey *et al.,* 2010b) have increased likelihood for LBP, whereas moderate load was protective of LBP (Bildt Thorbjornsson *et al.,* 2000; Vingard *et al.,* 2000). In this context, work load has been found to affect women to a greater extent as they appear to suffer more from LBP (Vingard *et al.,* 2000). In contrast, repetition as referred to by Vingard *et al.,* (2000) seems to affect males to a greater extent, with a greater predominance to LBP being linked to males (Bildt Thorbjornsson *et al.,* 2000; Vingard *et al.,* 2000).

In addition, research investigated by Crook *et al.*, (2002), shows that a history of LBP due to work occupation was a risk factor for the increase in disability and future occurrences of LBP. According to Dempsey *et al.,* (1997), it is important to establish preceding injury profiles as this is a contributing factor to recurring LBP.

Table 2.4: OCCUPATION								
AUTHOR	**YEAR**	**COUNTRY**	**OCCUPATION TYPE**	**REPONDENTS**	**PREVELANCE OF LBP %**	**AGGRAVATING FACTORS**	**SMOKING %**	
Bovenzi	1996	Italy	Bus drivers	234	83.8	Shock jerking movements	-	37.2
			Tractor driver	1155	8.13	Shock jerking movements	-	35
Omokhodion *et al.,*	2000	Nigeria	Hospital staff	80	69	Heavy physical, poor posture and prolonged sitting and standing	-	-
Latza *et al.,*	2000	Germany	Construction workers	571	50.1	Carrying heavy loads, lifting, bending over	-	-
Teitz *et al.,*	2002	USA - New York	Intercollegiate rowers	1632	32	Changes in training, rowers physique, equipment	-	-
Rugelj *et al.,*	2003	Slovenia	Physiotherapists	133	73.7	Lifting and handling patients	-	-
Hoy *et al.,*	2004	UK	Forklift truck drivers	46	65.2	Lifting tasks	-	50%
Smith *et al.,*	2005	Korea	Nurses	330	72.4	Bend, twist or stretch	-	-
Holmberg *et al.,*	2005	Sweden	Farmers	1013	64	Manuel handling, whole body vibration	8.5	22.4
Chen *et al.,*	2005	Taiwan	Taxi drivers	1242	51	Bending and twisting, job dissatisfaction, job stress	-	-
Van Vuuren *et al.,*	2006	South Africa	Plant workers	109	71.6	Long hours, hard manual work	-	-
Okunribido *et al.,*	2007	Scotland	Bus drivers	80	59	Shock jerking movements	-	-
Wynne-Jones *et al.,*	2007	UK	Primary care consultants	935	37	-	-	-
Spyropoulos *et al.,*	2007	Greece	Public office workers	771	61.6	Ergonomics	-	37.3
Lui *et al.,*	2008	USA-Columbus	Farmers	2045	38.4	Manual handling, whole body vibration, mechanical shock	-	-
Mattila *et al.,*	2009	Finland	Finnish military males	391,241	30	Carrying heavy loads	-	-
Pargali *et al.,*	2010	Iran	Dentists	90	33 - >55	Prolonged, static muscle contractions, muscle ischemia	-	-
Secer *et al.,*	2011	Turkey	Novice soldiers	871	74	Carrying heavy loads	-	23.07
Bernard *et al.,*	2011	France	Vineyard workers	3974	40%	Traditional blade sharpening, manual pruning	-	-

2.4.3 Diagnosis

Based on the varied anatomy (Section 2.2) and the varied number of factors (Section 2.4.1) that can be involved in the development of LBP, it is often difficult to isolate the causative agents effectively and efficiently (Dagenais and Haldeman, 2012), which often leads to incorrect, delayed diagnoses and/or mismanagement of the patient (Morris, 2006; Dagenais and Haldeman, 2012). As a result, it is critical that all practitioners responsible for the care of patients consider a full and extensive case history, a comprehensive physical examination and pertinent special investigations (the latter as required by the clinical indications of the case history and examination) (Haslett *et al.,* 1999; Haldeman, 2005; Larsson *et al*., 2008; Helfenstein Junior *et al.,* 2010).

The most common special investigations include the use of imaging examinations (Marchiori, 1999; Haldemann, 2005; Helfenstein Junior *et al.,* 2010), which include but are not limited to: standard radiographic imaging (Taylor and Resnick 2000; Yochum and Rowe, 2005; Dagenais and Haldeman, 2012), videofluoroscopy, computed tomography (CT) (Taylor and Resnick 2000; Yochum and Rowe, 2005; Dagenais and Haldeman, 2012), CT-myelography (Taylor and Resnick 2000; Yochum and Rowe, 2005; Dagenais and Haldeman, 2012), magentic resonance imaging (MRI), dynamic MRI (Taylor and Resnick 2000; Yochum and Rowe, 2005; Dagenais and Haldeman, 2012), nuclear imaging, bone densitometry (Taylor and Resnick 2000; Yochum and Rowe, 2005) and ultrasound studies (Morris, 2006). In addition to these studies, discography, manometry, diagnostic nerve blocks, epidural steroid injections, epiduroscopies, facet joint / sacro-iliac joint injections, nerve root blocks and sympathetic blocks are also considered for specific patients (Haldeman, 2005; Morris, 2006). Muscle testing which includes electromyography (static / dynamic, needle, ambulatory), nerve conduction studies, thermography and quantitative sensory testing (Morris, 2006) have been noted to be utilised in diagnosing particular conditions (Haldeman, 2005).

More generally, special investigations also include: blood tests, cultures and other laboratory testing which may be called for (e.g. biopsy) (Ferri, 2004; Haslett *et al.,* 2000; Dagenais and Haldeman, 2012) in order to obtain a conclusive diagnosis or to rule out "red flags" (which would dictate the treatment options available to the practitioner and patient) (Haldeman, 2005).

In addition to seeking the cause of the LBP experienced by the patient (through case history, physical examination and / or special investigations), it is also necessary to identify all the related risk factors that may have contributed to the patients LBP, as they are equally responisble for determining the outcomes of care as well as the possibility of chronicity of the present LBP episode (Dagenais and Haldeman, 2012). These risk factors in particular have been identified as :

- Compensation issues (Accident Compensation Corporation, 1997; Australian Acute Musculoskeletal Pain Guidelines Group, 2003; Airaksinen *et al.,* 2006; Nielens *et al.,* 2006; van Tulder *et al.,* 2006).
- Emotional issues (Accident Compensation Corporation, 1997; The Norwegian Back Pain Network, 2002; Australian Acute Musculoskeletal Pain Guidelines Group, 2003; Airaksinen *et al.,* 2006; Nielens *et al.,* 2006; van Tulder *et al.,* 2006).
- Family problems (Accident Compensation Corporation, 1997; Australian Acute Musculoskeletal Pain Guidelines Group, 2003; Nielens *et al.,* 2006; van Tulder *et al.,* 2006).
- Fear aviodance behaviour (Accident Compensation Corporation, 1997; The Norwegian Back Pain Network, 2002; Australian Acute Musculoskeletal Pain Guidelines Group, 2003; Airaksinen *et al.,* 2006; Nielens *et al.,* 2006; van Tulder *et al.,* 2006).
- Inappropriate beliefs (Accident Compensation Corporation, 1997; The Norwegian Back Pain Network, 2002; Australian Acute Musculoskeletal Pain Guidelines

Group, 2003; Airaksinen *et al.,* 2006; Nielens *et al.,* 2006; van Tulder *et al.,* 2006).

- Neurological involvement (The Norwegian Back Pain Network, 2002; Nielens *et al.,* 2006).
- Poor job satisfaction (Accident Compensation Corporation, 1997; The Norwegian Back Pain Network, 2002; Australian Acute Musculoskeletal Pain Guidelines Group, 2003; Airaksinen *et al.,* 2006; Nielens *et al.,* 2006; van Tulder *et al.,* 2006).
- Prior LBP (Accident Compensation Corporation, 1997; Nielens *et al.,* 2006).
- Severity of the pain (Nielens *et al.,* 2006).
- Unrealistic treatment expectations (Accident Compensation Corporation, 1997; The Norwegian Back Pain Network, 2002; Australian Acute Musculoskeletal Pain Guidelines Group, 2003; Airaksinen *et al.,* 2006; Nielens *et al.,* 2006; van Tulder *et al.,* 2006).

2.4.4 Management and treatment of LBP

2.4.4.1 Primary care interventions

These include patient education, medications, manual therapy, physical modalities and other possible interventions such as acupuncture (Haldeman, 2005; Dagenais and Haldeman, 2012).

2.4.4.1.1 Educational interventions

Education includes advise to stay active (The Norwegian Back Pain Network, 2002; Australian Acute Musculoskeletal Pain Guidelines Group, 2003; Negrini *et al.,* 2006; van Tulder *et al.,* 2006; Chou *et al.,* 2007; Skillgate *et al.,* 2007; Dagenais, Tricco and Haldeman, 2010), back schools (The Norwegian Back Pain Network, 2002; Negrini *et al.,* 2006), back exercises independant of back schools (The Norwegian Back Pain Network, 2002; Skillgate *et al.,* 2007) and reassurance in terms of activity even in the

face of pain in the low back (The Norwegian Back Pain Network, 2002; Australian Acute Musculoskeletal Pain Guidelines Group, 2003; Negrini *et al.,* 2006; van Tulder *et al.,* 2006; Dagenais, Tricco and Haldeman, 2010). In contrast to the above Morris (2006) indicated that back schools are of limited value (Symonds *et al.,* 1995; Cherkin *et al.,* 1996; van Tulder *et al.,* 1997).

It would seem that rest in the acute phase of LBP may be an effective method, but more recently this seems to have been mooted (Waddell *et al*., 1997, Vroomen *et al.,* 1999; Alencar, 1999; The Norwegian Back Pain Network, 2002; Australian Acute Musculoskeletal Pain Guidelines Group, 2003; Negrini *et al.,* 2006; van Tulder *et al.,* 2006; Chou *et al.,* 2007; Dagenais, Tricco and Haldeman, 2010). Thus according to Dagenais and Haldeman (2012), exercise and activity seems to be the most highly recommended intervention for the management of LBP (in particular acute LBP).

2.4.4.1.2 Medicinal interventions

In the acute phase of LBP, treating the inflammation with anti-inflammatory drugs and analgesics is thought to decrease swelling and related pain (Waddell *et al*., 1997, Vroomen *et al.,* 1999 and Alencar, 1999). To this end, the following Table 2.5 outlines the current recommendations with regards to medication use in acute LBP:

Table 2.5. Medication used for the relief of acute LBP

Study	Acetaminophen	Muscle relaxants	NSAIDs	Opioid analgesics
Pohjolainen *et al.,* (2000)	No comment	No comment	No	No comment
The Norwegian Back Pain Network (2002)	Yes	Yes	Yes	Yes
Australian Acute Musculoskeletal Pain Guidelines Group (2003)	Yes	Yes	Yes	Yes
Negrini *et al.,* (2006)	Yes	Yes	Yes	Yes
van Tulder *et al.,* (2006)	Yes	No	Yes	No comment
Chou *et al.,* (2007)	Yes	Yes	Yes	Yes
Dagenais, Tricco and Haldeman (2010)	No	No	No	No

Table 2.5 seems to support the previous assertion by Manga *et al.,* (1993), who stated that the validity of medicinal therapies are very questionable. Additionally, it would seem that patients are less satisfied with the care from medical doctors (limited to medicinal care) as opposed to chiropractic treatment (which has a more hands on approach to care) (Manga *et al.,* 1993). Haldeman (2005) also reports that manipulation under anaesthesia, joint anaesthesia and epidural anaesthesia also exist in the treatment of LBP, although there are questions around the risk – benefit ratios, treatment effects and the options for reasonable alternative treatments that have less risks and which are more cost effective.

2.4.4.1.3 Manual interventions

According to Redwood and Cleveland (2003), Haldeman (2005) and Skillgate *et al.,* (2007), chiropractors and naprapaths are musculoskeletal and soft tissue specialists that work on a system of treatment which includes massage / cross friction therapy, manipulation / mobilisation, stretching (e.g. contract-relax-antagonist-contract (CRAC), post isometric relaxation), strenghtening and a variety of interventions (e.g. active release therapy, muscle energy techniques, Graston techniques and other mechanical device aided soft tissue therapies aimed at optimising the functions of the musculoskeletal / locomotor system (Haldeman, 2005). In the most recent evaluation of the literature by Dagenais and Haldeman (2012), the following summary outlined the recommendations for the use of massage and manipulation in acute LBP:

Table 2.6: Manual Interventions in the relief of acute LBP.

Study	Massage	Manipulation
The Norwegian Back Pain Network (2002)	Yes	Yes
Australian Acute Musculoskeletal Pain Guidelines Group (2003)	No	Yes
Negrini *et al.,* (2006)	No	Yes
van Tulder *et al.,* (2006)	No	Yes
Chou *et al.,* (2007)	No	Yes
Dagenais, Tricco and Haldeman (2010)	No	No

This contradiction in terms of the use of massage and manipulation stems from the fact that on one hand those familiar with the application of manipulation understand its far reaching benefits, which is associated with a small amount of risk (Morris, 2006); whereas on the other, manipulation is seen as a broad range of procedures that, at best, have a placebo response to care (Morris, 2006). Notwithstanding this controversy, manipulation has received positive recommendations for use by the Quebec Task Force (Spitzer, 1995); the Agency for Health Care Policy and Research (1994); the Clinical Standards Advisory Group (1994); the Accident Compensation Corporation (1997) and the European Guidelines for Acute Low Back Pain (Airaksinen *et al.,* 2006).

2.4.4.1.4 Physical modalities

In terms of the physical modalities that are available for use as an intervention for LBP, there are thermal modalities, traction modalities and electromodalities.

Thermal therapies include ice packs, cold whirlpools, warm whirlpools, paraffin baths, hydrocollator packs and infra red lamps. Of these, the most widely used thermal therapy is the ice pack (Haldeman, 2005), either by itself or in combination with an ice massage. The principle application of ice is either directed at inflammation in the region of application (Haldeman, 2005) or at areas of hyper metabolic activity (Travell and Simons (1999). Another application of cold is via a vapocoolant spray which has been documented by Travell and Simons (1999) and Chaitow and DeLany (2000).

In contrast, heat is generally applied with hydrocollator packs, infra red lamps, heated air, whirlpools and paraffin baths (in order of most to least often utilised, although the use does also depend on the condition(s) utilised for) (Travell and Simons, 1999; Chaitow and DeLany, 2000; Haldeman, 2005).

With regards to electromodalities:

- Therapeutic ultrasound, spans both the thermal and electrotherapies, as unlike the thermal therapies ultrasound is also reponsible for micromassage but, like the thermal therapies it is responsible for heating of deeper tissues. In this context, it has been found to be beneficial in some cases of LBP, but not in others, thus there is no agreement on the clinical efficacy and relative effectiveness of this electromodality in patients with LBP (Kitchen and Bazin, 1996; Haldeman, 2005). The clinical practice guidelines from Belgium (Nielens *et al.,* 2006), United Kingdom (National Institute for Health and Clinical Excellence (NICE), 2009), Italy (Negrini *et al.,* 2006), Europe (Airaksinen *et al.,* 2006) and the USA (Chou *et al.,* 2007) indicate limited evidence for use (Dagenais and Haldeman, 2012), particularly in chronic LBP.
- TENS (Transcutaneous electrical nerve stimulation) also produces differing literature results in terms of the treatment of LBP (Beurskens *et al.,* 1995; van Tulder *et al.,* 1997) and the clinical practice guidelines from Belgium (Nielens *et al.,* 2006), United Kingdom (NICE, 2009), Italy (Negrini *et al.,* 2006), Europe (Airaksinen *et al.,* 2006) and the USA (Chou *et al.,* 2007) indicating limited evidence for use (Dagenais and Haldeman, 2012) particularly in chronic LBP.
- IFC (Interferential current) / galvanic current / faradic current have been found to have variable results in the treatment of LBP (Foster and Palastanga 1990, Shekida Industries, 1993; Sanya, 2000). The clinical practice guidelines from United Kingdom (NICE, 2009), Europe (Airaksinen *et al.,* 2006) and the USA (Chou *et al.,* 2007) indicate limited evidence for use (Dagenais and Haldeman, 2012), particularly in chronic LBP.
- According to Durmus *et al.,* (2009), EMS (Electrical muscle stimulation), in contrast to the modlaities above, seems to show some positive benefit for patients suffering from LBP.
-

Other physical modalities include the use of traction, acupuncture and physical aides. In terms of traction (manual, continuous, sustained, intermittent and / or intersegmental traction), it has been noted that it is of limited or no value in the treament of LBP (Lindequist *et al.,* 1984; LeClaire *et al.,* 1996; Morris, 2006). This is further supported by the clinical practice guidelines from Belgium (Nielens *et al.,* 2006), United Kingdom (NICE, 2009), Italy (Negrini *et al.,* 2006), Europe (Airaksinen *et al.,* 2006) and the USA (Chou *et al.,* 2007) indicating limited evidence for use (Dagenais and Haldeman, 2012), with the exception of the USA LBP guidelines (Chou *et al.,* 2007).

The physical aides are similar to acupuncture which seems to be limited to immediate relief of LBP (Beurskens *et al.,* 1995), with some publications indicating no benefit beyond that of a placebo (Furlan *et al.,* 2005; Morris, 2006). In contrast, Hooper (1996) indicates that the use of splints, braces and orthotics may be of benefit for particular cases of LBP (Hooper, 1996).

2.4.4.1.5 Nutritional and herbal supplementation and homeopathic remedies

Other first line interventions that have been considered is the use of supplementation (vitamins and minerals), herbal medicines and homoeopathic remedies. In this regard, supplementation in the literature includes those essential substances that are imperative in regulation and execution of normal metabolic functions resulting in normal growth and development (in terms of the minerals electrolyte balance is also considered as important) (Mills *et al.,* 1999; Dagenais and Haldeman, 2012). There are many forms of administration of vitamins and minerals, which range from natural intake with food to capsules, tablets, creams, gels and liquids (Mauro *et al.,* 2000). Similarly, herbal medicines which include all “herbal medicinal products”, can be used / administered as whole herbs, herbal materials or preparations and / or products that contain as its active ingredient plants or plant materials. In contrast, homoeopathic remedies are generally limited to liquids or tablets (most often associated with consitutional remedies) and more rarely to gels, sprays and creams (most often assocaited with compounds) (Dagenais

and Haldeman, 2012). In the above context, the Accident Compensation Corporation, (1997); Mills *et al.,* (1999); Mauro *et al.,* (2000); The Norwegian Back Pain Network, (2002), Autralian Acute Musculoskeletal Pain Guidelines Group, (2003); Airaksinen *et al.*, (2006); Nielens *et al.*, (2006) and van Tulder *et al.,* (2006), found variable benefit from these nutritional and herbal supplements and homoeopathic remedies with the majority indicating that there is inconclusive evidence for the efficacy and relative effectiveness of these therapies.

2.4.4.2 Secondary care interventions

Secondary care interventions include medications, injections, surgery, behavioural therapy and multidisciplinary care (including rehabilitative care) (Dagenais and Haldeman, 2012), as well as socioeconomic / ergonomic changes (Bildt Thorbjornsson *et al.,* 1998; Alencar, 1999; Hoogendoorn *et al*., 2000; Baptista *et al*., 2007). The behavioural therapies (Ernst and White, 1998; Morris, 2006; van Tulder *et al.,* 2007) seem to show the most promise for future development, but currently have the least research in support of their effectiveness.

2.4.4.2.1 Surgical / invasive therapies

This range of therapies includes, but is not limited to spinal injection therapies (facetal, sacro-iliac, epidural, nerve blocks), epidural neuroplasty, subarachnoid and epidural neurolysis, intrathecal infusion therapy, spinal cord stimulation, intrathecal pumps and their agents, intradiscal electro-thermo-nucleoplasty therapy, nucleoplasty, chemonucleolysis, vertebroplasty in addition to non spinal therapies such as sympathetic blocks (Haldeman, 2005; Morris, 2006; Dagenais and Haldeman, 2012).

2.4.4.2.2 Prevention of LBP at work

According to Bildt Thorbjornsson *et al*., (1998), Alencar (1999), Hoogendoorn *et al*., (2000), and Baptista *et al*., (2007), the prevention critera suitable for LBP are made up of three important factors: Firstly, the physical aspect which encompasses ergonomics in the work place and occupational safety principles dealing with biomechanical issues. Secondly, organisational prevention where the overall suitability of an individual in his work space, communication with his employer or company and quality management are addressed. Thirdly, psychosocial factors that include monotony, job unsuitabilty and work in excess are avoided. Therefore focusing on all three aspects in the work place will prevent LBP and its aggravation and these factors will assist in ameliorating current LBP.

Occupational LBP prevention is centred around three factors, as suggested by Helfenstein Junior *et al.,* (2010); cognitive measures (stress, training, decision making, psychological processes), organisational measures (communication, resource management, team work and paradigms of work) and physical measures (posture, repetitive movements, job description and biomechanical aspects). Concentration of these three factors may ensure overall prevention of LBP.

The results in a study conducted by Plovier *et al.,* (2011) indicated that, in the occupational field, it is of importance that the short and long term effects of LBP be prevented in the early stages so as to minimise the effects in retirement.

2.4.5 Management of LBP and costs

In order to manage LBP effectively, the magnitude of its economic burden locally and intenationally has to be understood (Manga, 1993; Dagenais and Haldeman, 2012). In a study done by Dagenasis *et al.,* (2008); 27 relevent studies, published in English, that focused on the total cost of LBP, direct and indirect costs of LBP were examined (Australia, Belguim, Korea, Netherlands, United States and the UK). Direct medical costs were physical therapy (inclusive of the appropriate non invasive primary and secondary interventions), inpatient services, pharmacy and primary care. In addition indirect services had a large percentage of the overall cost in decrease worked production (Dagenais *et al.,* 2008). Direct costs ranged from the highest at 66% (Euro 4,236.371,342) in the Netherland's to 3% in Sweden. The largest mean cost was recorded as from physical therapy (17%) to mental health at 1%. Indirect costs were higher than direct costs and were recorded in Sweden at SEK 24,257,000,000 (Dagenais *et al.,* 2008).

This impact on the expediture that is metered out to health care related to LBP (Bildt Thorbjornsson *et al*., 2000), can be seen in the Netherlands (2001) where musculoskeletal conditions were rated as the most expensive disease in work absenteeism amounting to a cost of US$3.1 billion and a disablement cost of US$1.5 billion. It was further noted that the entire employment force cost the Netherlands government US$4.6 billion, which is in agreement with Hart et al., (1995) and Woodwell (1999) who noted LBP as the third most commonly reported symptom, the second most frequent cause of worker absenteeism (Guo *et al*., 1999) and the most costly ailment of working age adults in the United States of America.

Thus, it is critical that cost effective solutions are found for this epidemic. In this vein, research shows that chiropractic treatment of LBP is much more cost effective than medical management of LBP (Manga *et al.,* 1993). Evidence found in countries such as Canada have found Chiropractic treatment reduced chronic problems, decreased

hospitalisations, decreased auxillary costs and individuals who were treated for LBP by chiropractors versus physicians returned back to work much faster (Dagenais and Haldeman, 2012). On the African continent, however, there is limited research to establish the effect of LBP on the general population (Louw *et al*., 2007), with most research concetrating on particular population groups (mostly occupation based studies) or specific populations. Only a few have looked at the general population (van der Meulen, 1997; Docrat, 1999). This, therefore, limits the ability of health policy makers and other decision making bodies to implement the appropraite strategies to deal with this epidemic on a national scale (Dagenais and Haldeman, 2012). Therefore, this study aimed to determine the prevalence and risk factors of LBP in the white population of greater eThekwini metropolitan area.

Chapter Three: Methodology

3.1 Introduction

This chapter will outline the material and methods utilized in this study to achieve the aims and objectives stated in Chapter One.

3.2 Design

Survey research is determined by gathering information from a large and dispersed group of people (Dyer, 1997). The primary data was collected by means of a questionnaire and modified using a focus group to suit the selected population group. This is a quantitative cross-sectional survey which uses a questionnaire to collect the data (Salant and Dillman, 1994). The research tool of choice in this study was a questionnaire, as bias is kept to a minimum and a decreased chance of misinterpretation of the results (Mouton, 1996).

Therefore, a descriptive epidemiology study was initiated by approaching high income, middle and low income suburbs and randomly selecting the streets and houses that would be used in the study. The research topic was approved by the Faculty of Health Science Research and Bioethics committees (Appendix G).

3.3 Advertising

No advertising was used in this research.

3.4 Methods

3.4.1 Sample method

The sampling procedure was a two-stage stratified cluster sample. The process followed a selection of white populated areas, which were stratified into high, medium and low income. The second process looked at the consecutive selection of participants from each of the selected areas (Esterhuizen, 2010).

Statistics South Africa (www.statssa.co.za) supplied the researcher income statistics on all the suburbs that are distributed in the greater eThekwini Metropolitan area. The statistics were then analysed to establish which three suburbs had the best average of all three income areas (high, medium, low). The suburbs that were chosen for the study were Umhlanga Rocks (47% white populated and high income), Morningside (55% white populated and medium income) and Malvern (59% white populated and low income) (Appendix J).

Brabys 23rd edition and 2009 Postcodes 2nd edition were used to establish which roads fell into Umhlanga Rocks, Morningside and Malvern. All the roads in the various suburbs were counted and divided by 200 to determine how many houses would be approached per road (an even distribution of the total sample, 600 participants). Umhlanga Rocks had 27 roads, which amounted to 7.0 houses per road. The other 11 questionnaires were handed out to participants from central houses in Umhlanga, different from those central areas that had already been approached. This meant that in every 2nd road 12 houses were approached for the first 22 roads. Morningside had 33 roads, which amounted to 6.0 houses per road. The remaining 2 questionnaires were obtained from central houses in Morningside, different to those houses that had already been approached. This meant that in every 16th road 7 houses were approached. Malvern had 64 roads which amounted to 3.0 houses per road and the remaining 8 questionnaires were obtained from central houses in Malvern, different to those houses

that were already approached. This meant that in every 8th road, 4 houses were approached. The participants had to be 18 years and older. Participants were visited at their homes between 8am and 5pm on Saturdays and Sundays as majority of the participants were not available during the week.

Numbers 1 to 200 were put into a hat and one was drawn at each road. This indicated the number of the house that was to be approached. If the number were too high, another number was then drawn. If there was no answer at the selected house, the next immediate house was then approached.

3.4.2 Participants

Any resident over the age of 18 at the selected house who met the criteria (as per the inclusion and exclusion criteria Section 3.4.5) was asked to participate in the study. If they accepted participation, they then read through the letter of information (Appendix A), and then the questionnaire (Appendix F). The participant was the asked to complete the questionnaire. The participant had to stand on a scale to determine the weight and their height which was measured by the researcher. Once this had been completed the participant's body mass index was determined following which the completed questionnaire was placed in a sealed box to ensure anonymity of the participants. No particulars of the participant (e.g. name, identification number, residential address) appeared anywhere on the questionnaire, which helped to ensure anonymity of the participant. If there was no answer at the selected house, the next immediate house was then approached.

3.4.3 Measurement frequency

This questionnaire was administered only once per participant. If all participants that were present at the time of the visit met the inclusion criteria, they were requested to fill out the questionnaire.

3.4.4 Sample size

Six hundred participants in total were sampled in order to detect an assumed prevalence of 50% from the population, with 4% precision around the sample estimate and 95% confidence (Esterhuizen, 2010).

3.4.5 Sample characteristics

Inclusion criteria

- Only Individuals of South African white ethnicity, living in one of the selected suburbs in the greater eThekwini metropolitan area, were included in the study
- The participants had to be 18 years and older, in order for there to be no need to obtain parental consent. There was no upper age limit so as to get a wider prevalence of LBP.
- The participants were either male or female.
- The participants had to be literate in English in order to complete and comprehend the questionnaire.

Exclusion Criteria

- Participants who were not of white ethnicity.
- Participants who were under the age of 18 years old.
- Those who participated in the focus group and pilot study were excluded from the main study.
- Those who did not consent to the study were excluded.

3.5 Data collection

3.5.1 Procedure

Any participant that met the inclusion and exclusion criteria of the study and accepted to take part in the study would have been asked to then do the following:

- Read through the Letter of Information that explained the study/ and signed the Letter of Informed Consent (Appendix A).
- The participant stood on a scale to measure their weight. Height was measured by the researcher in order to determine the body mass index.
- The participant then completed the questionnaire (Appendix F).
- The questionnaire was placed in a sealed box to ensure confidentiality of all the participants. (No particulars of the participant e.g. name, identification number, residential address) appeared anywhere on the questionnaire, which also helped to ensure confidentiality of the participant).
- If there is no answer at the selected house, the next immediate house was approached.
- The information obtained from the data collection process was then recorded and sent for statistical analysis.

3.5.2 Focus group

The purpose of the focus group is to recommend any suggestions regarding the questionnaire in order to limit any misinterpretation by the participants (white population). Participants were encouraged to discuss their thoughts and ideas surrounding the topic of the questionnaire (Salant and Dillman, 1994). The focus group contextualised the questionnaire (Salant and Dillman, 1994), enhancing the validity (Bernard, 2000) and determined the face and content validity (Mouton, 1996; Dyer, 1997; Bernard, 2000).

The focus group consisted of the researcher, the supervisor, the co-supervisor, three representatives of the population group studied, two representatives from the health profession, and two representatives experienced in completing questionnaires.
Each member of the focus group received:

- Letter of Information (Appendix A)
- Informed Consent Form (Appendix B)
- Confidentiality Statement (Appendix C)
- Code of Conduct (Appendix C) and
- An original copy of the questionnaire (Appendix)

The above process and procedure was video recorded in order to enable accurate recording changes to questionnaire (Appendix I – as a result of the confidentiality statement signed by all participants of the focus group including the researcher that the DVD will only be available for purposes of examination and will be removed prior to the final publication of this dissertation).

3.5.3 Pilot Study

The pilot study involved a small sample of 5 participants from the population to which the final questionnaire was administered in order to determine the time taken to answer the questionnaire and to rule out any specific ambiguities in the questionnaire (Dyer, 1997).

These participants were instructed to read through the questionnaire and answer all the questions. The questionnaire was then finalised by making small changes to present a comprehensive questionnaire to the participants and the questions were easy to understand.

3.5.4 Final discussion on the questionnaire

The post focus group questionnaire (Appendix E) was derived by changes made by participants during the focus group. The Chiropractic Department and Ethics Committee then analysed the post focus group questionnaire and a pilot study was carried out. This final questionnaire (Appendix F) was formulated and photocopied and given to participants taking part in the study.

Specific changes at each point on the questionnaire.

From the Original questionnaire (Appendix D) to post focus group questionnaire (Appendix E).

- Question 5 was reformatted and the options were shuffled around.
- Question 7 - Present work status – the question of full time and part time was asked first and then the option of occupation was inserted.
- Risk Factors as a heading was introduced.
- Question 9, 10,11,12 were moved and become question 23, 24, 25, 26,27,28,29 and were formulated on the basis of trying to classify if the birth process is a risk for LBP.
- Question 12 had prolonged standing/ bending as an option to be chosen.
- Question 19 had 3 options added to the original question (Hockey, Golf and Surfing)
- Question 20 had the total exercise sessions per week erased.
- Question 21 was added regarding medical aid with a yes/no answer.
- Question 22 had 2 questions added to it. The first one regarding a diagnosed heart condition and second a rating scale of stress between 1-10.
- Question 30 was moved and placed before the diagram of the back.
- Only one diagram of the back was utilized.
- If the participant answered yes to having LBP, the question was then completed.
- Question 31 was added in classifying current LBP.

- Question 33 was formulated into specific timeframes.
- Question 34 was formulated into 9 different portions covering recent LBP.
- Question 35 - disabilities were erased and replaced with activities of daily living.

Final questionnaire:

Section A Concerned the demographic, socio-economic, and other personal data of the respondents.

Section B Contained the specific known risk factors and other factors that are potential risk factors as per the literature.

Section C Were answered only by participants who suffered from LBP.

3.5.5 Data analysis - statistical methodology

SPSS version 18 was used to analyse the data. A p value < 0.05 was considered as statistically significant. Associations between categorical covariates and prevalence of back pain were assessed using Pearson's chi square test, and differences in means between two independent groups were tested using t-tests. The risk factors for lifetime prevalence of back pain were tested using a binary logistic regression model in order to control for confounding factors. This was done in males and females separately. Odds ratios and 95% confidence intervals were reported. Descriptive analysis was by means of frequency tables, bar graph and pie charts for categorical variables, and summary statistics such as mean, standard deviation and range for continuous variables (Esterhuizen, 2010).

Chapter Four: Results and discussion

4.1 Introduction

The statistical findings and results obtained from the data will be presented and discussed in this chapter. The results and discussion are not normally discussed together in one chapter, but it's done so in the context of this study for ease of data presentation and analysis.

Objective One: To determine the lifetime, period and point prevalence of LBP in the white population of greater eThekwini metropolitan area.

Objective Two: To describe the characteristics of LBP in this population.

Objective Three: To identify the risk factors that influences the prevalence of LBP in this white population. These included age, gender, marital status, education / income, ethnicity, smoking, exercise, posture, biomechanical, physiological stress and occupational factors.

Objective Four: To assess the effect of LBP on activities of daily living.

4.2. Data sources

Data from both primary and secondary sources were used in this chapter.

4.2.1. The primary data

Primary sources of data included information collected from the participants of this study in the form of a completed questionnaire (Appendix F).

4.2.2. The secondary data

Secondary sources of data included the use of literature outlined in Chapter Two, which was obtained from research dissertations, journal articles, internet sources, books, personal communication with the statistician (Esterhuizen, 2011), supervisor (Jones, 2011) and co-supervisor (Korporaal, 2011).

4.2.3 The following abbreviations are pertinent to the chapter

ANOVA	analysis of variance.
C.I.	confidence interval
n	refers to the sample size.
N	number.
p	refers to the *p*-value, which indicates the data statistical significance. If the *p*-value is very small then it can be concluded that the results are significant (Hicks, 2004).
OR	odds ratio
SD	standard deviation
Sig.	significance value or *p* value
%	percentage
=	implies “equals to”.
<	refers to a figure “less than” the figure reported.
>	refers to a figure “greater than” the figure reported.

4.3 Response Rate

With respect to the response rates it must be noted that:

1. The sampling procedure was a two-stage stratified cluster sample:
    a. This meant that the process followed a selection of white populated areas (stratified into high, medium and low income white suburbs). In order to achieve this, Statistics South Africa (www.statssa.co.za, 2011) supplied income statistics on all the suburbs that are distributed in the greater eThekwini metropolitan area. The statistics were then analysed to establish which three suburbs had the best average of all three income areas (high, medium, low). The suburbs chosen for the study were Umhlanga Rocks (47% white populated and high income), Musgrave (55% white populated and medium income) and Malvern (59% white populated and low income).
    b. The second process was the random selection of participants from each of the selected areas (Esterhuizen, 2010). This included the use of Brabys 23rd edition and 2009 Postcodes 2nd edition to establish which roads fell into the Umhlanga Rocks, Morningside and Malvern suburbs. In Umhlanga Rocks there were 27 roads, which resulted in seven houses per road. The additional 11 questionnaires were handed to participants from central houses in Umhlanga Rocks, different from those that had previously been approached. In contrast Morningside had 33 roads, which amounted to six houses per road. The remaining two questionnaires were obtained from central houses in Morningside, different to those houses that had already been approached. Whereas Malvern had 64 roads which amounted to three houses per road and the remaining eight questionnaires were obtained from central houses in Malvern, different to those houses that had already been approached.

Participants were visited at their homes between 8am and 5pm on Saturdays and Sundays as majority of the participants are not available during the week (particularly in Malvern and Morningside).

Once on site, the researcher drew numbers out of a hat (numbers one to 200), which indicated the number of the house(s) that were approached. If there was no answer, the researcher noted the details and came back at a time that a participant from the house was available to talk to the researcher. This ensured that the participants were randomly selected and increased the validity of the research (Mouton, 1996; Mouton, 2001).

Based on the above process, six hundred participants in total were sampled in order to detect an assumed prevalence of 50% from the population, with 4% precision around the sample estimate and 95% confidence (Lapane *et al.,* 2007; Esterhuizen, 2010).

The data was collected, in person by the researcher, over a period spanning March 2011 – September 2011, a period of seven months. This method of data collection was preferred over posted questionnaires or questionnaires delivered by a third party. Reasons for this included the decreased return rate of questionnaires in studies where postal surveys were utilised (Lapane *et al.,* 2007), affecting the viability and bias of the sample. Additionally, the research budget was also not able to facilitate incentives (Asch *et al.*, 1998; Halpern *et al.*, 2002), advance incentives (Delnevo *et al*., 2004; Leung *et al.,* 2004) and / or use aspects of the lottery as an incentive (Robertson *et al.,* 2005) as suggested by the cited publications. Further to this, it was also not possible to change or have different modes of questionnaire delivery (electronic or other means) as suggested by Kasprzyk *et al.,* (2001) as the group that was targeted was not an isolated or defined group, but rather a sample of the general population as a whole.

As a result, the consort diagram for this study would be represented by Figure 4.1 as outlined on the following page.

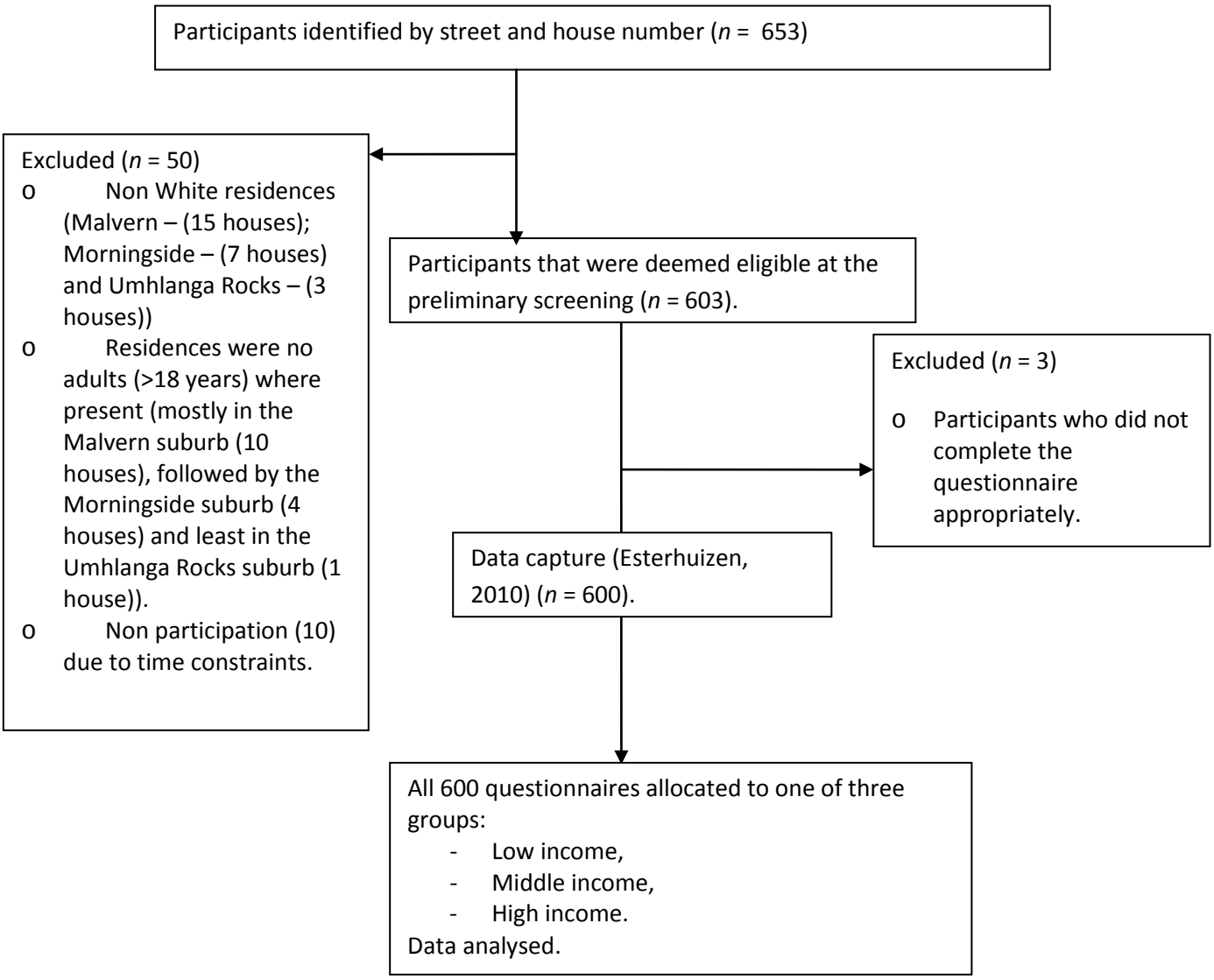


Figure 4.1 Flow diagram adapted from Moher, Schulz and Altman, (2001).

4.4 Results

4.4.1 Objective One:

To determine the point, period and lifetime prevalence of LBP in the white population of greater eThekwini metropolitan area.

In medicine, there are several ways of explaining the prevalence of LBP. In the summary below ***Point***, ***Period*** and ***Lifetime Prevalence*** in the white population will be explained.

4.4.1.1 Point prevalence:

According to Galukande (2005), point prevelance is the present experience of LBP.

Table 4.1: Point prevalence: Do you currently have low back pain?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never had LBP	321	53.5	53.5	53.5
	Yes	204	34.0	**34.0**	87.5
	No	75	12.5	12.5	100.0
	Total	600	100.0	100.0	

The point prevalence of LBP found in this study was 34% overall which coincides with similar results achieved by Mijiyawa *et al*., (2000), a Togolese study which recorded a 35% point prevalence and van Vuuren *et al*., (2005), a steel workers study in South Africa where a 36% point prevalence was reported. Additionally these results seem to agree with those found by Valkenburg *et al.,* (1982) where the point prevalence in a Danish population showed a 30.2% in females and 22.2% in males, which may indicate that this study could report a higher female percentage reporting of LBP in the statistics that are to follow.

In contrast to this study, Biering-Sörensen *et al.,* (1989) showed a marked difference, with statistics as low as 15.2% in females and 12.0% in males.

Point prevalence was further analyzed in low (36.0%) (Malvern), middle (26.5%) (Morningside) and high (39.5%) (Umhlanga Rocks) income suburb categories within the greater eThekwini metropolitan area. There was a significant association between group and point prevalence of LBP (p = 0.017), with the point prevalence being highest in the high income group, and lowest in the middle income group.

Table 4.2: Point prevalence: Do you currently have LBP?

		Never had LBP	Yes	No	
Low income	Count	97	72	31	200
	% within group	48.5%	**36.0%**	15.5%	100.0%
Middle income	Count	125	53	22	200
	% within group	62.5%	**26.5%**	11.0%	100.0%
High income	Count	99	79	22	200
	% within group	49.5%	**39.5%**	11.0%	100.0%
Total	Count	321	204	75	600
	% within group	53.5%	34.0%	12.5%	100.0%

Pearson's chi square = 12.0, p = 0.017

The inter-group differences could be associated with:

a. Respondent self-selection (viz. those choosing to respond / participate because they had LBP) (Mouton, 2006; Lapane *et al.*, 2007). It was, however, noted in the study, and it is reported here that the only reason for not wishing to participate in this study was related to the respondents not being able to accommodate the researcher in terms of time.
b. Respondent groupings (viz. the numbers of respondents per location). It was more likely to get more than one respondent per household in the lower income groups as compared to the higher income groups (according to the notes taken by the researcher during the course of the study). This should be supported by data that characterizes each of the groups as the factors affecting LBP are analyzed (see Table 4.17; 4.20; 4.21 and 4.22).
c. Data reporting with regards to the current reporting of pain in the low back may also be influenced by fear of reporting occupation related injury and fear of avoidance behavior as a result of the fact that the low income groups tend to be resistant at reporting factors to employers as they perceive this to influence their working relationship with their employer and / or chances for promotion (Gheldof *et al.*, 2005). However, this factor may be minimized if the group does

not have a significant number of respondents that fall into an employment category or are self-employed (see Tables 4.21; 4.21; 4.31 and Figure 4.13).

d. Further to this employment type as associated with location of the income related suburbs may also be responsible for the point prevalence achieved.(Table 4.22).

e. Lastly personal factors such as age, gender and body mass index may also be related to this outcome (see Table 4.34).

4.4.1.2 Period prevalence:

An episode of low back pain over a 1 year period or a given time period (Galukande , 2005).

Table 4.3: Period Prevalence: How often do you experience LBP?

	Frequency	Percent	Valid Percent	Cumulative Percent
Never had LBP	315	52.50	52.50	52.50
0-3 months	128	21.33	**21.33**	73.83
6-12 months	110	18.33	**18.33**	92.16
Longer than one year	47	7.83	**7.83**	100.0
Total	600	100.0	100.0	

In the group overall, the 0 - 3 month period prevalence was 21.3%, 6-12 months was 18.3% and those who had LBP longer than a year was 7.8%.

The period prevalence found by Gyntelburg *et al*., (1974) was 25% in males; by Svensson *et al., (*1982) was 31% in males and 35% in females and by Papageorgiou *et al.*, (1995) was 35% in males and 42% females which seems to be higher than the the results achieved in this study. This is also reflected in the summary table (Table 4.4) below.

Table 4.4 INTERNATIONAL PREVALENCE OF LBP				One year %
AUTHOR	**DATE**	**COUNTRY**	**TYPE OF STUDY**	
Luo *et al.,*	1995	USA	National	18
Hillman *et al.,*	1996	UK - Bradford	National	39
Maniadakis *et al.,*	2000	UK	National	36
Jin *et al.,*	2004	Shanghai	Working environments : garment factory workers, battery and kiln product workers, primary school teachers	40-74
Boonen *et al.,*	2005	Netherlands	National	21
van Vuuren *et al.,*	2005	South Africa	Steel Industry	56
van Vuuren *et al.,*	2006	South Africa	Manganese industry	69.8
Dagenais and Haldeman	2012	-	International	50

This seems to suggest that this study agrees with the outcomes of Luo *et al.*, (1995) and Boonen *et al.,* (2005). The reason for disagreement with Jin *et al.,* (2004); van Vuuren *et al.,* (2005) and van Vuuren *et al.* (2006) may include the specificity of their population groups (viz. particular working populations) whereas the high percentages reported by Maniadakis *et al.,* (2000) may be related to their study being linked to medical schemes coverage claims and not the general population (viz. without the naturally higher skew, as patients would only claim if they had low back pain).

With regards to Hillman *et al.,* (1996), who had a two phase study, which included the screening of respondents in the first phase (therefore excluding LBP of non-musculoskeletal origin) and thus only reported LBP prevalence's in persons with LBP of musculoskeletal origin. This would, therefore, increase the likelihood of patients reporting pain in the low back region and, therefore, result in an outcome different to this current study.

In addition to these methodological differences it is also possible that demographic as well as LBP risk factors may have been unique or more pronounced in the different studies, therefore resulting in differences in reporting and recording of the data with regards to the prevalence of LBP.

Further confounding these results one also has to consider the possibility that the respondents also affect the outcome as their likelihood of remembering episodes of LBP becomes increasingly hazy due to memory decay as the time from that episode increases (Mouton, 1996; Mouton, 2000).

With regard to the subgroup analysis, it was revealed that there was no significant difference between the groups in terms of period prevalence (p = 0.073).

Table 4.5: Period prevalence: How often do you experience LBP?

		never had LBP	0-3 months	6-12 months	Longer than one year	
Low income	Count	96	50	39	15	200
	% within group	48.0%	25.0%	19.5%	7.5%	100.0%
Middle income	Count	122	37	26	15	200
	% within group	61.0%	18.5%	13.0%	7.5%	100.0%
High income	Count	97	41	45	17	200
	% within group	48.5%	20.5%	22.5%	8.5%	100.0%
Total	Count	315	128	110	47	600
	% within group	52.5%	21.3%	18.3%	7.8%	100.0%

Pearson's chi square =11.57, p=0.073

The above results are at odds with the literature as outlined in Table 4.5, as it would stand to reason that low income groups should have higher prevalence reporting than higher income groups, based on the results of Jin *et al.,* (2004); van Vuuren *et al.,* (2005) and van Vuuren *et al.* (2006) who studied predominantly lower income groups and given the fact that national averages range between 36 - 50% (Hillman *et al.*, 1996; Maniadakis *et al.,* 2000; Dagenais and Haldeman, 2012), which implies that higher income groups would require lower percentages for their prevalence's in order to obtain a national average that is lower than that indicated for lower income groups.

Notwithstanding the differences between this study and the cited studies above, it is also possible that the significantly lower point prevalence's (0-3; 6-12 and over 1 year) are as a result of the manner in which the question was phrased as follows in question 33 of the questionnaire:

How often do you experience LBP?	0 – 3 months	6-12 months	Longer than 1 year

The manner in which this question was phrased may have elicited a response as regards the frequency of LBP episodes that the respondent experienced as compared to whether or not they actually had pain in that period (the latter being a true reading of period prevalence as opposed to frequency). Additionally it is also noted that the 4-6 month period was omitted from the questionnaire, which may have confounded results. It is therefore suggested that future research look at including both a frequency and period prevalence questions, in order to ascertain whether there is indeed a difference between how respondents would respond to these questions and if indeed different results are obtained.

4.4.1.3 Lifetime prevalence:

According to Walker (2000), lifetime prevelance is at least one episode of LBP in a lifetime. In total, 48% of those who answered this question said they had lifetime prevalence of LBP.

Table 4.6 Lifetime prevalence: Have you ever experienced LBP?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	285	**47.5**	48.0	48.0
	No	309	51.5	52.0	100.0
	Total	594	99.0	100.0	
Missing	0	6	1.0		
Total		600	600	100.0	

This compares favourably with the international studies noted in Table 4.7 (below), where the South African white population seems to have lower lifetime prevalence than the listed international studies. It is of interest that this study seems to compare most favourably with Louw, Morris and Grimmer-Somers (2007), which is another African based study. Reasons for the differences between this and other studies will be further explored in the discussion of the individual risk factors, but are not dissimilar to the discussions around the point prevalence (Section 4.4.1.1) and period prevalence's (Section 4.4.1.2) discussed previously.

Table 4.7 INTERNATIONAL PREVALENCE OF LBP				Lifetime %
AUTHOR	**DATE**	**COUNTRY**	**TYPE OF STUDY**	
Bovenzi,	1996	-	Intervention study	66.4-83.8
Hillman *et al.,*	1996	UK - Bradford	National	59
Van der Meulen	1997	South Africa	Ethnic group specific	57.6
Cassidy *et al.,*	1998	-	Epidemiological study	84
Frank *et al.,*	1996	-	Epidemiological study	50 –80
Docrat *et al.,*	1999	South Africa	Ethnic group specific	78.2
				76.6
Loney and Stratford,	1999	-	Review of literature	59-84
Walker	2000	Global	Review of literature	11-84
Jin *et al.,*	2004	Shanghai	Working environments : garment factory workers, battery and kiln product workers, primary school teachers	50-79
Waddell,	2004	USA	Epidemiological study	50-80
Walker *et al.,*	2004	Australia	National	65
Galukande *et al.,*	2005	Africa - Uganda	National	62.3
Van Vuuren *et al.,*	2005	South Africa	Steel Industry	64
Van Vuuren *et al.,*	2006	South Africa	Manganese industry	71.6
Louw, Morris and Grimmer-Somers	2007	Africa	Review of literature	36–62
Dagenais *et al.*,	2008	International	Review of literature	5–65
Koley *et al.,*	2008	India – Punjab	National	60
Bell and Burnett,	2009	Global	Review of literature	60–90
Helfenstein Junior *et al.,*	2010	Global	Review of literature	50–80
Dagenais and Haldeman	2012	International	Review of literature	85

Looking at the figures from Table 4.7, it is seen that the lifetime prevalence figures range from 5-85%, with an average of 60.93% between these studies, which is lower than the 85% indicated by Dagenais and Haldeman (2012) in their latest review. The biggest factor influencing this difference would be the changes in time as well as the larger aging population globally (Joubert *et al.,* 2005).

Further to the above, there was a significant difference in lifetime prevalence of LBP between the income groups (p = 0.011) with the prevalence being highest in the low income group and lowest in the middle income group.

Table 4.8: Lifetime prevalence: Have you ever experienced LBP?				
		Yes	No	
Low income	Count	105	91	196
	% within group	53.6%	46.4%	100.0%
Middle income	Count	79	121	200
	% within group	39.5%	60.5%	100.0%
High income	Count	101	97	198
	% within group	51.0%	49.0%	100.0%
Total	Count	285	309	594
	% within group	48.0%	52.0%	100.0%

Pearson's chi square = 8.9, p= 0.011

These lifetime prevalence differences between the income groups seem to follow the trend that is depicted in the lifetime prevalence's table (Table 4.8) and are on average lower than most reported prevalence's globally. This confirms that there is a a lower prevalence rate of LBP among the white population, which contradicts the assertion that predisposing factors (Woolf and Pfleger, 2003) have a greater prevalence and incidence in Africa and would therefore increase the likelihood of an increased prevalence.

In the context of incidence age, the age of the respondent first experienced LBP ranged from 1 to 58 with a mean of 25.6 and a standard deviation of 9.8 years.

Table 4.9 What was your age when you first experienced low back pain? (Years)		
N	Valid	284
	Missing	316
Mean		25.61
Median		25.00
Std. Deviation		9.823
Minimum		1
Maximum		58
Percentiles	25	20.00
	50	25.00
	75	30.00

The above data (Table 4.9) would seem to concur with the findings of Jones *et al.,* (2002), who indicated that new onset low back pain had a 12.5% occurrence in 12 year olds (this average was slightly higher in girls than boys). This concurs with Olsen *et al.,* (1992), who indicated that 36% of participants had LBP by the age of 15 years of age, which is similar to the studies by Fairbank *et al.,* (1984) and Balague *et al.,* (1988).

In contrast the data obtained in this study indicates a slightly older onset of low back pain than compared to Pellise *et al.,* (2011), where the age of low back pain onset was 12.98 years (1.88 SD; range 11.1 – 14.98) and Jones *et al.*, (2004), who indicated that children reported first onset of low back pain as early as 10.0-10.9 years, with a lifetime prevalence 17.6% in boys and 18.8% in girls of that age. This confirms the current prevalence that was found in the same study where children aged 10.0-10.9 years had a 2.9% recurrence in boys and a 3.1% recurrence in girls.

4.4.2 Objective Two

4.4.2.1 To describe the characteristics of LBP in this population.

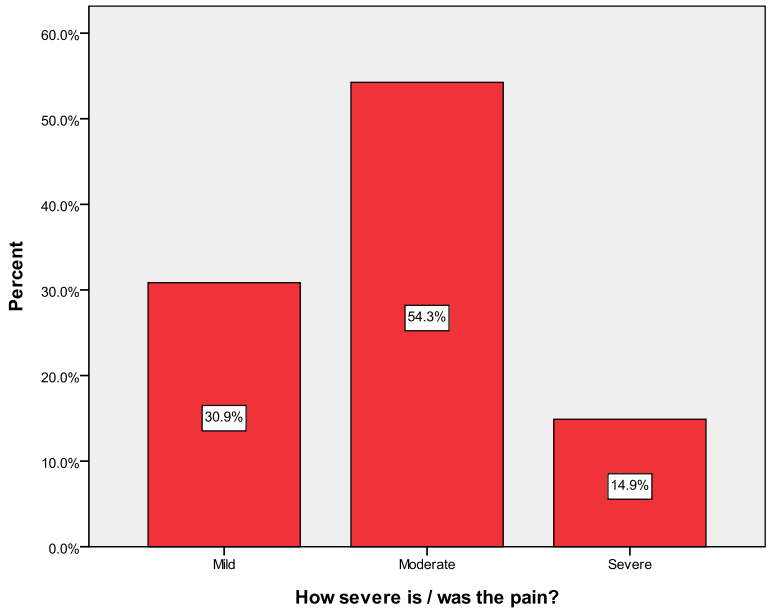


Figure 4.1: How severe was the pain?

The majority of those who had current LBP said their pain was moderate (54.3%) with only 14.9% having severe pain. The worst pain occurred mostly in the evening, followed by morning pain (Figure 4.2), which suggests that these participants either developed pain during the course of their working day (fatigue) or as a result of generative arthritic changes to the spinal joints (known to cause morning pain (Munro *et al.,* 1995)) .

This would concur with the reporting of 'least pain' in the morning (in the working populace after a restful period) followed by whilst sleeping (again possibly the working populace and those with arthritic changes, who would have worst pain at the end of a day or early morning (Munro *et al.,* 1995)) (Figure 4.3).

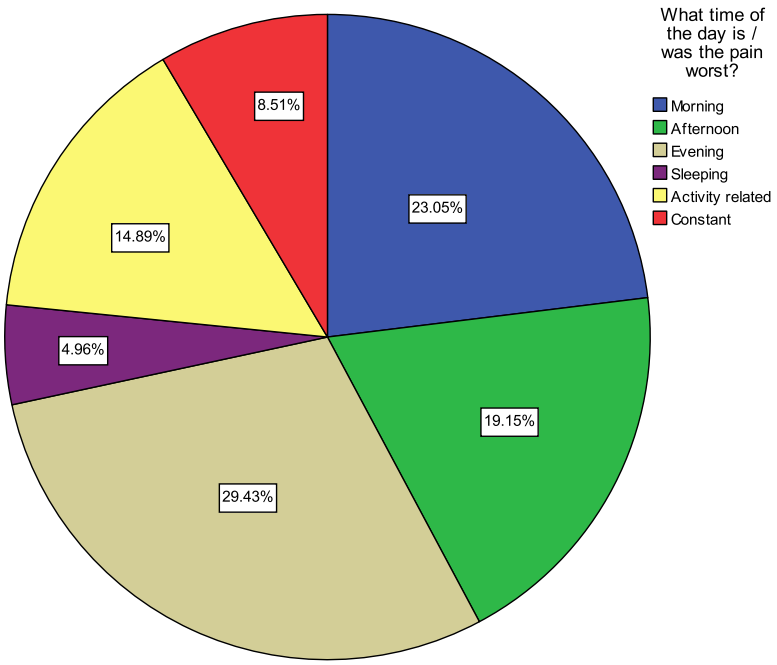


Figure 4.2: Time of day that pain is worst

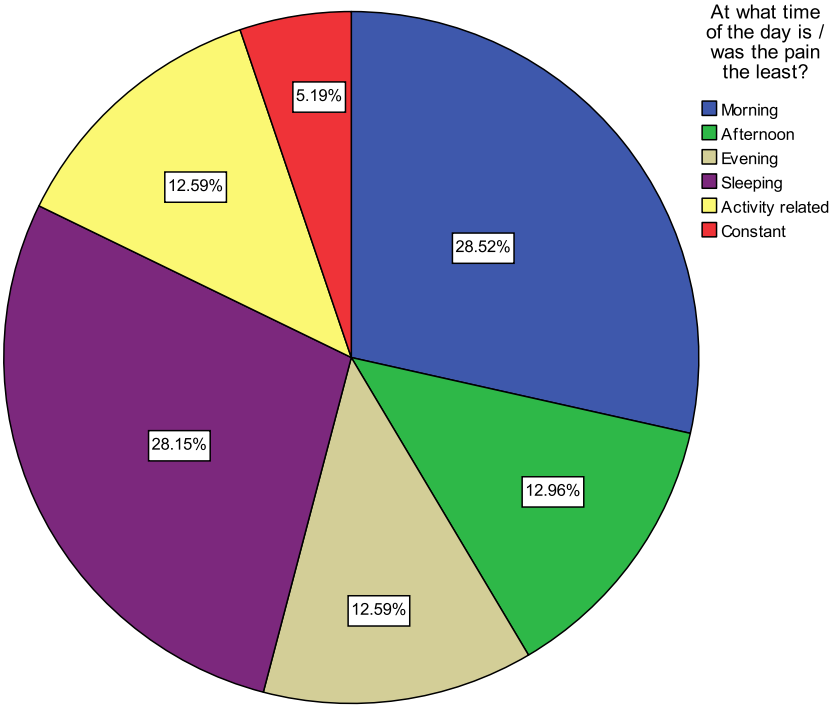


Figure 4.3: Time of day that pain was least

Table 4.10 Pain rating scale			
		Please rate your LBP at its worst. Pain rating scale (0 -10) with 0 being the least and 10 being the most severe amount of pain).	Please rate your LBP at its least. Pain rating scale (0 -10) with 0 being the least and 10 being the most severe amount of pain).
N	Valid	281	261
	Missing	319	339
Mean		6.88	3.18
Std. Deviation		1.878	1.716
Minimum		1	1
Maximum		10	10

Furthermore, and in congruence with the Table 4.10, the average pain rating out of 10 for worst pain severity was 6.88 and the least was 3.18. Majority of the respondents found that pain was gradual in onset (50.6%) (Table 4.11). This would concur with slow degenerative changes (Munro *et al.,* 1999), but also accounts for "weekend warriors" (sudden onset) who injure themselves whilst participating in sporting or other irregular activities (Hoogendoorn *et al.,* 2000; Heneweer *et al.,* 2010).

Table 4.11: How did your low back pain begin?				
		Frequency	Valid Percent	Cumulative Percent
Valid	Gradually	137	50.6	50.6
	Abruptly	88	32.5	83.0
	Unsure	46	17.0	100.0
	Total	271	100.0	

These results would concur with the noted progression in the LBP reported in Figure 4.4.

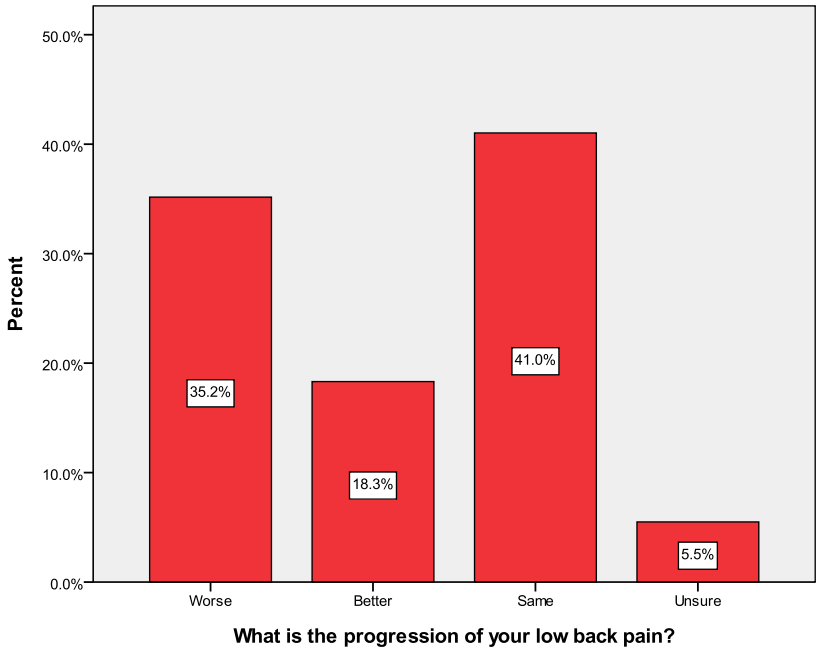


Figure 4.4: Progression of LBP

With respect to the progression of low back pain, most participants' back pain was noted as having stayed the same (41%) while some participants were getting worse (35.2%). Only 18% felt less pain as time progressed.

With respect to the causes of pain, it was reported by respondents in open ended format that LBP originated from one or more of the following (Table 4.12).

Table 4.12 Do you know what caused your low back pain?		
	Frequency	Valid Percent
Accident / Car accident	4	2.9
Age	2	1.5
Bad posture / posture	5	3.6
Bending	4	2.9
Birth	1	.7
Birth defect	1	.7
Carrying infants children	2	1.5
Child birth / pregnancy / epidural	24	17.5
Driving	1	.7
Fall / Fallen / Fallen down / Fell off a chair	13	9.5
Foot changes	1	.7
Fused vertebrae	1	.7
Gardening	1	.7
Hip displacement	1	.7
House work	1	.7

Table 4.12 Do you know what caused your low back pain? Continued …		
	Frequency	Valid Percent
Kidney infection	2	1.5
Lifting beams / Lifting boxes / Lifting heavy objects	3	2.1
No stretching	1	.7
Overuse	1	.7
Popped disc / slipped disc	3	2.1
S-shaped spine / Scoliosis	2	1.5
Sitting	1	.7
Sleep	1	.7
Sport (general)	34	24.7
Standing / Standing for long periods	4	2.9
Weak core	1	.7
Work / job	23	16.7
Total	138	100
No reported activity	462	(77)
Total	600	

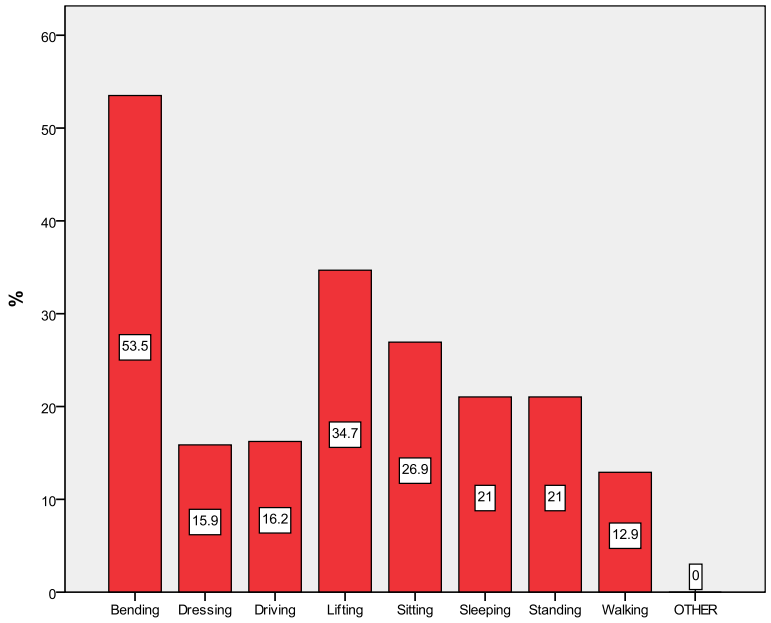


Figure 4.5: Activities associated with LBP

In terms of LBP, it was found that bending and lifting were reported as the highest offenders amongst those who had previously had LBP (Figure 4.5). This concurs with Roffey *et al.,* (2010d) and Wai *et al.,* (2010b).

Table 4.13 How would you rate your overall disability because of your LBP?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	None	89	14.8	32.7	32.7
	Mild	141	23.5	51.8	84.6
	Moderate	36	6.0	13.2	97.8
	Severe	6	1.0	2.2	100.0
	Total	272	45.3	100.0	

It was noted that current pain, reported along with mild disability was most frequent at 51.8%, whereas pain with severe disability was reported in only 2.2% of respondents.

Table 4.14 Have you ever had to stay away from work because of LBP?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	47	7.8	16.8	16.8
	No	233	38.8	83.2	100.0
	Total	280	46.7	100.0	
Missing	0	320	53.3		
Total		600	100.0		

Table 4.15 Statistics		
If 'Yes', for how long? (weeks)		
N	Valid	41
	Missing	559
Median		2.000
Minimum		.1
Maximum		42.0
Percentiles	25	1.000
	50	2.000
	75	2.000

It would seem that pain resulted in only 16.8% of all respondents having to stay away from work due to LBP for any period. In terms of the actual time spent away from work, the median duration of absenteeism from work was two weeks with a range from one day to 42 weeks.

Table 4.15 Have you ever lost your job / been medically boarded due to LBP?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	5	.8	1.8	1.8
	No	271	45.2	98.2	100.0
	Total	276	46.0	100.0	

Cumulative absences from work usually lead to medical boarding of employees and it would seem reasonable that a small percentage of this study, who have been absent from work for up to 42 weeks would have resulted in their medical boarding. Thus it is reasonable to expect that only 1.8% had ever lost their job or been boarded due to their current LBP (Table 4.15).

In summary, respondents were characterized with a current pain episode that included pain of a moderate nature that was worse in the evening, reduced in the morning or the pain prevented them from falling asleep or pain woke the participant up. The pain was noted to have started both abruptly and through insidious causes after which little progression to improvement was noted.

The most common work related cause of LBP was bending and lifting and resulted in moderate absences from work, with a very small percentage of respondents having been medically boarded.

4.4.3 Objective three

To identify the risk factors that influence the prevalence of LBP in this population. These included age, height, weight, gender, marital status, education / income, ethnicity, smoking, exercise, posture, biomechanical, physiological stress and occupational factors.

4.4.3.1 Demographics of the sample:

4.4.3.1.1 Age, Height and Weight

Mean age, height and weight of the three groups and the sample as a whole are shown in Table 4.16, along with the *p* values for the ANOVA test to compare the three means.

Table 4.16 ANOVA test to compare means between the three income groups

Group		How old are you?	Height (m)	Weight
Low income	Mean	**36.62**	**1.6922**	**80.14**
	N	200	200	200
	Std. Deviation	15.450	.10645	16.141
Middle income	Mean	**38.56**	**1.7148**	**80.28**
	N	200	200	200
	Std. Deviation	13.973	.10450	16.921
High income	Mean	**40.44**	**1.7148**	**83.17**
	N	200	200	200
	Std. Deviation	12.292	.11344	16.119
Total	Mean	**38.54**	**1.7073**	**81.20**
	N	600	600	600
	Std. Deviation	14.029	.10854	16.430
	p value	**0.024**	**0.056**	**0.114**

In terms of the three income groups, it is noted that age was significantly different between the three groups ($p = 0.024$). It was noted that the low and high income groups where significantly different from each other, with the low income group having the lowest age and the high income group having the highest age. From the above results it would seem to suggest that the high income group would potentially report the highest degree of LBP, as a result of this group having the highest age (The Editors, 1995; Leboeuf-Yde *et al.,* 2009; Plouvier *et al.,* 2011; Dagenais and Haldeman, 2012). These literature findings are again substantiated in Table 4.32 in

the regression analysis of LBP in males in this study and agree with the study by Louw *et al.,* (2007), which is another study that is based on populations in South Africa. This was however not true for the female population in this study (Table 4.32) as age was not a noted factor in the development of LBP in women. Therefore the results of this study generally contrast the work of Daltroy *et al.*, (1991), Biering-Sörensen (1983), Battie *et al*., (1990 and Burdorf and Sorock (1997)

Whereas in terms of height (m) and weight (kg) the income groups did not differ significantly from each other (although it is noted that the height of the participants between the middle and high income groups as compared to the low income group nears statistical significance). These findings concur with the findings of Leboeuf-Yde (2003) who shoed in her study that there was a poor association between BMI and LBP. It also confirms the findings of Kostova (2001) and Henneweer *et al.,* (2010), where it was found that a combination of factors including age, obesity, smoking and BMI were more likely to be associated with LBP if found in combination than if they occurred in isolation.

4.4.3.1.2 Gender

Table 4.17 Cross tabulation and chi square test of gender and group

			Group			Total
			Low income	Middle income	High income	
Gender	Male	Count	**79**	**97**	**104**	280
		% within group	39.5%	48.5%	52.0%	46.7%
	Female	Count	**121**	**103**	**96**	320
		% within group	60.5%	51.5%	48.0%	53.3%
Total		Count	200	200	200	600
		% within group	100.0%	100.0%	100.0%	100.0%

Pearson's chi square = 6.68; *p*=0.035

The gender distribution seems to be significantly different between the high and low income groups, where there are more males participants in the high income group in contrast to the low income group in which there are more female participants. This concurs with the height and weight elements noted in Table 4.16.

Thus, it would seem that the low income group is composed of predominantly young females, with an average / above average height and a slightly higher than average

BMI score (based on the noted height and weight) as compared to the high income group which seems to be predominantly males, with an average height, an average BMI score. This would tend to indicate that there is a chance that the low income group may be more likely to suffer from LBP since there is a predominance of LBP in females (Valkenburg *et al.,* 1982; Fairbank *et al.,* 1984; Salminen *et al.,* 1984; Svensson *et al.,* 1988; Balague *et al.,* 1994; Jin *et al.,* 2004; Munce and Stewart, 2007), an above average weight (Mirtz *et al.,* 2005) and an above average height (Buckwalter *et al.,* 1993); as compared to the older (based on the age analysis supported by The Editors, 1995; Leboeuf-Yde *et al.,* 2009; Plouvier *et al.,* 2011; Dagenais and Haldeman, 2012) males in the high income group (although it is noted that older males tend to be predisposed to LBP. It would also seem more likely that the males have a greater likelihood in being physically active based on their BMI (Mirtz *et al.,* 2005; Henneweer *et al.,* 2010), which would be protective of LBP. These findings are supported when one considers the regression analysis outcomes in Tables 4.33 and 4.34.

The middle income group seems to be unaffected by these variables as they consistently achieve average parameters / fall between the high and low income groups.

4.4.3.1.3 Marital status

Table 4.18 Cross tabulation and chi square test for marital status and group						
			Group			Total
			Low income	Middle income	High income	
Marital Status	Divorced	Count	25	25	31	81
		% within group	12.5%	12.5%	15.5%	13.5%
	Married	Count	68	**90**	**107**	265
		% within group	34.0%	45.0%	53.5%	44.2%
	Separated	Count	6	8	5	19
		% within group	3.0%	4.0%	2.5%	3.2%
	Single	Count	**82**	61	42	185
		% within group	41.0%	30.5%	21.0%	30.8%
	Staying together	Count	8	6	13	27
		% within group	4.0%	3.0%	6.5%	4.5%
	Widowed	Count	11	10	2	23
		% within group	5.5%	5.0%	1.0%	3.8%
Total		Count	200	200	200	600
		% within group	100.0%	100.0%	100.0%	100.0 %

Pearson's chi square = 32.5; $p < 0.001$

In terms of the marital status (Table 4.18) of the participants, single people were more common in the low income group while there were more married people were higher in the high income group. This would fit with the profile of the respondents as noted in the discussion under Table 4.17.

4.4.3.1.4 Education

Table 4.19 Cross tabulation and chi square test of education and group						
			Group			Total
			Low income	Middle income	High income	
Education	None	Count	3	4	2	9
		% within group	1.5%	2.0%	1.0%	1.5%
	Primary	Count	0	3	0	3
		% within group	.0%	1.5%	.0%	.5%
	High school	Count	12	16	7	35
		% within group	6.0%	8.0%	3.5%	5.8%
	Matriculated	Count	95	88	58	241
		% within group	47.5%	44.0%	29.0%	40.2%
	Tertiary	Count	87	87	131	305
		% within group	43.5%	43.5%	65.5%	50.8%
	Other	Count	3	2	2	7
		% within group	1.5%	1.0%	1.0%	1.2%
Total		Count	200	200	200	600
		% within group	100.0%	100.0%	100.0%	100.0%

Pearson's chi square = 32.7; p = < 0.001

4.4.3.1.5 Work (full time and part time)

Table 4.20 Cross tabulation and chi square test of work and group						
			Group			Total
			Low income	Middle income	High income	
Work	Unknown	Count	8	1	2	11
		% within group	4.0%	.5%	1.0%	1.8%
	Full time	Count	**152**	**185**	**188**	525
		% within group	76.0%	92.5%	94.0%	87.5%
	Part time	Count	40	14	10	64
		% within group	20.0%	7.0%	5.0%	10.7%
Total		Count	200	200	200	600
		% within group	100.0%	100.0%	100.0%	100.0%

Pearson's chi square = 37.2; p < 0.001

From Table 4.19, tertiary education was more common in the high income group. This concurs with the participants who they are in full time work who were

categorized between the middle and high income group (Table 4.20), as it is more likely for someone to hold a full time employment position with a tertiary education. Additionally, it seems to suggest that the older the participant, the more likely they are to have had some form of education and employment. Thus, with the high income group being older, it stands to reason that they would also be the more educated (the converse may also be true) (Table 4.19).

4.4.3.1.6 Occupation

Table 4.21 Cross tabulation and chi square test for occupation and group

			Group			Total
			Low income	Middle income	High income	
Occupation	Unknown	Count	5	5	2	12
		% within group	2.5%	2.5%	1.0%	2.0 %
	Housewife	Count	8	7	16	31
		% within group	4.0%	3.5%	8.0%	5.2 %
	Retired	Count	8	5	10	23
		% within group	4.0%	2.5%	5.0%	3.8 %
	Employed	Count	**109**	**130**	**99**	338
		% within group	54.5%	65.0%	49.5%	56.3 %
	Self employed	Count	19	28	**54**	101
		% within group	9.5%	14.0%	27.0%	16.8 %
	Student	Count	**40**	14	15	69
		% within group	20.0%	7.0%	7.5%	11.5 %
	Unemployed	Count	11	11	4	26
		% within group	5.5%	5.5%	2.0%	4.3 %
Total		Count	200	200	200	600
		% within group	100.0%	100.0%	100.0%	100.0%

Pearson's chi square = 54.6; $p < 0.001$

It would seem, that on average, the high income group was characterised by self-employed, employ mess, followed by participants who indicated they were housewives and students. In contrast, the low income group was characterised by full time employers, students and participants who were unemployed. The middle income group averaged between high and low income groups.

In terms of significant differences it is noted that the self-employment was more common in the high income group and being a student was more common in the low income group.

4.4.3.1.7 Stress:

The average stress level of the entire sample was 5.96 with a standard deviation of 2.2 (range 0 - 10) while the stress levels of the three groups varied significantly (p = 0.001). The stress levels reported by the high income group were the highest, followed by the middle and then lowest in the low income group. The difference between the high and low income groups was statistically significant (p = 0.001) but not between any other groups.

Table 4.22 Stress levels

Please rate your stress level on a scale of 0 – 10 (0 being the least and 10 being the most)

Group	Mean	N	Std. Deviation
Low income	5.56	200	2.301
Middle income	5.97	200	1.968
High income	6.36	200	2.301
Total	5.96	600	2.217

Bonferroni post hoc tests to compare mean stress between the three income groups.
Please rate your stress level on a scale of 0 - 10. (0 being the least and 10 being the most)

(I) group	(J) group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Low income	Middle income	-.410	.220	.187	-.94	.12
	High income	-.805*	.220	.001	-1.33	-.28
Middle income	Low income	.410	.220	.187	-.12	.94
	High income	-.395	.220	.218	-.92	.13
High income	Low income	.805*	.220	.001	.28	1.33
	Middle income	.395	.220	.218	-.13	.92

The mean difference is significant at the 0.05 level.

Stress was not associated with lifetime (p = 0.425) or current prevalence of LBP (p = 0.347), therefore it seems that it is most likely to be related to work or home stressors. With the high come group suffering the most stress it is likely that the stressor is related to work / occupation. This concurs with the following set of results in which employment was significantly associated with stress (p < 0.001). Those who were in full time employment (high income) were significantly more stressed than

those who were not employed (low income) (p = 0.001), but not more so than part time workers (p = 0.074) (Table 4.23).

Report of mean stress in three employment categories

Table 4.23 Please rate your stress level on a scale of 0 - 10(0 being the least and 10 being the most).

Work	Mean	N	Std. Deviation
Don't work	3.64	11	2.693
Full time	6.07	525	2.201
Part time	5.42	64	1.983
Total	5.96	600	2.217

Please rate your stress level on a scale of 0 - 10. (0 being the least and 10 being the most.)

(I) Work	(J) Work	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Don't work	Full time	-2.438*	.667	.001	-4.04	-.84
	Part time	-1.786*	.714	.038	-3.50	-.07
Full time	Don't work	2.438*	.667	.001	.84	4.04
	Part time	.652	.290	.074	-.04	1.35
Part time	Don't work	1.786*	.714	.038	.07	3.50
	Full time	-.652	.290	.074	-1.35	.04

The mean difference is significant at the 0.05 level.

The above results do not seem to correlate with the findings of Heneweer *et al.,* (2010), who suggested that there is robust evidence indicating that psychological factors (such as stress) are related to future episodes of LBP and related disability levels (Bongers *et al.,* 1993; Hoogendoorn *et al.,* 2000; Linton and Ryberg, 2000; Heneweer *et al.,* 2010). It is further noted that stress may be linked to apprehension about a previous injury or increased perceived damage to the low back with a subsequent injury (Morris, 2006). This is not reflected in this study where stress is more significantly linked to the occupation / employment status than the presence of LBP.

Table 4.24: Based on the assessment of the demographics of the respondents:

	Low income	Middle income	High income	Significance levels
Age	Younger	Average	Older	Age (p=0.024).
Gender	More female	Equal	More male	Gender (p=0.035).
Height	Above average height	Taller than	Taller than	Height (p=0.056).
Weight	Above average BMI (for female)	Average BMI	Average BMI	Weight (p=0.114).
Marital status	Single	Married	Married	Marital status (p<0.001).
Education	Matriculated	Matriculated	Higher / tertiary education	Education (p<0.001).
Full time / part time	Less full time / more part time	Full time employed	More full time / less part time	Work (p<0.001).
Occupation description	Employed / student / unemployed	Employed / self employed and student	Employed / self employed / housewife / retired	Occupation (p<0.001).
Stress	Least stress	Average stress	Most stress	Stress (p=0.001)
Predisposition to low back pain	Highest Chance 		Lowest Chance	

4.4.3.2 Factors associated with LBP:

4.4.3.2.1 Smoking:

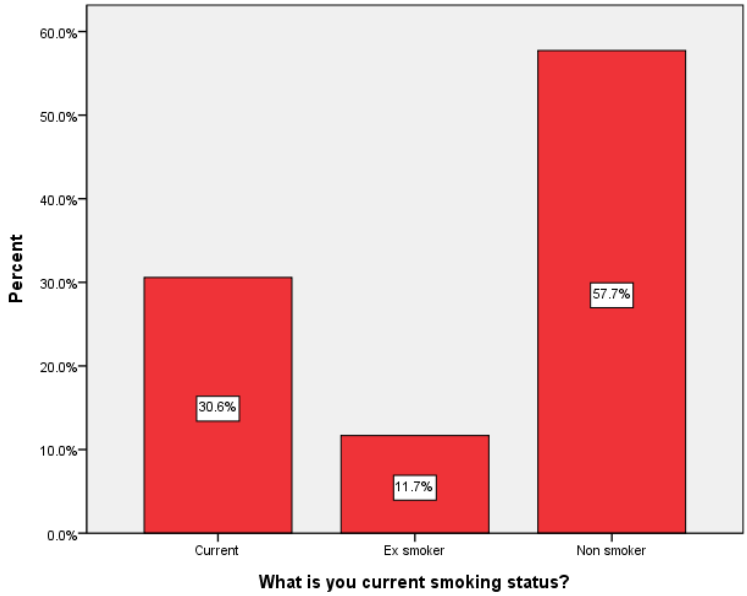


Figure 4.6

Of the total number of participants (*n* = 600) it would seem that the majority were non-smokers at the time that the questionnaire was administered. This would suggest that the likelihood for the predisposition to LBP in the entire sample is lower than a similar study undertaken by (Skillgate *et al.,* 2007), in which it was reported that there were a higher number of smokers.

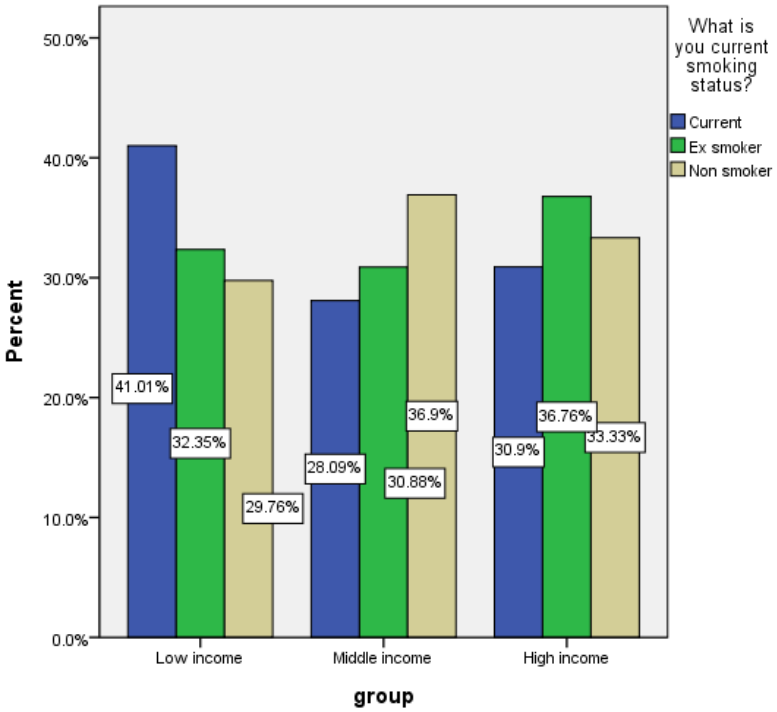


Figure 4.7 What is your current smoking status?

Table 4.25 What is your current smoking status?						
			Current	Ex-smoker	Non-smoker	Total
Group	Low income	Count	73	22	100	195
		% within group	37.4%	11.3%	51.3%	100.0%
	Middle income	Count	50	21	124	195
		% within group	25.6%	10.8%	63.6%	100.0%
	High income	Count	55	25	112	192
		% within group	28.6%	13.0%	58.3%	100.0%
Total		Count	178	68	336	582
		% within group	30.6%	11.7%	57.7%	100.0%

Pearson chi square = 7.823; p = 0.098

When the groups are compared with each other, it would seem that the ex-smokers constituted the greatest number in the high income group, as compared to non-smokers in the middle income group and the current smokers in the low income group. This is unusual as it would be expected that the high income group has a higher level of disposable income to spend on smoking (see as a luxury with its added "sin tax" (Black and Mahomed, 2006). Predisposing factors that might however, be related to this inversed relationship could include peer pressure of the

younger age group, “boredom”, rebellion in the family home, being stressed or being at parties more frequently (Shehu and Idris, 2008). These may also then account for the decreasing levels of smoking in the middle income and higher income groups, are slightly older and less susceptible to the pressures identified by Shehu and Idris (2008). Conversely, older individuals and those with greater affluence may also be exposed to media and publicity related to effects of smoking and would therefore be more inclined to stop smoking with increasing awareness of its associated risks (Moodie *et al.,* 2008). These assumptions, however, require further research in order to be substantiated in the context of the participants in this study.

Nevertheless, it would seem that the low income group has the highest likelihood of LBP based on their smoking habits, which would concur with Harreby *et al.,* (1996); Vindigni *et al.,* (2005); Skillgate *et al.*, (2007) and Frymoyer *et al.*, (2011).

4.4.3.2.2 Exercise :

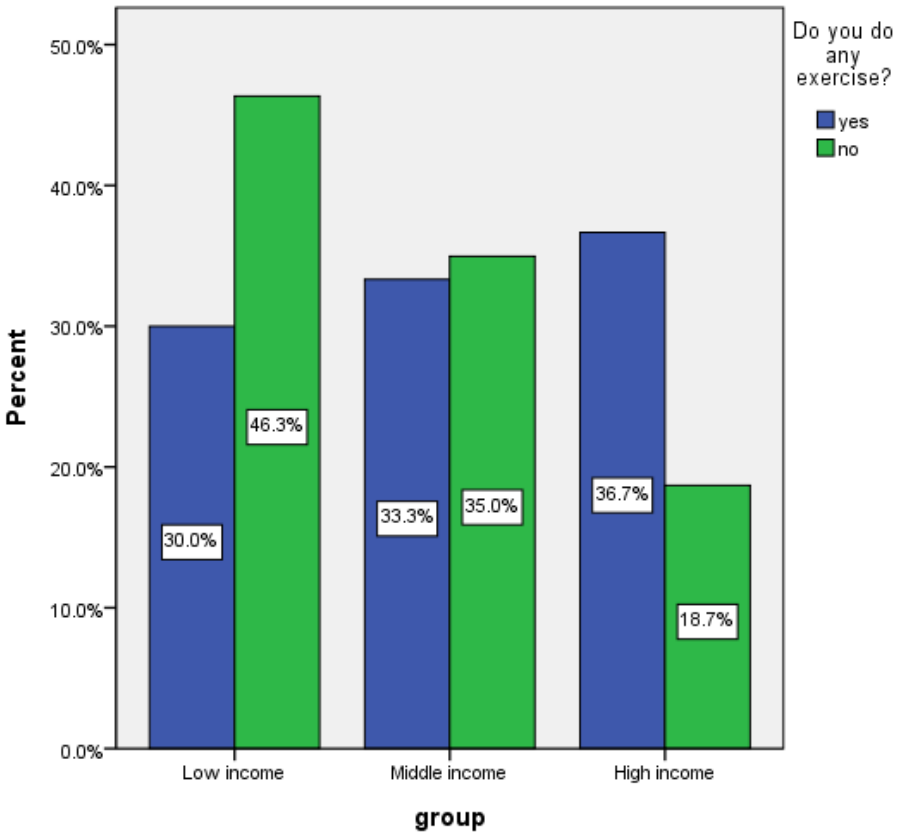


Figure 4.8 Do you do any exercise?

Table 4.26 Do you do any exercise?					
			Yes	No	
Group	Low income	Count	135	57	192
		% within group	70.3%	29.7%	100.0%
	Middle income	Count	150	43	193
		% within group	77.7%	22.3%	100.0%
	High income	Count	165	23	188
		% within group	87.8%	12.2%	100.0%
Total		Count	450	123	573
		% within group	78.5%	21.5%	100.0%

Pearson Chi-Square = 17.179; $p = 0.000$

When comparing the exercise levels between the groups it is evident that the low income group were not very active as compared to the high income group. The statistics also indicated that there is a significant difference in the levels of reported exercise between these groups ($p = 0.000$).

This is significant as exercise is often seen as a preventative measure against the development of LBP (Haldeman, 2005; Morris 2006; Dagenais and Haldeman, 2012). This implies that the low income group is at higher risk for the development of LBP as compared to the other two groups (Cady *et al.*, 1985; Salminen *et al.,* 1995; Heistaro *et al.,* 1999) and concurs with the previous results who indicated that the participants who have a slightly higher than average BMI score, are students (therefore increased sedentary activity) and are part time employed (usually casual labour) (also related to increased sedentary activity).

Also the heavy handed do-it-yourself work and other manual repetitive tasks are less likely to be done by the high income group, which would protect them from the development of LBP as compared to the low income group (Hoogendoorn *et al.,* 2000; Henneweer *et al.*, 2010). Additionally it was also noted in Hoogendoorn *et al.,* (2000) and Henneweer *et al.*, (2010), that these activities would more often affect women (which have a higher number in the low income group as compared to the high income group).

4.4.3.2.3 Do you have medical aid ?

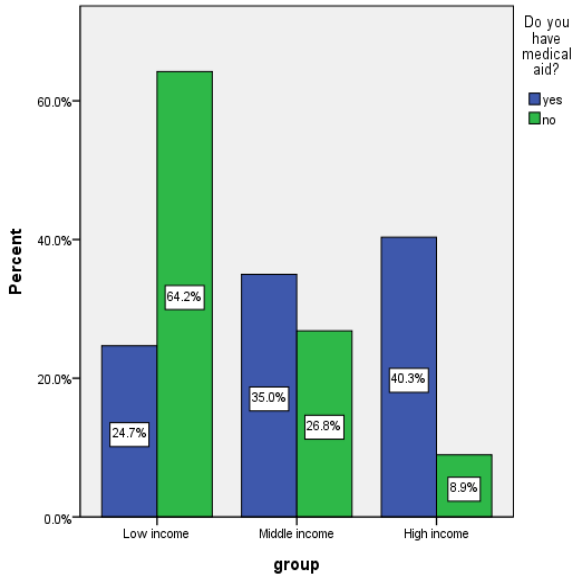


Figure 4.9

Table 4.27 Do you have a medical aid?					
			Yes	No	
Group	Low income	Count	115	79	194
		% within group	59.3%	40.7%	100.0%
	Middle income	Count	163	33	196
		% within group	83.2%	16.8%	100.0%
	High income	Count	188	11	199
		% within group	94.5%	5.5%	100.0%
Total		Count	466	123	589
		% within group	79.1%	20.9%	100.0%

Pearson Chi-Square 75.666; *p*=0.000

4.4.3.2.4 Do you have a comprehensive medical aid ?

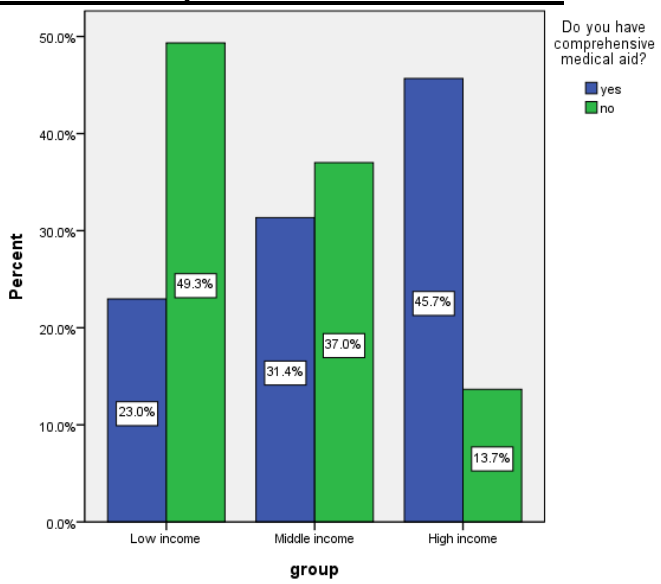


Figure 4.10

Table 4.28 Do you have comprehensive medical aid?					
			Yes	No	Total
Group	Low income	Count	85	112	197
		% within group	43.1%	56.9%	100.0%
	Middle income	Count	116	84	200
		% within group	58.0%	42.0%	100.0%
	High income	Count	169	31	200
		% within group	84.5%	15.5%	100.0%
Total		Count	370	227	597
		% within group	62.0%	38.0%	100.0%

Pearson Chi-Square = 74.035'; p = 0.000

4.4.3.2.5 Do you have a hospital scheme ?

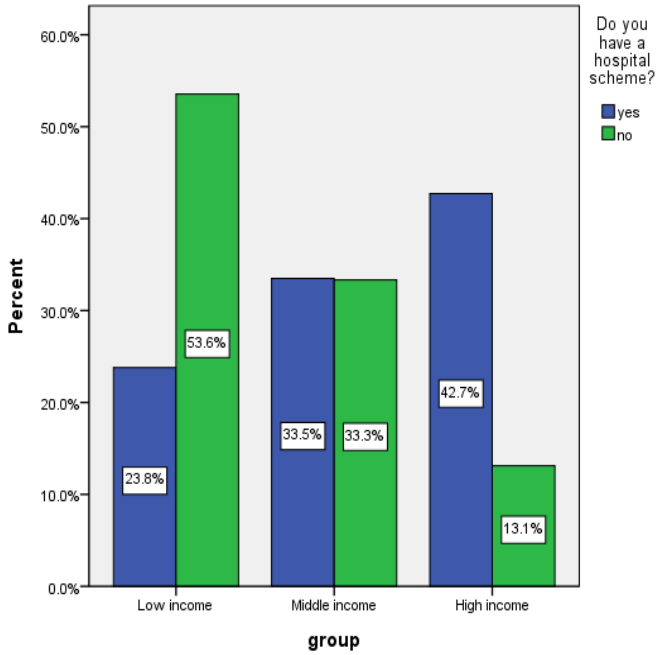


Figure 4.11

Table 4.29 Do you have a hospital scheme?					
			Yes	No	
Group	Low income	Count	98	98	196
		% within group	50.0%	50.0%	100.0%
	Middle income	Count	138	61	199
		% within group	69.3%	30.7%	100.0%
	High income	Count	176	24	200
		% within group	88.0%	12.0%	100.0%
Total		Count	412	183	595
		% within group	69.2%	30.8%	100.0%

Pearson Chi-Square = 67.120; p = 0.000

In terms of the following questions:

- Do you have medical aid?
- Do you have a comprehensive medical aid?
- Do you have a hospital scheme?

It was found that the low income group consistently reported a significantly lower access to medical aid (whether it be a comprehensive plan or a hospital scheme). Which is consistent with their ability to afford such care (based on their level of income), but inconsistent with their expenditure on luxury (Black and Mohamed, 2006) items such as smoking (questions around alcohol use where not asked in this study and it is recommended that this be included in future questionnaires).

Conversely, it also implies that the higher income levels have greater access to medical care and, therefore, less LBP to report (Morris, 2006) and / or they have greater mechanisms in place to prevent the occurrence of LBP (Dagenais and Haldeman, 2012) and are more likely to participate in activities that prevent LBP (Dagenais and Haldeman, 2012).

4.4.3.2.6 Do you feel that you have sufficient access to healthcare services?

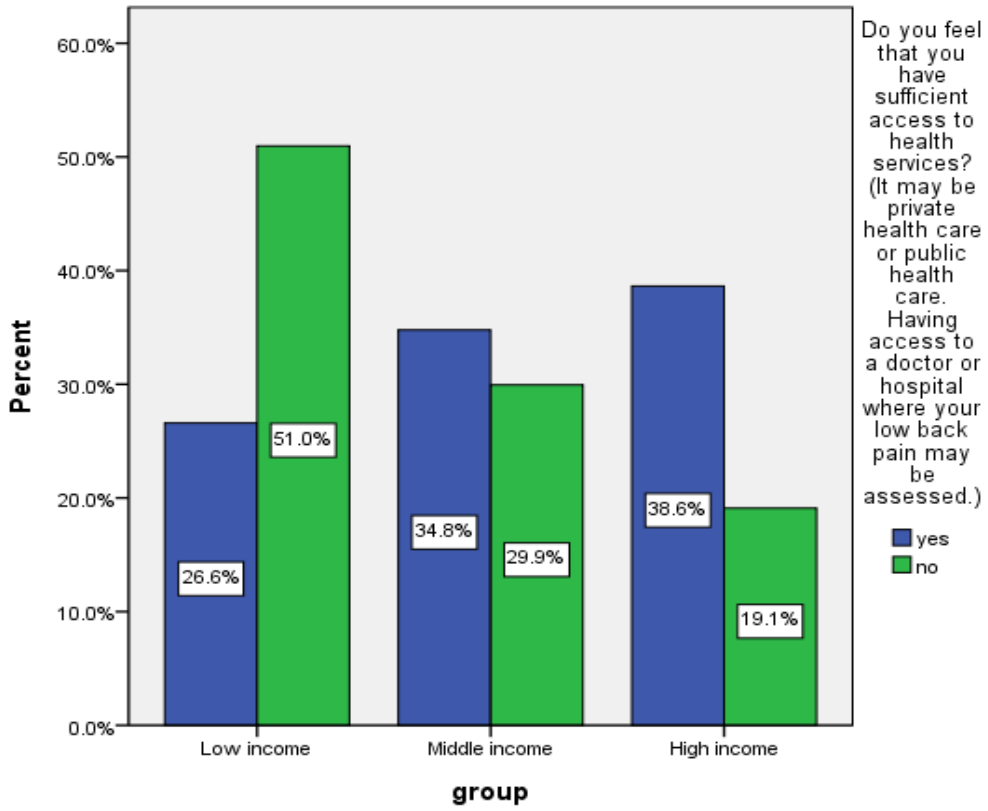


Figure 4.12

Table 4.30 Do you feel that you have sufficient access to healthcare services? (It may be private health care or public health care. Having access to a doctor or hospital where your low back pain may be assessed).

			Yes	No	Total
Group	Low income	Count	117	80	197
		% within group	59.4%	40.6%	100.0%
	Middle income	Count	153	47	200
		% within group	76.5%	23.5%	100.0%
	High income	Count	170	30	200
		% within group	85.0%	15.0%	100.0%
Total		Count	440	157	597
		% within group	73.7%	26.3%	100.0%

Pearson Chi-Square = 34.796; p = 0.000

The participants perception of their access to medical care (private or public), seems to correlate with the reporting of medical cover, comprehensive care and / or hospital scheme. This seems to imply that the low income group has very limited access to medical care and particularly care for their LBP, as compared to their higher income counterparts.

4.4.3.2.7 Do you feel that your job gives you low back pain ?

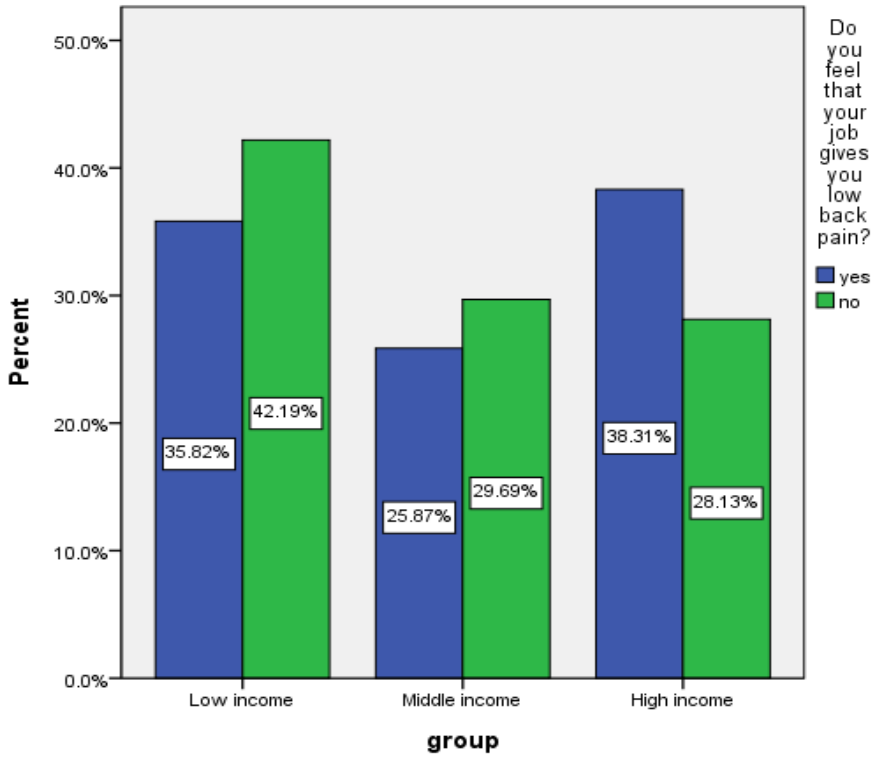


Figure 4.13

Table 4.31 Do you feel that your job gives you LBP?					
			Yes	No	
Group	Low income	Count	72	27	99
		% within group	72.7%	27.3%	100.0%
	Middle income	Count	52	19	71
		% within group	73.2%	26.8%	100.0%
	High income	Count	77	18	95
		% within group	81.1%	18.9%	100.0%
Total		Count	201	64	265
		% within group	75.8%	24.2%	100.0%

Pearson Chi-Square 2.195; p = 0.334

These results seem to concur with the low income group's perception that their employment doesn't necessarily result in LBP. This is either as a result of the fact that the low income group has fewer employment opportunities (Section 4.4.3.2) and, therefore, by default will have lower levels of perception of LBP related to their employment; or as a result of the fact that they have higher social influencers and smoking (Section 4.4.3.2) that predisposes them to LBP (Battie *et al.,* 1989; Heliovaaria *et al.,* 1991; Harreby *et al.,* 1996, Vindigni *et al.,* 2005; Skillgate *et al.,* 2007).

In the high income group, there is a converse dichotomy, where the respondents seem to think that their LBP is predominantly from their working environment. This concurs with the fact that they have lesser social influencers as compared to the low income group, but they have greater employment opportunities and therefore a greater likelihood for the predisposition of LBP from their work environment (Hoogendoorn *et al.,* 2000; Roffey *et al.,* 2010a; Roffey *et al.,* 2010b; Roffey *et al.,* 2010c; Roffey *et al.,* 2010d; Roffey *et al.,* 2010e; Wai *et al.,* 2010a; Wai *et al*., 2010b).

Table 4.32: Overall - Low, Middle and High income area results.

	Low income	**Middle income**	**High income**	**Relevant *p* values**
Age	Younger	Average	Older	Age (p=0.024).
Gender	More female	Equal	More male	Gender (p=0.035).
Height	Above average height	Tallest	Tallest	Height (p=0.056).
Weight	Above average BMI (for female)	Average BMI	Average BMI	Weight (p=0.114).
Marital status	Single	Married	Married	Marital status (p<0.001).
Education	Matriculated	Matriculated	Higher / tertiary education	Education (p<0.001).
Full time / part time	Less full time / more part time	Full time employed	More full time / less part time	Work (p<0.001).
Occupation description	Employed / student / unemployed	Employed / self employed and student	Employed / self employed / housewife / retired	Occupation (p<0.001).
Predisposition to low back pain	Highest Chance ←		→ Lowest Chance	
Smoking	More common in this group	Middle range	Least common in this group	Smoking (*p*=0.098)
Exercise	Least common in this group	Middle range	Most common in this group	Exercise (*p*=0.000)
Medical aid	Least available in this group	Middle range	Most available in this group	Medical aid (*p*=0.000)
Comprehensive medical aid	Least available in this group	Middle range	Most available in this group	Comprehensive medical aid (*p*=0.000)
Hospital scheme	Least available in this group	Middle range	Most available in this group	Hospital scheme (*p*=0.000)
Access to health services	Limited access	Middle range	Open access	Access to health services (*p*=0.000)
Predisposition to low back pain	Highest Chance ←		→ Lowest Chance	
Does work predispose to LBP?	No	Middle range	Yes	(*p*=0.334) Perception is inverted although not significantly different
From the above it would seem that there is a significant difference in the LBP experienced by the low income group as compared to the high income group.				

4.4.3.3. Regression analysis per gender:

Based on the results between the income groups, it was decided that the differences between males and females be investigated in order to ascertain how much the gender variances actually influenced the outcome of the population groups by income. This is particularly true as some of the information gained in the questionnaire was particularly related either to males or females (e.g. pregnancy).

4.4.3.3.1 Females:

4.4.3.3.2 Logistic Regression analysis of risk factors for lifetime prevalence of LBP in females

Table 4.33 Logistic Regression analysis

	Sig.	OR	95% C.I. for OR	
			Lower	Upper
Group (low income vs. high income)	.134	1.585	.867	2.895
Group (middle income vs. high income)	.026	.493	.265	.918
Answering the telephone	.003	2.274	1.330	3.887
Prolonged standing or bending	.025	2.086	1.097	3.967
Number of pregnancies to term	.043	1.209	1.006	1.454
Ever had multiple births	.068	7.833	.862	71.183
Ever had gynecological problems	.009	5.515	1.518	20.040
Constant	.506	1.290		

In females, middle income groups were at almost half the risk of LBP than high income groups (p = 0.026) and occupational tasks associated with LBP were answering the telephone (p = 0.003) and prolonged standing and bending (p = 0.025). As number of pregnancies to term increased, so did the risk of LBP (p = 0.043). Multiple births was a marginally non - significantly increased risk (p = 0.068), and having gynaecological problems increased the risk significantly by five times (p = 0.009).

From these results it would seem that the high income and low income groups (viz. these groups who were statistically not different from each other) of females had a higher likelihood of LBP than the females in the middle income group (which was statistically significantly different from the high income and borderline statistically significantly different from the lower income group).

These findings seem to suggest the LBP reporting in the high income group was related mostly to the female participants in that group, which was predominantly male dominated. Conversely this supports the findings in the low income group which had predominantly more females in the group.

It is interesting to note, however, that the associated work related postures of answering the telephone and standing / sitting for prolonged periods were not seen as problems in the low income group, but then this is to be anticipated as the majority of the low income group did not have full time employment (Section 4.4.3.2) and that the high income group reported more work related LBP (Section 4.4.3.2). Therefore, it could be hypothesised that the work related problems predominate in the high income group and the remaining issues of increased pregnancies and to term pregnancies as well as gynaecological problems may predominate in the low income groups. This is, however, speculation and it would require further research in order to verify this assertion.

4.4.3.3.3 Males:

4.4.3.3.4 Logistic regression analysis of risk factors for lifetime prevalence of LBP in males

Table 4.34 Logistic regression analysis

	Sig.	OR	95% C.I. for OR	
			Lower	Upper
Prolonged standing or bending	.064	1.939	.962	3.909
Comprehensive medical aid	.032	1.857	1.055	3.269
Constant	.009	.259		

In males, the risk of back pain was more age dependent (p=0.003) with the risk increasing as age increased. Prolonged standing or bending also increased the risk in males but non significantly (p = 0.064).

The results of the analysis of the male participants in this study seem to be less related to the level of income and more related to the age of the participants, which concurs with the The Editors, (1995); Leboeuf-Yde *et al.,* (2009); Plouvier *et al.,* (2011) and Dagenais and Haldeman, (2012). This may explain the average results obtained in the middle income group, where the females tended to have the least

LBP and in converse the males being the oldest (average age 40.44 years of age (Table 4.16)), in the middle income group reporting the most LBP (averaging the results). In contrast, the low income group had the youngest males (average age 36.62 years of age (Table 4.16)), therefore indicating that this group had the least amount of LBP, but with the higher predominance of females having LBP (this concurs with Valkenburg *et al.,* 1982; Fairbank *et al.,* 1984; Salminen *et al.,* 1984; Svensson *et al.,* 1988; Balague *et al.,* 1994; Jin *et al.,* 2004; Munce and Stewart, 2007), this group seemed to fair the worst with regards to LBP reporting.

The high income group seemed to have the middle of the average age range for the males in the study (38.56 years of age (Table 4.16)), which seems to suggest and agree with the females findings in the group (viz. they are the greatest contributor of LBP in the findings – being female – and potentially related to their occupation). The impact of female findings seems to be significant in that it is noted that there are no significant relationships with regards to income groups and males. This may be an area for further investigation in future research (to what extent does female reporting of LBP skew sub-group reporting).

Additionally, those male participants with comprehensive medical aid also had a higher risk of back pain (p=0.032), although this might be a consequence of having back pain rather than a causative factor. This finding requires further investigation as no literature could be found to support or negate the assertions made here based on the findings of the study.

4.5 To establish the demands on resources available to the private/ public health care sector.

This section looks at the overall access to healthcare and the potential costs of the healthcare that the participants sought. To this end, these statistics where taken for the population as a whole.

Table 4.35 Have you been treated for low back pain?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	174	29.0	63.7	63.7
	No	99	16.5	36.3	100.0
	Total	273	45.5	100.0	
Missing	Unknown	327	54.5		
Total		600	100.0		

Table 4.35 indicates that 63.9% of participants stated they previously had LBP, 63.7% had previously been treated for it. This indicates that the majority of the population in the study sought some form of medical care. This is broken down further in Figure 4.14 below.

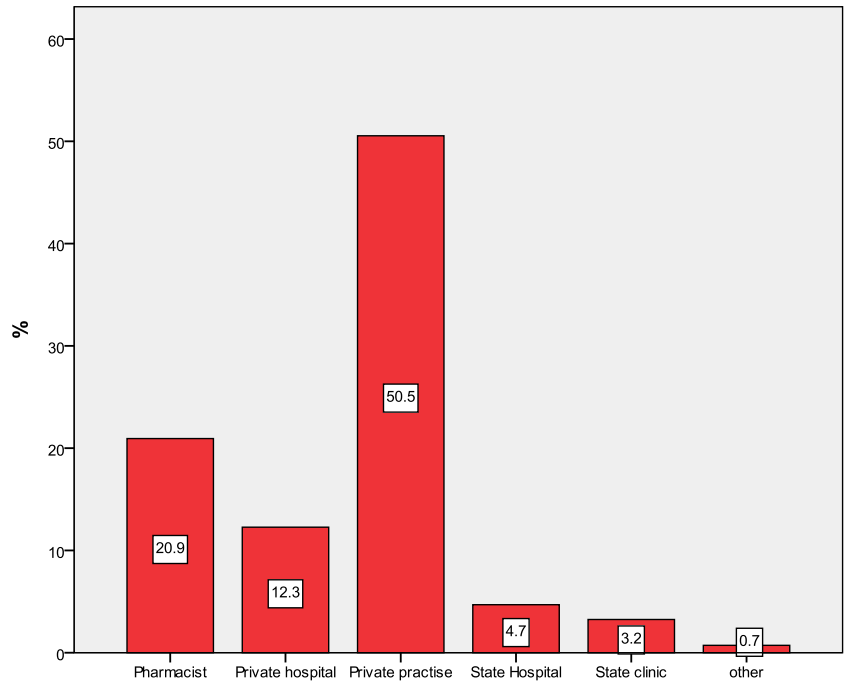


Figure 4.14: Percentage of those participants who had ever had back pain who received each type of treatment for LBP

From Figure 4.14, it can be seen that 50.5% of the participants sort treatment from private practitioners, seeking treatment from the pharmacist was the second most sort after treatment (21%).

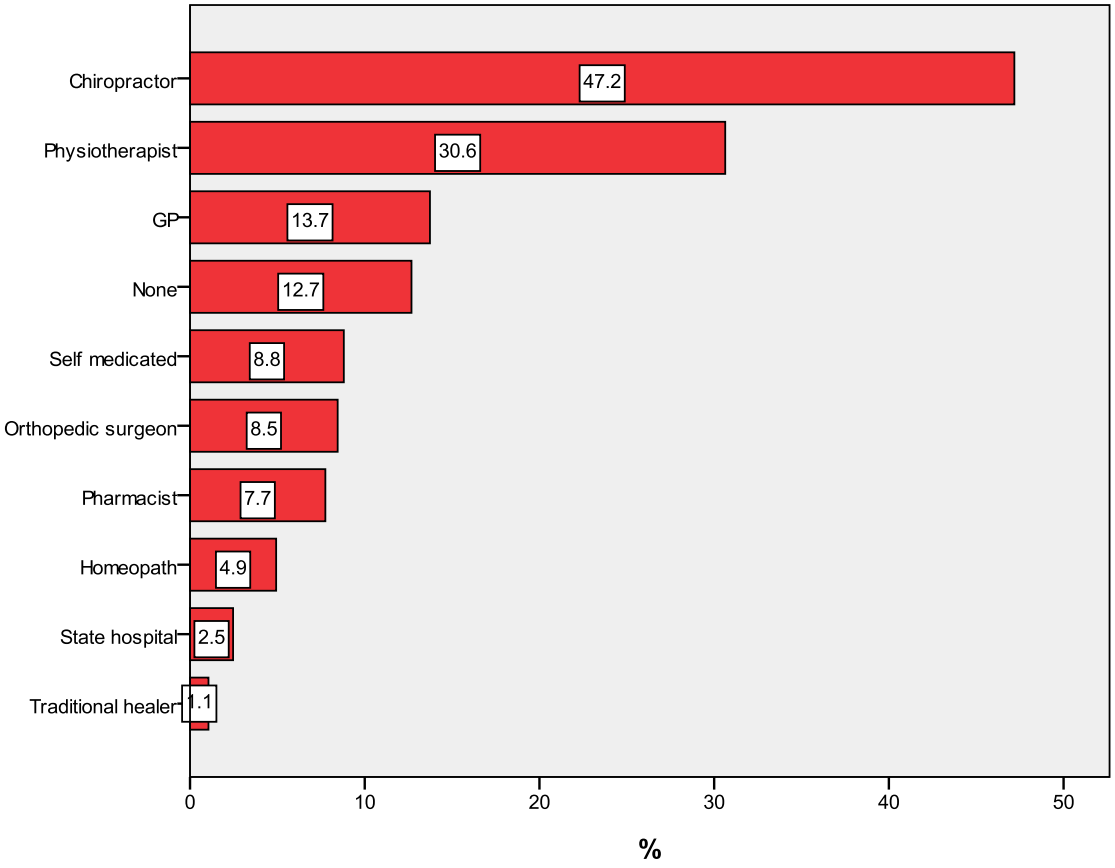


Figure 4.15: Percentage of those who had previously had LBP who received each type of treatment for LBP

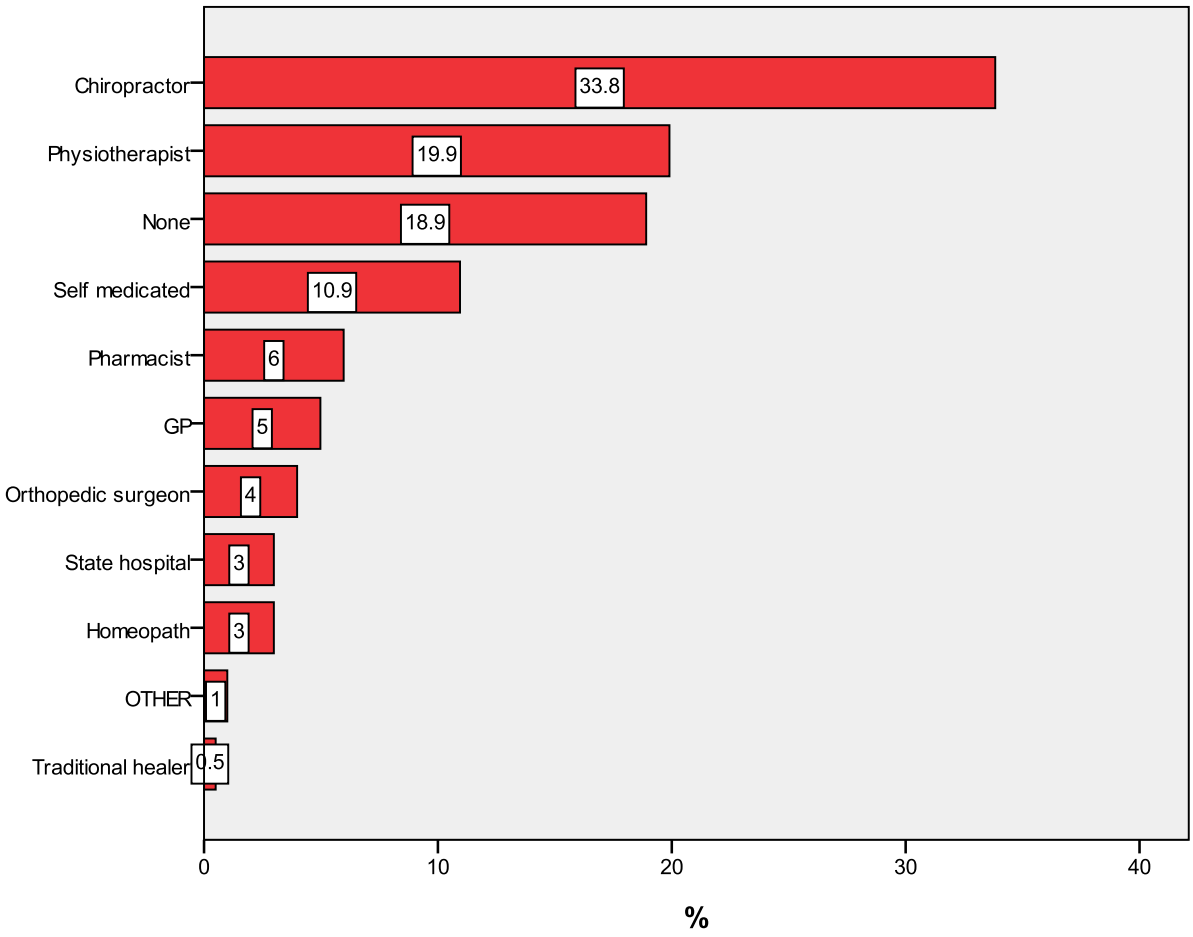


Figure 4.16: Percentage of those who had current LBP who are receiving each type of treatment for LBP

It would seem from Figure 4.15 and Figure 4.16, that chiropractic care was the most common form of private practitioner care, followed by physiotherapy care and general practitioner (for previous care) care. From Figure 4.16, it would seem that participants with current LBP seemed to prefer a "wait and see attitude" before consulting a healthcare practitioner for further assistance. This is congruence with Dagenais and Haldeman (2012) review of current literature, who advocate a wait and see approach with maintained levels of activity (exercise).

Table 4.36 How long have you been obtaining treatment for your current LBP? (Weeks)		
N	Valid	88
	Missing	116
Median		2.900
Minimum		.3
Maximum		51.0

Of the participants with current LBP and who had been receiving treatment, the median duration of treatment was 2.9 weeks with a range from 2 days to 42 weeks. In terms of chiropractic care it would seem that the average of 2.9 weeks is reasonable (Morris, 2006), however, it is uncertain which intervention(s) were responsible for treatment up to 51 weeks (1 year). Such lengthy treatment protocols are not ill advised in the chiropractic literature (Haldeman, 2005; Morris, 2006; Dagenais and Haldeman, 2012), although it may be possible in the presence of co-morbid pathology (Buckwalter *et al.,* 1993) and / or other more drastic interventions such as surgery (Morris, 2006) and / or chronic use of pain medication (Poul *et al.*, 1993; Seth, 1999) and / or if the LBP stemmed from an injury with or without complications (Morris, 2006).

It is possible, with the results achieved from this study and based on the access levels to medical aids, which the longer intervention periods or chronic medication uses are more likely to occur in those participants with access to medical aid cover and more precisely comprehensive medical aid cover. This would concur with the high income group (Section 4.4.3.2).

It would, therefore, be of interest in a future study to examine whether the levels of income would be related to the length of interventions received for LBP, as the current study had insufficient numbers in order to determine a significant / non-significant relationship between the groups and intervention time. This is particularly relevant in terms of the cost of LBP and it would allow for more accurate identification of the income group spending the greatest amount of time / money in the treatment of their LBP.

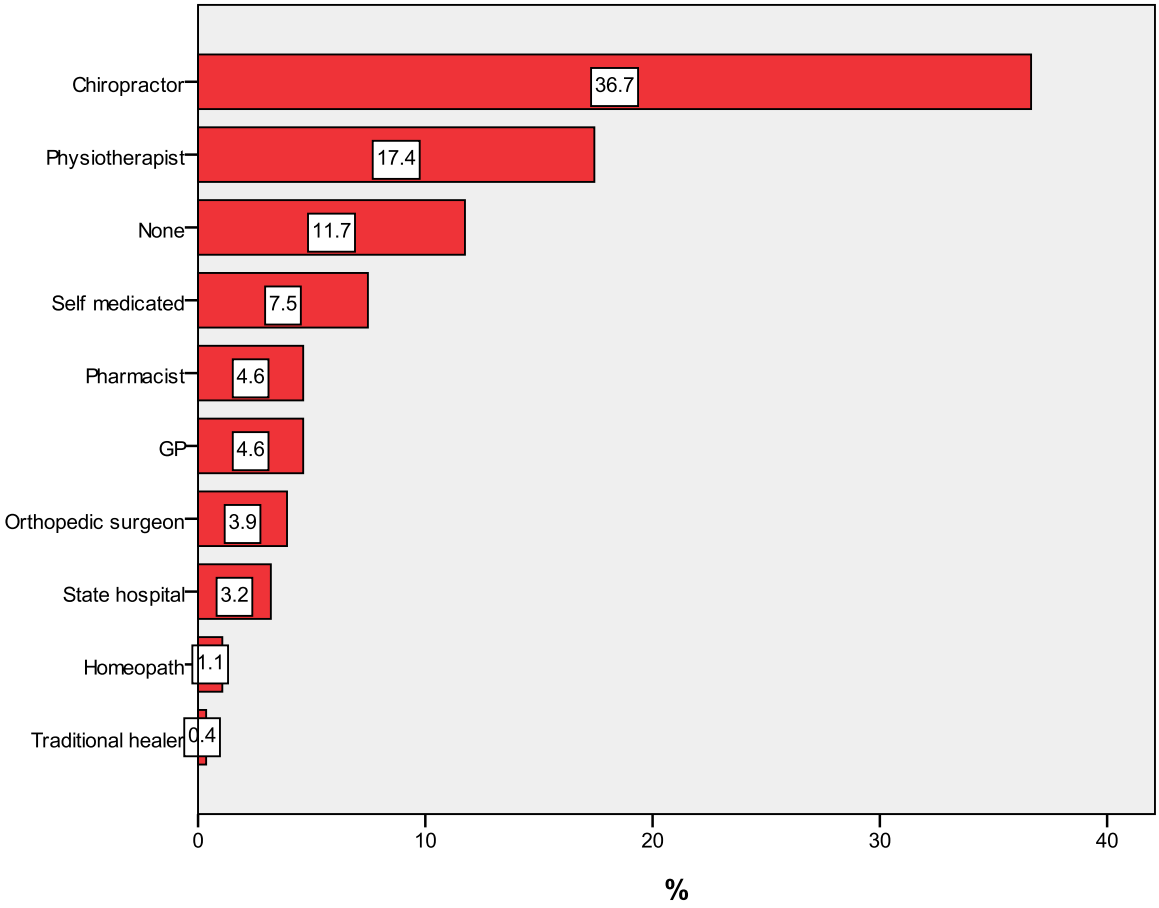


Figure 4.17: Percentage of each treatment which was effective for relieving LBP in the participants who had LBP

Table 4.37 Does the medication you receive for your low back pain help?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	108	37.9	61.7	61.7
	No	67	23.5	38.3	100.0
	Total	175	61.4	100.0	
Missing	Unknown	110	38.6		
	Total	110	38.6		
Total		285	100.0		

In terms of treatment efficacy / effectiveness, it was noted by 36.7% of those who had previously had LBP, that Chiropractic treatment was effective (Figure 4.17). Of the participants who were receiving / had received medication, 61.7% (Table 4.37) stated medication was effective. Based on these results, it is evident that medication is perceived as a useful intervention for LBP, however, this needs to be understood

in context, as medication can potentially only be utilised for acute pain episodes and less so for long term pain (Waddell *et al*., 1997, Vroomen *et al.,* 1999 and Alencar, 1999).

Table 4.38 Treatment Cost's

		How much does your medication cost per month?	How much does your treatment cost per month excluding medication
N	Valid	64	81
	Missing	110	93
Mean		230.78	798.27
Median		150.00	500.00
Minimum		20	50
Maximum		2000	6000
Percentiles	25	92.50	280.00
	50	150.00	500.00
	75	287.50	1050.00

The median amount of money spent per month on medication for LBP was R150,00 with a range from R20,00 to R2000,00 while the median amount spent on treatment excluding medication was R500,00 with a range from R50,00 to R6000,00 These findings seem to support the short term use of medication (Waddell *et al*., 1997, Vroomen *et al.,* 1999 and Alencar, 1999) and imply the long term use of chirorpactic and physiotherapy as options of care. In order to minimise these costs it would be prudent to enagage participants and patients more globally in active care programmes which include exercise (The Norwegian Back Pain Network, 2002; Australian Acute Musculoskeletal Pain Guidelines Group, 2003; Negrini *et al.,* 2006; van Tulder *et al.,* 2006; Chou *et al.,* 2007; Skillgate *et al.,* 2007; Dagenais, Tricco and Haldeman, 2010). This is particularly true of the younger population group in this study which is characterised by the low income population group.

Table 4.39 Do you feel that you have sufficient access to healthcare services? (It may be private health care or public health care. Having access to a doctor or hospital where you're LBP may be assessed).

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	214	75.1	75.1	75.1
	No	71	24.9	24.9	100.0
	Total	285	100.0	100.0	

Based on the above reported interventions, there seems to be sufficient access to healthcare services irrespective of the participant's income level.

It is noted that of those who had previously had LBP, 75% felt that they had sufficient access to healthcare services. This is mirrored in that of those who had previously had LBP, 80.4% had medical aid, and 66% had comprehensive medical aid. It must, however, be considered that it is also possible that those with medical aid cover (standard or comprehensive) are also more likely to take risks in recreational activities or occupational activities knowing that they have medical coverage to assist in the paying of expenses incurred. Therefore, the reporting may be skewed in favour of those reporting membership of medical aids and exclude those in the low income group that do not have access to such services.

Table 4.40 Do you have medical aid?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	225	78.9	80.4	80.4
	No	55	19.3	19.6	100.0
	Total	280	98.2	100.0	
Missing	Unknown	5	1.8		
	Total	5	1.8		
Total		285	100.0		

Table 4.41 Do you have comprehensive medical aid?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	189	66.3	66.3	66.3
	No	96	33.7	33.7	100.0
	Total	285	100.0	100.0	

4.6 Review of the objectives for this study:

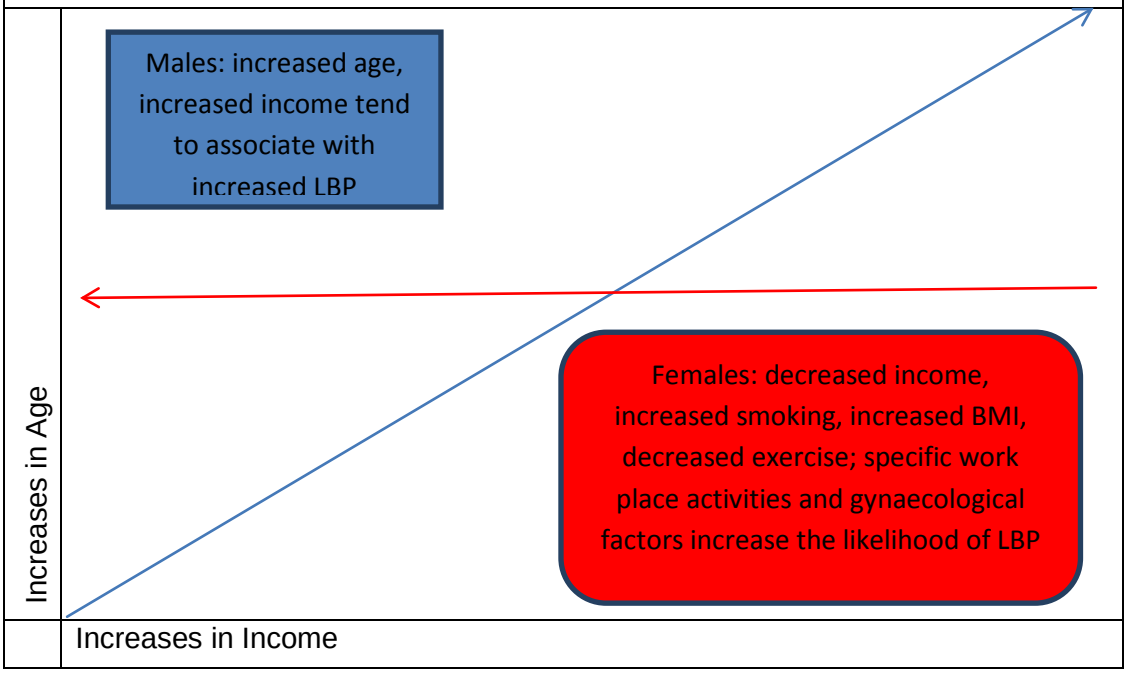
The aim of this study was to determine the prevalence of and risk factors for low back pain in the white population of the greater eThekwini metropolitan area.

The objectives of the study were:

- To determine the point, period and lifetime prevalence of LBP in the white population of greater eThekwini metropolitan area.
  - The point prevalence was comparable to the literature (Section 4.4.1.1).
  - The period prevalence was lower than is currently published in the literature (reasons provided in this dissertation for possible differences require further investigation to substantiate them) (Section 4.4.1.2).
  - The lifetime prevalence seems to correspond with the literature, although the results of this study entered at the lower range of the spectrum when compared internationally and seem to compare more favourably with previously obtained results on the African continent (Section 4.4.1.3).
- To describe the characteristics of LBP in this population.
  - The results of this study as outlined in (Section 4.4.2.1) indicated that the onset, severity, progression and causative agents are well within what is expected in the literature.

- To identify the risk factors that influences the prevalence of LBP in this population.

Table 4.42: Significant LBP factor comparison between males and females.



- To assess the effect of LBP on activities of daily life and productivity in this population.
  - The effect of LBP in this population group was limited to a small number (< 2%), where medical boarding was considered.
  - Productivity seems moderately affected by the absence from work.
  - Impact / cost to society seems largest for care beyond medication (with limited perceived benefit) and limited medication (with increased perceived benefit).

4.7 Conclusion:

The prevalence of LBP in the white population as compared to other South African studies (Docrat, 1999 and van der Meulen, 1997) indicated that the study population had a slightly lower prevalence than previously noted. In terms of the international studies, it was again noted that the white population in this showed a lower prevalence of LBP than noted internationally (See Table 4.7). The regression analysis completed for the male population in this study showed that if they reported LBP, that they were characterized by increased income and higher age. In contrast the female population in this study showed decreased income, exercise; increased smoking and BMI; along with specific work place activities that were significantly related to their increased likelihood of LBP.

These factors have helped the researcher establish the red flags and factors that increase the predisposition of LBP in the South African context. More research of this nature is needed in the South African context to establish and minimize the risk of LBP and the financial strain this condition has on the economy, particularly as data that was analysed and reported in this chapter, as at some points in contrast to the literature (e.g. female, with lower income with decreased age is a predisposing factor for LBP, which is in contrast to the literature norm of the older, male that is self-employed).

Chapter Five: Conclusions and Recommendations

5.1 Introduction

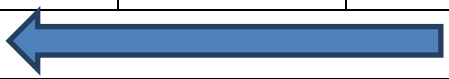
This chapter presents the conclusions and recommendations with respect to the outcomes of this study.

5.2 Conclusions

In conclusion, it is noted that the point prevalence for the studied sample was 34%, the period prevalence (longer than 1 year) was 7.8% and the lifetime prevalence was 47.5%.

In terms of the participants, it would appear that the income groups were composed of respondents with different demographic characteristics, which have resulted in the income groups having different causative agents of LBP, different presentations of their LBP and, therefore, different implications for cost and impact to society. This is summarised in the Table 5.1 below.

Table 5.1	**Low income**	**Middle income**	**High income**	**Relevant p values**
Age	Younger	Average	Older	Age (p = 0.024).
Gender	More female	Equal	More male	Gender (p = 0.035).
Height	Above average height	Tallest	Tallest	Height (p = 0.056).
Weight	Above average BMI (for female)	Average BMI	Average BMI	Weight (p = 0.114).
Marital status	Single	Married	Married	Marital status (p< 0.001).
Education	Matriculated	Matriculated	Higher / tertiary education	Education (p < 0.001).
Full time / part time employment	Less full time / more part time	Full time employed	More full time / less part time	Work (p < 0.001).
Employment description	Employed / student / unemployed	Employed / self employed and student	Employed / self employed / housewife / retired	Occupation (p < 0.001).
Predisposition to low back pain	Highest Chance 		Lowest Chance	

Table 5.1 continued …	Low income	Middle income	High income	Relevant p values
Smoking	More common in this group	Middle range	Least common in this group	Smoking (p = 0.098).
Exercise	Least common in this group	Middle range	Most common in this group	Exercise (p = 0.000).
Medical aid	Least available in this group	Middle range	Most available in this group	Medical aid (p = 0.000).
Comprehensive medical aid	Least available in this group	Middle range	Most available in this group	Comprehensive medical aid (p = 0.000).
Hospital scheme	Least available in this group	Middle range	Most available in this group	Hospital scheme (p = 0.000).
Access to health services	Limited access	Middle range	Open access	Access to health services (p = 0.000).
Predisposition to low back pain	Highest Chance		Lowest Chance	
Does work predispose to LBP?	No	Middle range	Yes	(p = 0.334.) Perception is inverted although not significantly different

From the above it would seem that there is a significant difference in the LBP experienced by the low income group as compared particularly to the high income group, which has implications for a variety of resource allocation strategies from national government in terms of health, education and finance (housing and social grants).

5.3 Recommendations

1. Methodology

The sample size – it is suggested that an increased sample size would allow for further verification of the outcomes obtained in this study and potentially validate the findings (see future research recommendations). Additionally it may be important to look at other major centers within the country (e.g. Cape Town / Johannesburg) by repeating this study in order to determine whether the results obtained in this study are unique to the context of the study or whether they have a broader application in South Africa.

The questionnaire –

If this questionnaire is used in further research, the specificity (viz. question 33 of the questionnaire was ambiguous when assessed in retrospect) of certain questions should be closely assessed to obtain clearer data. This particular question on how often they had LBP in each option needs to be written to evaluate the frequency of LBP episodes and another question needs to be developed in order to more accurately record the period prevalence for each of these time periods.

With reference to Section 4.4.1.2. in the questionnaire (viz. 'How often do you experience LBP?'), the 3-6 month option was erroneously omitted. This needs to be included as it affects the respondents reporting. This would also potentially affect period prevalence reporting.

A question on the consumption of alcohol and the link that alcohol has to the predisposition of LBP / increased sick leave (Skillgate *et al.,* 2007) should be included.

Future studies

The relationship between neck pain and back pain needs to be further researched as the literature supports a relationship between the two, which this study did not include.

In terms of causative factors for work / home (recreational) related musculoskeletal disorders it is suggested that the general population also be asked to report these in each context for LBP as well as other conditions. This study, which focused on the prevalence and most common causative factors, cannot make generalised comments about particular activities with conviction as this was not the aim of this particular study.

In addition to the above point, it is also suggested that a future study consider questions around whether LBP was present before, during and / or after an activity so that some level of causation could be loosely defined.

More specifically, a future study should be conducted to investigate the degree to which pregnancy and gynaecological issues are more or less prevalent in low income, middle income and high income areas as there was a borderline significant difference between the income groups.

Each group had particular demographic characteristics and it may be important to determine whether these characteristics were unique to this study population or whether this is indeed a larger phenomenon, as this has implications for a variety of resource allocation strategies from national government in terms of health, education and finance (housing and social grants).

Determining the type, period and cost of intervention by each income group should be noted in a further study as this has implications for public sector funding of care for LBP in the low income groups and for medical re-imbursement schemes in the high income groups.

Further to the previous point, the treatment interventions such as medication for LBP needs to be clarified in terms of use within an episode of pain (viz. do participants use medication for acute use or for long periods for chronic pain?), as this may also determine the possibility of LBP chronicity and / or excess financial outlay in terms of this intervention.

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APPENDIX A

LETTER OF INFORMATION – FOCUS GROUP

Dear Participant

I would like to welcome you into the focus group of my study.

The title of my research project is:
An epidemiological investigation of low back pain in the white population in the greater eThekwini metropolitan area.

Objectives of this study:
The data obtained by means of this questionnaire will allow for further assessment into the point (present), period (3-6months) and lifetime prevalence of low back pain (LBP) into the white population in the greater eThekwini metropolitan area. The questionnaire will cover aspects on clinical features of (LBP), risk factors and the effect on activities of daily living and productivity can further be evaluated.

Your participation in this study is much appreciated and you are assured your comments and contributions to the discussion will be kept confidential throughout. The results of the discussion will only be used for research purposes.

Procedure:
Before commencing the focus group discussion, kindly read and sign the Informed Consent Form, Confidentiality Statement and Code of Conduct Statement. Each member will then receive a copy of the questionnaire, after which each of the questions will be discussed in sequential order. Please recommend any suggestions that you may have regarding the questions in order to limit any misinterpretation by the respondents (white population). You are required to adequately evaluate the scope of LBP in terms of its definition. The questionnaire must be readable and understandable in layman's terms. The questionnaire must meet the objectives prescribed above. If inconsistencies are found or changes proposed, a unanimous vote is required to institute change to the questionnaire.
Questionnaire evaluation and discussion throughout the focus group must be kept confidential.
This focus group will be recorded, if u have any objection to being filmed please advise accordingly and you will be placed in a position where you will be heard and not seen.

If you have any further questions please feel free to contact my supervisor/ Co-supervisor or myself.
Supervisor: Dr. Andrew Jones: 083 4098371
Co-supervisor: Dr. Charmaine Korporaal: 031 3732611
Researcher: Brinique Dyer: 078 4590273

Your time, opinion and assistance with this project are invaluable and greatly appreciated.

Brinique Dyer

APPENDIX B
INFORMED CONSENT FORM – FOCUS GROUP

DATE: 4 October 2010

TITLE OF RESEARCH PROJECT:
An epidemiological investigation of low back pain in the white population in the greater eThekwini Metropolitan Area.

NAME OF SUERVISOR: Dr Andrew Jones: 083 4098371

NAME OF RESEARCHER: Brinique Dyer: 078 4590273

Please circle the appropriate answer:

1.	Have you read the research information sheet?	Yes	No
2.	Have you had an opportunity to ask questions regarding this study?	Yes	No
3.	Have you received satisfactory answers to you questions?	Yes	No
4.	Have you had an opportunity to discuss this study?	Yes	No
5.	Have you received enough information about this study?	Yes	No
6.	Do you understand the implications of your involvement in this study?	Yes	No
7.	Do you understand that you are free to		
	a) withdraw from this study at any time?	Yes	No
	b) withdraw from this study at any time, without reasons given?	Yes	No
	c) withdraw from this study at any time without affecting your future health care or relationship with the Chiropractic day clinic at the Durban University of Technology?	Yes	No
8.	Do you agree to voluntarily participate in this study?	Yes	No
9.	Who have you spoken to regarding this study?		

_____

If you have answered <u>NO</u> to any of the above, please obtain the necessary information from the researcher and/or supervisor before signing. Thank you.

<u>Please print in block letters:</u>

Focus Group Member: _____ Signature: _____

Witness Name: _____ Signature: _____

Researcher's Name: _____ Signature: _____

Supervisor's Name: _____ Signature: _____

APPENDIX C
CONFIDENTIALITY STATEMENT – FOCUS GROUP

IMPORTANT NOTICE:

THIS FORM IS TO BE READ AND FILLED IN BY EVERY MEMBER PARTICIPATING IN THE FOCUS GROUP, BEFORE THE FOCUS GROUP MEETING CONVENES.

DECLARATION

1. All information contained in the research documents and any information discussed during the focus group meeting will be kept private and confidential. This is especially binding to any information that may identify any of the participants in the research process.
2. The returned questionnaires will be coded and kept anonymous in the research process.
3. None of the information shall be communicated to any other individual or organization outside of this specific focus group as to the decisions of this focus group.
4. The information from this focus group will be made public in terms of a journal publication, which will in no way identify any participants of this research.

Once this form has been read and agreed to, please fill in the appropriate information below and sign to acknowledge agreement.

Please print in block letters:

Focus Group Member: _____ Signature: _____

Witness Name: _____ Signature: _____

Researcher's Name: _____ Signature: _____

Supervisor's Name: _____ Signature: _____

APPENDIX D
CODED QUESTIONNAIRE- Pre-focus Group

Background Information - Identifying Information

Questionnaire Number_____			Date of Interview (____/____/____)					
Please mark an X in the applicable box.								
(A) Demographics								
1	How old are you? (Years)							
2	Gender		Male 1			Female 2		
3	Height (cm)				Weight (kg)			
4	Marital status	Married 1	Single 2	Divorced 3	Separated 4	Widowed 5	Staying together 6	
5	Highest level of education	No formal education 1	Primary school 2	High school 3	Matriculated 4	Tertiary 5	Other (specify)	
6	Present work status	Self -employed 1	Unemployed 2	Retired 3	Housewife 4	Student 5	Other (specify)	
7	If employed, what is your occupation?							
		Businessperson 1	Artisan/ Tradesman 2	Farmer 3	Unskilled Worker 4	House Executive 5	Salesperson 6	
		Managerial 7	Clerical 8	Student 9	Other (Specify)			
		For how long have you been in this occupation? (Years)						
8	If you are retired / unemployed what was your previous occupation?							
		Businessman 1	Artisan 2	Farmer 3	Unskilled Worker 4	Housewife 5	Salesman 6	
		Managerial 7	Clerical 8	Student 9	Other (specify)			
		For how long were you in this occupation? (Years)						
(B) Risk Factors								

	Relevant to females only.(question 9-12)								
9	Number of children /adoptive children								
10	Number of pregnancies ?								
11	Have you ever had multiple births (twins/triplets etc?)						Yes	No	
	If the answer is 'yes' please specify.								
12	Number of foster children?								
13	Do you suffer from any gynaecological problems?						Yes	No	
	Did you have one of the following		C-section with epidural 1		Natural with epidural 2		Natural Birth 3		
	If yes to Natural birth please specify?		Stirrup		Water bath				
	Does your occupation involve any of the following for the majority of the day?	Lifting heavy objects 1	Sitting for long periods 2		Driving for long hours 3		Causes your body to turn 4		
		Answering telephone 5	Working on a computer 6		Working with arms overhead 7		Working in an air-conditioned room 8		
		Other (specify)	Prolonged standing/ Bending		Repetitive Movements				
	Do you feel that your job gives you Low Back Pain?				Yes		No	Unsure	
	Total annual income?	R1 - 10 000	R10 001 - 20 000	R20 001- 30 000	R30001 - 40 000	R40001 – 50 000	R50001- 60 000	R60001- 70 000	R70001- 100 000
		R10000 150000	R 150001 - R 250000	R 250001– R 350000	R 350001 - R 450000	R 450001 – R 500000	> R 500001	N/A	Other (specify)
	What is you current smoking status?		Current Smoker 1		Ex- Smoker 2		Non-smoker 3		
	For current smokers	On average how many cigarettes do you smoke per day?							
		Duration of smoking (years)?							
		Do you have a cough as a result of smoking?						Yes	No
	Ex smokers	On average how many cigarettes did you smoke per day?							
		How long ago did you quit smoking (years)?							
		For how long did you smoke before you quit (years)?							
		Do you still cough even after giving up smoking?						Yes	No
	Do you do any exercise?	Yes				No			
		What type of exercise do you do most of the time?	Aerobics 1	Badminton 2		Boxing 3	Cricket 4	Cycling 5	
			Fishing	Gymnastics		Martial arts	Rugby	Road	

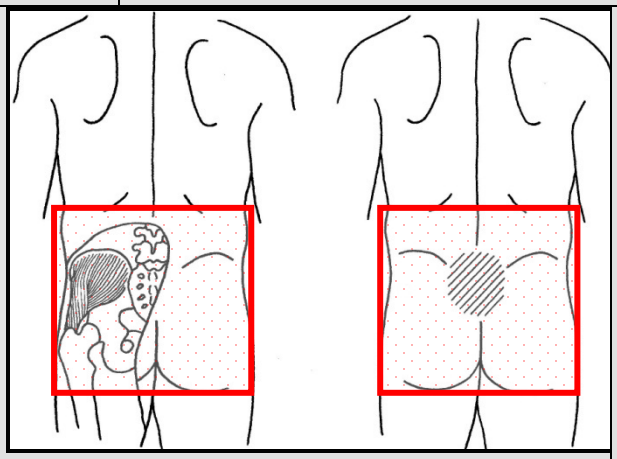
			6	7	9	10	Running 11	
			Squash 12	Soccer 13	Swimming 14	Tennis 15	Walking 16	
			Weight training 17	Yoga/Pilates 18	Cardio/Gym 19			
		Number of exercise sessions per week/ combined if more than one sport is played.						
		What is the total amount of time exercising each week? (Hours)						
	Do you have a Medical aid? If Yes is the answer please answer the following?	Do you have a comprehensive medical cover?				Yes (1)	No(2)	
		Do you have a hospital scheme?				Yes (1)	No(2)	
		Do you feel that you have sufficient access to health services? (It may be private health care or public health care. Having access to a doctor or hospital where your low back pain may be assessed.)				Yes (1)	No (2)	
		Do you suffer from any heart conditions?				Yes (1)	No(2)	
		Do you suffer from Diabetes Mellitus?				Yes (1)	No(2)	
		Have you ever been diagnosed with any other health condition? If so please specify						
		Please can you rate your stress level on a scale of 1-5(1 being the least and 5 being the most)						

Prevalence of Low Back Pain

Have you ever experienced Low Back Pain?	Yes	No

Lower Back Pain (LBP) is defined as "pain limited to the region between the lower margins of the 12th rib and the gluteal folds" (Galukande, Muwazi and Mugisa, 2005:164-167).

Please mark with an X on the diagram provided, exactly where you are experiencing pain.



Gluteus1[image].1999.Avaliable at:http://www.triggerpointbook.com/gluteu1.gif [[Accessed 8 September 2010]

IF YOUR ANSWER TO THE ABOVE QUESTION IS NO, YOUR QUESTIONNAIRE IS NOW COMPLETE. THANK YOU FOR YOUR PARTICIPATION	

IF YES TO THE PRESENCE OF LOW BACK PAIN: **C) Clinical (only participants with low back pain answer this section)**							
	What was your age when you first experienced Low Back Pain? (Years)						
	How often do you experience low back pain?		Seldom 1	Frequently 2	Constantly 3	Intermittently 4	
	How long have you had low back pain? (Recent episode)			Days	Months	Years	
	Current low back pain	Do you currently have low back pain?	Yes		No		
		If you have current low back pain: How severe is the pain?	Mild 1	Moderate 2	Severe 3	N/A 4	
		What time of the day is the pain worst?	Morning 1	Afternoon 2	Evening 3	Night 4	
			Activity Related 1	N/A 2	Other (specify) 3		
		At what time of the day is the pain at its least?	Morning 1	Afternoon 2	Evening 3	Night 4	
			Activity related 5	N/A 6	Other (specify) 7		
		How did your low back pain begin?	Gradually 1	Abruptly 2	Unsure 3		
		Did your low back pain begin with or without injury?	With injury 1		Without injury 2		
		If you answered with injury to the above question what caused your low back pain?	Accident 1	Gym Injury 2	Bad Posture 3	Occupation 4	
			Other (specify)				
		Progression of low back pain?	Getting worse 1	Getting better 2	Staying the same 3	Unsure 4	
		Please rate your low back pain at its ***worst*** with regard to overall disability? Pain rating scale (0 -10) with 0 being the least amount of pain and 10 being the most severe amount of pain).					
		Please rate your low back pain at its ***least*** with regard to overall disability? Pain rating scale (0 -10) with 0 being the least amount of pain and 10 being the most severe amount of pain).					
	Disability	How would you rate your overall disability because of your low back pain?	None 1	Mild 2	Moderate 3	Severe 4	

		Do you experience any difficulty in doing any of the following as a result of low back pain?	Bending 1	Dressing 2	Driving 3	Lifting 4
			Sitting 5	Sleeping 6	Standing 7	Walking 8
			Other (specify)10			
	Disability continued…	Have you ever had to stay away from work because of current low back pain?	Yes 1	No 2	NA (don't work) 3	
		If 'Yes', for how long (weeks)?				
		Have you ever had to stay away from work due to history of long- standing low back pain?	Yes 1	No 2	NA (don't work) 3	
		If 'Yes', for how long (weeks)?				
		Have you ever had to change your job due to low back pain?			Yes 1	No 2
		Have you ever lost your job due to low back pain?			Yes 1	No 2
	Treatment	Have you been treated for low back pain?			Yes 1	No 2
		Where have you received treatment for your Low back pain?	Pharmacist 1	Private hospital 2	Private Practice (GP) 3	State Clinic 4
			State hospital 5	Other (specify) 6		
		If u currently have low back pain what treatment are you obtaining presently?	Chiropractic 1	General Practitioner 2	Homeopath 3	Orthopaedic 4
			Pharmacist 5	Physiotherapy 6	Self Medication 7	State Hospital 8
			Traditional healer 9	Other (specify) 0		
		If u have had a history of low back pain what treatment did you obtain in the past?	Chiropractic 1	General Practitioner 2	Homeopath 3	Orthopaedic 4
			Pharmacist 5	Physiotherapy 6	Self Medication 7	State Hospital 8
			Traditional healer 9	Other (specify) 10		
		How long have you been obtaining treatment for your current low back pain?				
		Throughout your history of low back pain how long did you obtain treatment?				
		Which treatment	Chiropractic	General	Homeopath	Orthopaedic

		has helped in relieving your low back pain?	1	Practitioner 2	3	4
			Pharmacist 5	Physiotherapy 6	Self Medication 7	State Hospital 8
			Traditional healer 9	Other (specify) 10		
		Does the medication you receive for low back pain help?			Yes 1	No 2
		How much does your medication cost per month?				R
		How much does treatment cost per month excluding medication?				R

Thank you for participating in my research ! ☺

APPENDIX - E

CODED QUESTIONAIRE - Post Focus Group

Background Information - Identifying Information

Questionaire Number: **Date of Interview:**

Instructions - Put an 'X' in the applicable box

A) Demographics

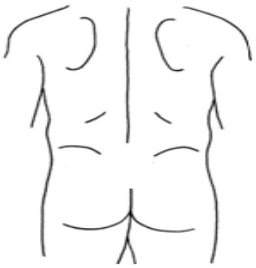
1	How old are you?							
2	Gender	Male 1				Female 2		
3	Height(cm)							
4	Weight(kg)							
5	Marital Status	Divorced 1	Married 2	Separated 3	Single 4	Staying Together 5	Widowed 6	
6	Highest level of education?	No formal education 1	Primary School 2	High School 3	Matriculated 4	Tertiary 5	Other (Specify) _____	
7	Present work status?	Full time 1				Part time 2		
		Housewife 1	Retired 2	Employed 3	Self Employed 4	Student 5	Unemployed 6	Other (Specify) _____
8	If employed, what is your occupation?	Artsian / Tradesman 1	Business Person 2	Clerical 3	Farmer 4	House Executive 5	Managerial 6	Sales Person 7
		Student 8		Other (specify)				
9	How long have you been in this occupation? (Years)	_____						
10	If you are retired/ unemployed what was your previous occupation?	Artsian / Tradesman 1	Business Person 2	Clerical 3	Farmer 4	House Executive 5	Managerial 6	Sales Person 7
		Student 8	Other (Specify) _____					
11	For how long where you in this occupation? (Years)	_____						

12	Does your occupation involve any of the following for the majority of the day?	Lifting heavy objects 1	Sitting for long periods 2	Driving for long hours 3	Causes your body to turn 4	Answering the telephone 5	Working on a computer 6	Working with arms overhead 7
		Working in an airconditioned room 8	Prolonged standing/ bending 9	Other(Specify) _____				
13	Do you feel that your job gives you low back pain?	Yes 1				No 2		
14	Total annual income?	R1 - R10 000	R10 001 - R20 000	R20 001 - R30 000	R30 001 - R40 000	R40 001 - R50 000	R50 001 - R60 000	R60 001 - R70 000
		R70 001 - R100 000	R100 001 - R150 000	R150 001 - R200 000	R200 001 - R250 000	R250 001 - R350 000	R350 001- R450 000	R450 001 - R500 000
		>R500 001	N/A					
15	What is you current smoking status?	Current smoker 1			Ex smoker 2			Non smoker 3
16	Current smokers	On average how many cigarettes do you smoke per day?						
		Duration of smoking? (Years)						
		Do you have a cough as a result of smoking?						
17	Ex smokers	On average how many cigarettes did you smoke per day?						
		How long ago did you quit smoking? (Years)						
		For how long did you smoke before you quit? (Years)						
		Do you have a cough as a result of smoking?						
18	Do you do any exercise?	Yes 1				No 2		
19	What type of exercise do you do most of the time?	Aerobics 1	Badminton 2	Boxing 3	Cardio (Gym) 4	Cricket 5	Cycling 6	Fishing 7
		Golf 8	Martial Arts 9	Road Running 12	Rugby 11	Squash 13	Soccer 14	Swimming 15
		Surfing 16	Tennis 17	Walking 18	Weight Training 19	Yoga / Pilates 20	Other (Specify) _____	
20	What is the total amount of time spent exercising each week?(Hours)	_____						
21	Do you have medical aid?	Yes 1				No 2		

22	If 'YES' please answer the following questions.	Do you have comprehensive medical aid?	Yes 1	No 2
		Do you have a hospital scheme?	Yes 1	No 2
		Do you feel that you have sufficient access to health services? (It may be private health care or public health care. Having access to a doctor or hospital where your low back pain may be assessed.)	Yes 1	No 2
		Do you suffer from any heart conditions?	Yes 1	No 2
		Do you suffer from Diabetes Mellitus?(High Blood Sugar)	Yes 1	No 2
		Have you been diagnosed with any health conditions? If so please specify.	_____	
		Please rate your stress level on a scale of 0 - 10. (0 being the least and 10 being the most.)	_____	

RELEVANT TO FEMALES ONLY (QUESTIONS 23 - 31)				
23	Number of pregnacies to full term?	_____		
24	Number of children?	_____		
25	Number of foster children?	_____		
26	Have you ever had multiple births? (Twins/ Triplets etc.)	Yes 1	No 2	
27	If so please specify.	_____		
28	Which of the following did you have?	C-Section with epidural 1	Natural with epidural 2	Natural birth 3
29	Do you have any gynaecological problems?	Yes 1	No 2	
30	Have you ever experienced low back pain?	Yes 1	No 2	

IF YOUR ANSWER TO THE ABOVE QUESTION IS 'NO' YOUR QUESTIONAIRE IS NOW COMPLETE. THANK YOU FOR YOUR PARTICIPATION.

Low back pain is defined as 'pain that occurs from the bottom of the ribs and extends to the buttocks' Please mark with an X where you are experiencing low back pain.	

C) Clinical (Only participants with low back pain answer this section).

31	Do you currently have low back pain?	Yes 1		No 2	
32	What was your age when you first experienced low back pain? (Years)	_____			
33	How often do you experience low back pain?	0 - 3 months 1	6-12 months 2	Longer than 1 year 3	
34	Most recent episode of low back pain	How severe is / was the pain?	Mild 1	Moderate 2	Severe 3
		What time of the day is / was the pain worst?	Morning 1	Afternoon 2	Evening 3
			When sleeping 4	Activity related 5	Constant 6
			Other(Specify) _____		
		At what time of the day is / was the pain the least?	Morning 1	Afternoon 2	Evening 3
			When sleeping 4	Activity related 5	Constant 6
			Other(Specify) _____		
		How did your low back pain begin?	Gradually 1	Abruptly 2	Unsure 3
		Do you know what caused your low back pain?	Please specify _____		

		What is the progression of your low back pain?	Getting worse 1	Getting better 2	Staying the same 3
			Unsure 4		
		Please rate your low back pain at its ***worst.*** Pain rating scale (0 -10) with 0 being the least and 10 being the most severe amount of pain).	_____		
		Please rate your low back pain at its ***least.*** Pain rating scale (0 -10) with 0 being the least and 10 being the most severe amount of pain).	_____		
35	Activities of daily living	How would you rate your overall disability because of your low back pain?	None 1	Mild 2	Moderate 3
			Severe 4		
		Do you experience any difficulties in doing any of the following as a result of your low back pain?	Bending 1	Dressing 2	Driving 4
			Lifting 4	Sitting 5	Sleeping 6
			Standing 7	Walking 8	
			Other (specify)_____		
			Yes 1	No 2	
		Have you ever had to stay away from work because of low back pain?	_____		
		If 'Yes', for how long? (weeks)	Yes 1	No 2	
		Have you ever had to change your job due to low back pain?	Yes 1	No 2	
		Have you ever lost your job / been medically boarded due to low back pain	Yes 1	No 2	
		Have you been treated for low back pain?	Yes 1	No 2	
		Where have you received treatment for low back pain?	Pharmacist 1	Private Hospital 2	Private practice 3
			State Hospital 4	State Clinic 5	
			Other (Specify) _____		

36	Treatment				
		If you have had a history of low back pain what treatment did you obtain in the past?	Chiropractic 1	General Practitioner 2	Homeopath 3
			Orthopaedic Surgeon 4	Pharmacist 5	Physiotherapist 6
			Self medicated 7	State hospital 8	Traditional healer 9
			None 10	Other (Specify) _____	
		If you currently have low back pain what treatment are you obtaining presently?	Chiropractic 1	General Practitioner 2	Homeopath 3
			Orthopaedic Surgeon 4	Pharmacist 5	Physiotherapist 6
			Self medicated 7	State hospital 8	Traditional healer 9
			None 10	Other (Specify) _____	
		How long have you been obtaining treatment for your current low back pain? (Days / Weeks)	_____		
		Which treatment has helped in relieving your low back pain?	Chiropractic 1	Practitioner 2	Homeopath 3
			Surgeon 4	Pharmacist 5	Physiotherapist 6
			Self medicated 7	State hospital 8	Traditional healer 9
			None 10	Other (Specify) _____	
		Does the medication you receive for your low back pain help?	Yes 1	No 2	
		How much does your medication cost per month?	_____		
		How much does your treatment cost per month excluding medication	_____		

APPENDIX - F

CODED QUESTIONAIRE - Post Pilot

Background Information - Identifying Information

Questionaire Number: **Date of Interview:**

Instructions - Put an 'X' in the applicable box

A) Demographics

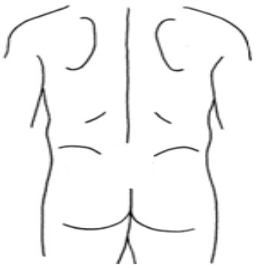
1	How old are you?							
2	Gender	Male 1				Female 2		
3	Height(cm)							
4	Weight(kg)							
5	Marital Status	Divorced 1	Married 2	Separated 3	Single 4	Staying Together 5	Widowed 6	
6	Highest level of education?	No formal education 1	Primary School 2	High School 3	Matriculated 4	Tertiary 5	Other (Specify) _____	
7	Present work status?	Full time 1				Part time 2		
		Housewife 1	Retired 2	Employed 3	Self Employed 4	Student 5	Unemployed 6	Other (Specify) _____
8	If employed, what is your occupation?	Artsian / Tradesman 1	Business Person 2	Clerical 3	Farmer 4	House Executive 5	Managerial 6	Sales Person 7
		Student 8		Other (specify)				
9	How long have you been in this occupation? (Years)	_____						
10	If you are retired/ unemployed what was your previous occupation?	Artsian / Tradesman 1	Business Person 2	Clerical 3	Farmer 4	House Executive 5	Managerial 6	Sales Person 7
		Student 8	Other (Specify) _____					
11	For how long where you in this occupation? (Years)	_____						

12	Does your occupation involve any of the following for the majority of the day?	Lifting heavy objects 1	Sitting for long periods 2	Driving for long hours 3	Causes your body to turn 4	Answering the telephone 5	Working on a computer 6	Working with arms overhead 7
		Working in an airconditioned room 8	Prolonged standing/ bending 9	Other(Specify) _____				
13	Do you feel that your job gives you low back pain?	Yes 1				No 2		
14	Total annual income?	R1 - R10 000	R10 001 - R20 000	R20 001 - R30 000	R30 001 - R40 000	R40 001 - R50 000	R50 001 - R60 000	R60 001 - R70 000
		R70 001 - R100 000	R100 001 - R150 000	R150 001 - R200 000	R200 001 - R250 000	R250 001 - R350 000	R350 001- R450 000	R450 001 - R500 000
		>R500 001	N/A					
15	What is you current smoking status?	Current smoker 1			Ex smoker 2			Non smoker 3
16	Current smokers	On average how many cigarettes do you smoke per day?						
		Duration of smoking? (Years)						
		Do you have a cough as a result of smoking?						
17	Ex smokers	On average how many cigarettes did you smoke per day?						
		How long ago did you quit smoking? (Years)						
		For how long did you smoke before you quit? (Years)						
		Do you have a cough as a result of smoking?						
18	Do you do any exercise?	Yes 1				No 2		
19	What type of exercise do you do most of the time?	Aerobics 1	Badminton 2	Boxing 3	Cardio (Gym) 4	Cricket 5	Cycling 6	Fishing 7
		Golf 8	Martial Arts 9	Road Running 12	Rugby 11	Squash 13	Soccer 14	Swimming 15
		Surfing 16	Tennis 17	Walking 18	Weight Training 19	Yoga / Pilates 20	Other (Specify) _____	
20	What is the total amount of time spent exercising each week?(Hours)	_____						
21	Do you have medical aid?	Yes 1				No 2		

22	If 'YES' please answer the following questions.	Do you have comprehensive medical aid?	Yes 1	No 2
		Do you have a hospital scheme?	Yes 1	No 2
		Do you feel that you have sufficient access to health services? (It may be private health care or public health care. Having access to a doctor or hospital where your low back pain may be assessed.)	Yes 1	No 2
		Do you suffer from any heart conditions?	Yes 1	No 2
		Do you suffer from Diabetes Mellitus?(High Blood Sugar)	Yes 1	No 2
		Have you been diagnosed with any health conditions? If so please specify.	_____	
		Please rate your stress level on a scale of 0 - 10. (0 being the least and 10 being the most.)	_____	

RELEVANT TO FEMALES ONLY (QUESTIONS 23 - 31)				
23	Number of pregnacies to full term?	_____		
24	Number of children?	_____		
25	Number of foster children?	_____		
26	Have you ever had multiple births? (Twins/ Triplets etc.)	Yes 1	No 2	
27	If so please specify.	_____		
28	Which of the following did you have?	C-Section with epidural 1	Natural with epidural 2	Natural birth 3
29	Do you have any gynaecological problems?	Yes 1	No 2	
30	Have you ever experienced low back pain?	Yes 1	No 2	

IF YOUR ANSWER TO THE ABOVE QUESTION IS 'NO' YOUR QUESTIONAIRE IS NOW COMPLETE. THANK YOU FOR YOUR PARTICIPATION.

Low back pain is defined as 'pain that occurs from the bottom of the ribs and extends to the buttocks' Please mark with an X where you are experiencing low back pain.	

C) Clinical (Only participants with low back pain answer this section).

31	Do you currently have low back pain?	Yes 1		No 2	
32	What was your age when you first experienced low back pain? (Years)	_____			
33	How often do you experience low back pain?	0 - 3 months 1	6-12 months 2	Longer than 1 year 3	
34	Most recent episode of low back pain	How severe is / was the pain?	Mild 1	Moderate 2	Severe 3
		What time of the day is / was the pain worst?	Morning 1	Afternoon 2	Evening 3
			When sleeping 4	Activity related 5	Constant 6
			Other(Specify) _____		
		At what time of the day is / was the pain the least?	Morning 1	Afternoon 2	Evening 3
			When sleeping 4	Activity related 5	Constant 6
			Other(Specify) _____		
		How did your low back pain begin?	Gradually 1	Abruptly 2	Unsure 3
		Do you know what caused your low back pain?	Please specify _____		

		What is the progression of your low back pain?	Getting worse 1	Getting better 2	Staying the same 3
			Unsure 4		
		Please rate your low back pain at its ***worst.*** Pain rating scale (0 -10) with 0 being the least and 10 being the most severe amount of pain).	_____		
		Please rate your low back pain at its ***least.*** Pain rating scale (0 -10) with 0 being the least and 10 being the most severe amount of pain).	_____		
35	Activities of daily living	How would you rate your overall disability because of your low back pain?	None 1	Mild 2	Moderate 3
			Severe 4		
		Do you experience any difficulties in doing any of the following as a result of your low back pain?	Bending 1	Dressing 2	Driving 4
			Lifting 4	Sitting 5	Sleeping 6
			Standing 7	Walking 8	
			Other (specify)_____		
			Yes 1	No 2	
		Have you ever had to stay away from work because of low back pain?	_____		
		If 'Yes', for how long? (weeks)	Yes 1	No 2	
		Have you ever had to change your job due to low back pain?	Yes 1	No 2	
		Have you ever lost your job / been medically boarded due to low back pain	Yes 1	No 2	
		Have you been treated for low back pain?	Yes 1	No 2	
		Where have you received treatment for low back pain?	Pharmacist 1	Private Hospital 2	Private practice 3
			State Hospital 4	State Clinic 5	
			Other (Specify) _____		

36	Treatment				
		If you have had a history of low back pain what treatment did you obtain in the past?	Chiropractic 1	General Practitioner 2	Homeopath 3
			Orthopaedic Surgeon 4	Pharmacist 5	Physiotherapist 6
			Self medicated 7	State hospital 8	Traditional healer 9
			None 10	Other (Specify) _____	
		If you currently have low back pain what treatment are you obtaining presently?	Chiropractic 1	General Practitioner 2	Homeopath 3
			Orthopaedic Surgeon 4	Pharmacist 5	Physiotherapist 6
			Self medicated 7	State hospital 8	Traditional healer 9
			None 10	Other (Specify) _____	
		How long have you been obtaining treatment for your current low back pain? (Days / Weeks)	_____		
		Which treatment has helped in relieving your low back pain?	Chiropractic 1	Practitioner 2	Homeopath 3
			Surgeon 4	Pharmacist 5	Physiotherapist 6
			Self medicated 7	State hospital 8	Traditional healer 9
			None 10	Other (Specify) _____	
		Does the medication you receive for your low back pain help?	Yes 1	No 2	
		How much does your medication cost per month?	_____		
		How much does your treatment cost per month excluding medication	_____		

APPENDIX G
Ethics Clearance Certificate

APPENDIX H
Population statistics

Statistics South Africa
Persons and Services - South Africa by Province and Municipality

Geography by Population group
for Person weighted

	Black African	Coloured	Indian or Asian	White	% White
Umhlanga Rocks	2013	236	1875	7365	**47**
Morningside	2000	554	3350	7164	**55**
Malvern	1638	287	4648	9512	**59**

Created on 22 October 2010
Space-Time Research
Web page:
www.str.com.au
Space-Time Research
Online support:
support@str.com.au
SuperCROSS.

APPENDIX I

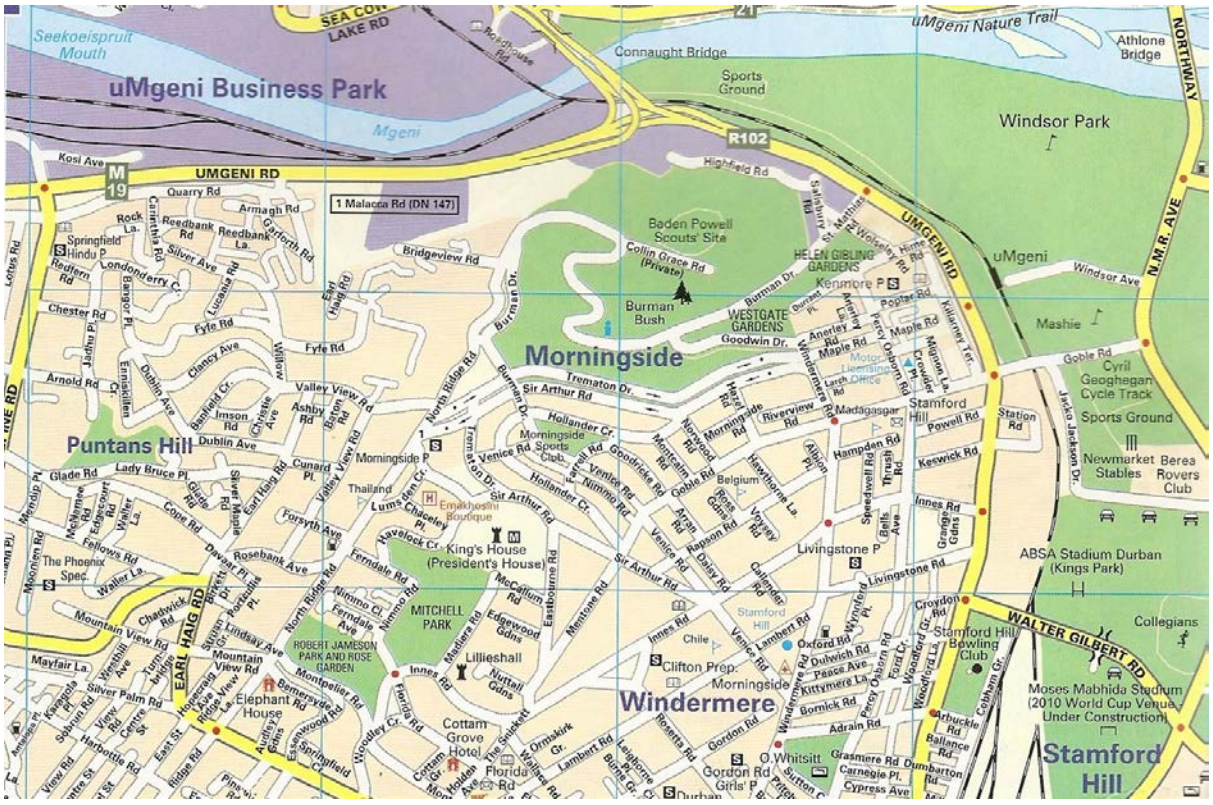
DVD of focus group (for purposes of examination only)

Note that this DVD will not be available in the final dissertation as this contravenes the confidentiality statements signed by all at the focus group.

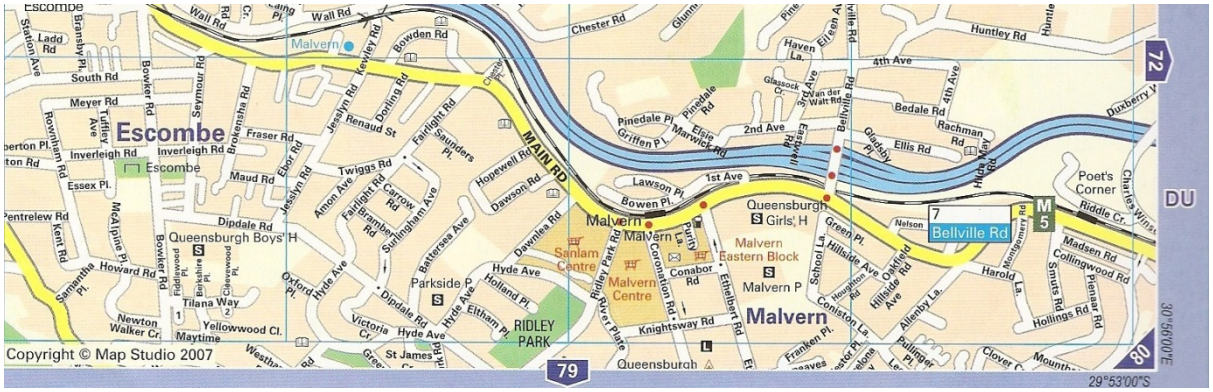
Appendix J


2
M12 Lighthouse Rd
Umhlanga Rocks Dr
uMhlanga Ridge Town Centre (Proposed)
uMhlanga Ridge
uMhlanga Rocks
La Lucia Sands
UMHLANGA ROCKS DR.
LEO BOYD HIGHWAY
Durban View Rd
Marine Dr.
Ridge Rd
Chartwell Dr.
Blue Waters La.
Ocean Way
O'Connor Promenade
Lighthouse Rd
Westridge
Hilken Centre
uMhlanga Country Club
uMhlanga Rocks Civic Centre
uMhlanga Plaza
Beverly Hills Sun Intercontinental
Oyster Box
uMhlanga Sands
Cabana Beach
uMhlanga Rocks Surf Lifesaving Club
uMhlanga Manors
DURBANVIEW PARK
Atholton P
Rolling Hills Country Club
PIONEER PARK
Natal Anti-Sharks Measures Board
uMhlanga Hospital
M 4
M 12
M 41
32

Appendix J


Seekoeispruit Mouth
uMgeni Business Park
Mgeni
SEA CON
LAKE RD
Connaught Bridge
Sports Ground
uMgeni Nature Trail
Athlone Bridge
NORTHWAY
Windsor Park
R102
Highfield Rd
UMGENI RD
M 19
Kosi Ave
Quarry Rd
1 Malacca Rd (DN 147)
Baden Powell Scouts' Site
Collin Grace Rd (Private)
HELEN GIBLING GARDENS
Kenmore P
uMgeni
Windsor Ave
N.M.R. AVE
Burman Bush
WESTGATE GARDENS
Goodwin Dr.
Mashie
Morningside
Bridgeview Rd
Burman Dr.
Springfield Hindu P
Chester Rd
Fyfe Rd
Arnold Rd
Clancy Ave
Dublin Ave
Puntans Hill
Valley View Rd
Trematon Dr.
Sir Arthur Rd
Hollander Cr.
Morningside Sports Club
Venice Rd
Stamford Hill
Madagascar
Powell Rd
Station Rd
Goble Rd
Cyril Geoghegan Cycle Track
Sports Ground
Newmarket Stables
Berea Rovers Club
Keswick Rd
Innes Rd
Livingstone P
Livingstone Rd
ABSA Stadium Durban (Kings Park)
Collegians
WALTER GILBERT RD
Stamford Hill Bowling Club
Croydon Rd
Thailand
Emakhosini Boutique
King's House (President's House)
The Phoenix Spec.
Waller La.
Rosebank Ave
Havelock Cr.
Ferndale Rd
Nimmo Cl.
MITCHELL PARK
McCallum Rd
Eastbourne Rd
Mentone Rd
Edgewood Gdns
Lillieshall
Nuttall Gdns
ROBERT JAMESON PARK AND ROSE GARDEN
EARL HAIG RD
Mountain View Rd
Mayfair La.
Silver Palm Rd
Elephant House
Bemersyde Rd
Montpelier Rd
Florida Rd
Cottam Grove Hotel
Clifton Prep.
Morningside
Windermere
Chile
Oxford Rd
Dulwich Rd
Peace Ave
Kittymere La.
Bormick Rd
Adrain Rd
Gordon Rd
O.Whitsitt
Gordon Rd Girls' P
Grasmere Rd
Carnegie Pl.
Cypress Ave
Dumbarton Rd
Arbuckle Rd
Ballance Rd
Moses Mabhida Stadium (2010 World Cup Venue - Under Construction)
Stamford Hill

Appendix J


Escombe
Malvern
Escombe
Queensburgh Boys' H
Queensburgh Girls' H
Malvern
Malvern
Malvern Eastern Block
Malvern P
Malvern
Sanlam Centre
Malvern Centre
Parkside P
RIDLEY PARK
Bellville Rd
MAIN RD
Wall Rd
Chester Rd
Huntley Rd
4th Ave
2nd Ave
1st Ave
Bedale Rd
Ellis Rd
Rachman Rd
Poet's Corner
Bowden Rd
Dipdale Rd
Hyde Ave
Knightsway Rd
Queensburgh
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72
79
80
DU
30°56'00"E
29°53'00"S