



**Research Department, Silver Chain  
Strategic Research Series - Number 07**

# **OSTEOPOROSIS RISK ASSESSMENT IN A HOME CARE SETTING**

**Joanna Smith  
Senior Research Officer**

**Gill Lewin  
Research Manager**

**Carolyn Roberts  
Research Assistant**

**Kate Mitchell  
Research Assistant**

**Nelly Newall  
Clinical Research Co-ordinator**

**20 March 2006**



## **ACKNOWLEDGEMENTS**

The Research Department would like to thank Sanofi Aventis Australia for their support in funding this project.

We would also like to acknowledge the clinical expertise provided by Dr Charles Inderjeeth (Rehabilitation and Aged Care, Sir Charles Gairdner Hospital) in the design of this research and analysis of the results.

As ever, we thank the clients surveyed and interviewed and the general practitioners who assisted us by allowing us to audit their notes.



## TABLE OF CONTENTS

<b>ACKNOWLEDGEMENTS</b> .....	<b>II</b>
<b>TABLE OF CONTENTS</b> .....	<b>III</b>
<b>INTRODUCTION</b> .....	<b>1</b>
<b>OBJECTIVES</b> .....	<b>2</b>
<b>METHOD</b> .....	<b>3</b>
Survey Sample.....	3
Survey.....	3
Interview Sample Selection.....	4
Interview Protocol.....	4
General Practitioner Notes.....	4
Analysis.....	5
<b>RESULTS</b> .....	<b>5</b>
Survey Respondents.....	5
Interviewees.....	5
Survey Results.....	5
<i>Osteoporosis Risk Profile</i> .....	5
<i>Fracture History</i> .....	9
<i>Summary Of Differences Between Gender, History Of Fracture And Age</i> .....	11
<i>Knowledge of Osteoporosis Diagnosis and Assessment</i> .....	12
<i>Fracture Index</i> .....	12
<i>Treatment After Fracture</i> .....	13
Interview Results.....	14
<i>Risk Factors</i> .....	14
<i>Fracture History</i> .....	14
<i>Treatment After Fracture</i> .....	16
<i>Osteoporosis Diagnosis And Treatment</i> .....	17
<i>Osteoporosis Treatment</i> .....	17
<i>Osteoporosis Knowledge</i> .....	19
General Practitioner Notes Audits.....	19
<b>DISCUSSION</b> .....	<b>20</b>
Limitations Of The Research.....	23
Future Directions.....	24
<b>CONCLUSION</b> .....	<b>24</b>
<b>REFERENCES</b> .....	<b>25</b>



## **APPENDICES**

Appendix I: Client Survey

Appendix II: The Fracture Index

Appendix III: Letter To Client, Information Sheet, Consent Form And Interview Protocol

Appendix IV: GP Letter Of Introduction And Information Sheet

For copies of these appendices please contact Silver Chain's Research Department, telephone 08 9242 0242.



## **INTRODUCTION**

It is well recognised that osteoporosis is a public health issue. In 2002 arthritis and musculoskeletal conditions, of which osteoporosis is one, were endorsed by the Australian Health Ministers as a National Health Priority Area [1]. In Australia almost 300 000 people are reported to have osteoporosis, but quantifying the incidence of osteoporosis is difficult and these figures are likely to be an underestimate of the actual number as the disease is not usually detected until a fracture occurs [1].

It is the fractures associated with osteoporosis that cause the real burden of the disease. In 2001, 177 people were hospitalised each day because of fractures. It is expected that by 2021, approximately 1,796,900 older people will be diagnosed with osteoporosis, nearly double that of the prevalence in 2001 and that there will be 387 fractures each day as a result requiring hospitalisation [2].

Fractures in older people increase their risk of acute hospital care, their use of home care, and risk of entering a residential aged care facility [1]. Fractures can significantly reduce activities of daily living (ADLs) and instrumental activities of daily living (IADLs) functioning, increasing the need for assistance with everyday tasks not only immediately after the fracture, but also long term [1] [3]. Research has shown that with older individuals, fractures increase dependency to the extent that at one year after a fracture, individuals with fall related injuries had not regained their levels of physical functioning experienced prior to their injury [3] [4]. In addition to declines in physical functioning, hip fractures in particular have a high mortality rate with death being relatively common in the months after the fracture [5] and up to 50% of people who survive hip fractures will require long term nursing care [2].

Bone mineral density can be safely and effectively measured to diagnose osteoporosis using dual-energy x-ray absorptiometry (DEXA) [1] and once diagnosis is made, there are several safe and effective treatment options available [1]. Unfortunately diagnosis is commonly made when the condition has advanced to such a state that a minimal trauma fracture has occurred but it is a condition which is preventable and the impacts of it can be reduced by lifestyle changes and if required, medication [6] [7].

Risk factors for osteoporosis are apparent well before diagnosis of osteoporosis or a fracture occurs. The risk factors for fracture and osteoporosis are well researched and documented. They include biomedical and genetic factors, behavioural risk factors, other medical conditions and a previous history of fracture [1] [2] [3] [8]. Biomedical and genetic factors include ageing, being post menopausal, having a family history, low vitamin D levels, and a low Body Mass Index (BMI). Behavioural factors include low calcium intake, lack of exercise, smoking and excessive alcohol consumption.



There are a number of other medical conditions that may lead to osteoporosis, most commonly the use of corticosteroids and early menopause.

The evidence suggests that a large proportion of older people in the community are at risk of osteoporosis, studies have shown that they are not being diagnosed or treated despite the general agreement that they should be [9] [5].

Management pathways for older people who sustain a fracture or have major risk factors for osteoporosis have been developed for use by General Practitioners [10] and in a tertiary hospital [11]. These pathways, based on current evidence of best practice have been developed to ensure that older people receive optimum treatment and management of osteoporosis.

Due to the age of Silver Chain's clients and their propensity to fall and fracture, and the prevalence of osteoporosis within the community at large, it would be expected that this group of older people would be particularly at risk of having osteoporosis. Based on existing evidence [5], it is expected that few of Silver Chain's clients who are at risk of developing osteoporosis or already have it, are being treated for or been advised of preventative measures against osteoporosis.

This study was designed to investigate the osteoporosis risk profile of Silver Chain's older clients and the prevalence of a recent fracture and subsequent osteoporotic therapy within this group. It has also examined whether risk had been identified by health professionals caring for these clients and if it had been, whether subsequent treatment was consistent with best practice treatment guidelines.

The purpose of this research, from an organisational perspective, was to determine whether our clients are receiving optimal management in regards to osteoporosis and if not, determine whether there is the potential for Silver Chain to contribute to improved management and better outcomes for our clients.

## **OBJECTIVES**

The study objectives were:

- 1 Describe the osteoporosis risk profile of Silver Chain's older clients.
- 2 Determine the prevalence of recent fracture amongst Silver Chain's older clients.
- 3 Understand the treatment pathway experienced by those clients who had fractured and compare it to osteoporosis guidelines.
- 4 Develop protocols for the assessment of Silver Chain clients' risk of osteoporosis and their referral for further assessment and management.



## METHOD

The study had two parts. The first, designed to address the first two research objectives was a mail survey of a random sample of Silver Chain clients aged over regarding their recent fracture history and other fracture/osteoporosis risk factors. The second component, designed to address the third objective, involved face-to-face interviews of a sub-sample of the survey respondents who had reported a fracture. These interviews were used to seek information regarding their post fracture therapy as well as to obtain permission to contact their GP to request access to their notes in order to be able to confirm the details of the post fracture treatment they recalled.

### Survey Sample

Surveys were sent to 1500 randomly selected clients who met the study criteria according to Silver Chain's information management system. The inclusion criteria were:

- Aged over 65 years of age
- Residing in the metropolitan area
- Not receiving palliative care services nor having grief counselling
- Not having a diagnosis of dementia
- Living at home

After a period of two weeks, a postcard reminding clients to complete the survey was sent to those who had not returned the survey.

### Survey

The survey developed was based on a review of the literature and discussions with other researchers in this area including a tertiary hospital where a similar survey had been completed [12]. The survey (see Appendix I) included:

- Information relating to height and weight
- Presence or absence of osteoporosis risk factors
- Presence or absence of fracture after the age of 50
- Number of fractures, site of fracture and times fractured
- Reason for fracture
- Incorporation of fracture risk using The Fracture Index [13]
- Treatment and osteoporotic therapy after fracture

The Fracture Index [13] was incorporated into the survey tool to determine whether it was able to discriminate between different risk groups in this client group. The Fracture Index consists of six<sup>1</sup> questions relating to age, fracture history, maternal fracture history, weight, smoking status, and ability to rise from sitting without using one's hands. The Index is scored out of a total of 11 with a higher score indicating the higher risk of fracture (see Appendix II).

---

<sup>1</sup> The Index also has an additional question relating to BMD Test results but can be used without this information.



## **Interview Sample Selection**

One hundred of the survey respondents who reported a fracture were randomly selected and telephoned to be recruited for an interview. Each of the 100 was telephoned and if contacted asked whether someone could visit and interview them. A maximum of three calls were made to clients who could not be contacted at different times of day. Once everyone in the initial sample had either been spoken to or found to be not contactable, a further random sample was selected and the process of telephoning was undertaken again. This process continued until 100 clients had accepted an interview.

Once clients had agreed to an interview, a letter, information sheet and consent form (see Appendix III) were mailed and the consent form was collected at the time of the interview.

## **Interview Protocol**

The interview protocol development was informed by the survey and discussions with other researchers in the field. Much of the information collected was to expand and validate the information gathered by the survey. The interview included questions about:

- physical risk factors
- risk factors relating to lifestyle
- fracture history
- treatment after a fracture
- osteoporosis diagnosis and treatment including current and past medication regime
- the client's knowledge of osteoporosis, causes and prevention
- falls

The interview also asked for each client's consent to contact their GP to confirm the client's recollection of fracture and osteoporosis treatment. The interview schedule can be found in Appendix III.

## **General Practitioner Notes**

We contacted 26 general practices involved in the care of clients with fractures for access to their medical notes. The GPs were contacted through a letter of introduction and information sheet which is given in Appendix IV. Included with these, was a copy of the client's consent for the GP to be contacted as a part of this research. The letter was followed by a phone call from our research nurse to make an appointment time. The research nurse audited the notes at the GPs' rooms and determined whether any of the following were present:

- Record of a fracture
- Evidence of assessment of fracture or osteoporosis risk
- Diagnosis of osteoporosis
- Results of any Bone Mineral Density test
- Evidence that relevant medications had been prescribed
- Evidence of lifestyle advice given
- Evidence of monitoring or management of osteoporosis



## **Analysis**

The data from the returned surveys was entered into an SPSS database and merged with demographic and service provision information taken from Silver Chain's information management system. The complete data set was analysed using SPSS Version 13. The analysis included basic descriptive analysis, comparisons between groups was determined use Chi-Squared analysis for categorical data and analysis of variance for continuous data.

In addition, interview data was merged with the survey and demographic data to provide a complete profile of fracture risk and treatment of 100 clients.

## **RESULTS**

### **Survey Respondents**

The survey response rate was 58% (n = 874). Female clients comprised 71% (n=628) of the respondent sample and the average age was 80 (sd = 7.16) ranging from a minimum age of 65 to 100 years. More than half, 54% (n=459), lived at home alone and 43% (n=374) were recorded as having a carer. The clients who responded to the survey received a wide range of Silver Chain's services with the most commonly used services being domestic assistance (72%, n=625), nursing (18%, n=157) and personal care (14%, n=125).

### **Interviewees**

Clients recruited for face-to-face interviews were a subset of the survey group. To obtain the interview group, 161 clients were randomly selected and contacted and 61 refused an interview.

Of the 100 clients interviewed, 90% were female and the average age was 81 (SD=6.86) ranging from a minimum of 65 to 96 years of age. Two-thirds (65%) of the clients lived alone and 37% were recorded as having a carer.

A large percentage (81%) of the interviewed clients received domestic assistance services, 16% received nursing and 12% personal care. In addition, 12% used CareLink Personal Alarm services.

The interview group had significantly fewer males ( $p < 0.001$ ) when compared to the respondents as a whole, but there were no other significant differences between the interview sub-sample and the whole study sample in relation to the other demographic information.

### **Survey Results**

#### ***Osteoporosis Risk Profile***

Table 1 shows the percentage and number of survey respondents who indicated that they had risk factors for osteoporosis and fracture.

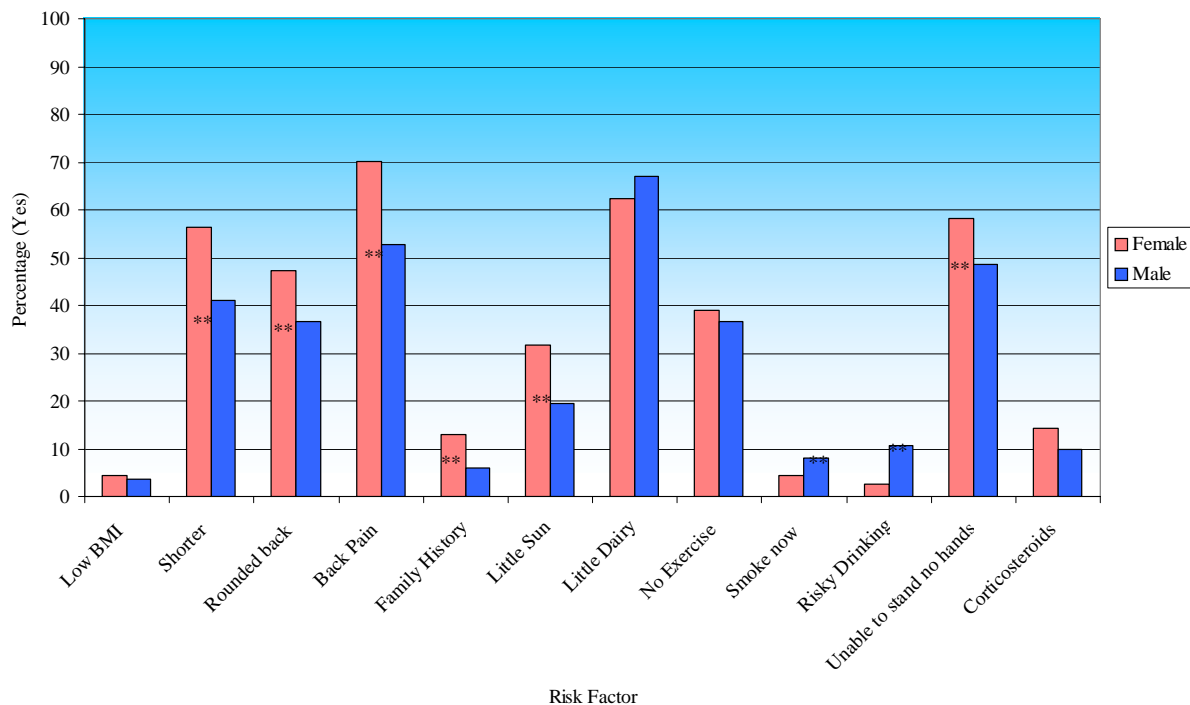


Table 1: Presence Of Risk Factors In Survey Group

Risk Factor	Percentage with Risk Factor (n)
Low BMI (<19 [1])	7.5% (66)
Shorter than height in youth	52.1% (455)
Back pain	65.3% (556)
Rounded back	44.2% (374)
Menopause < 45 Year (females only)	23.3% (140)
Family history of osteoporosis	11.1% (97)
Stand without using hands (no)	42.6% (365)
Use of corticosteroids > 3 months	13.1% (111)
No exercise	40.3% (335)
Less than 3 serves of dairy	68% (557)
No sun exposure per day	28.8% (247)
Current Smoker	5.4% (47)
Risky drinking	2.8% (24)

There were significant differences in the osteoporosis risk factors depending on the gender of the respondent. As Figure 1 shows, males were significantly less likely to have the risk factors of being shorter, rounded back, back pain, being unable to stand from a chair without hands, a family history of osteoporosis and no sun exposure. Males were significantly more likely to currently smoke and undertake risky drinking practices than females. Other risk factors showed no gender specific significant differences.

Figure 1: Differences Between Male And Female Osteoporosis Risk Factors

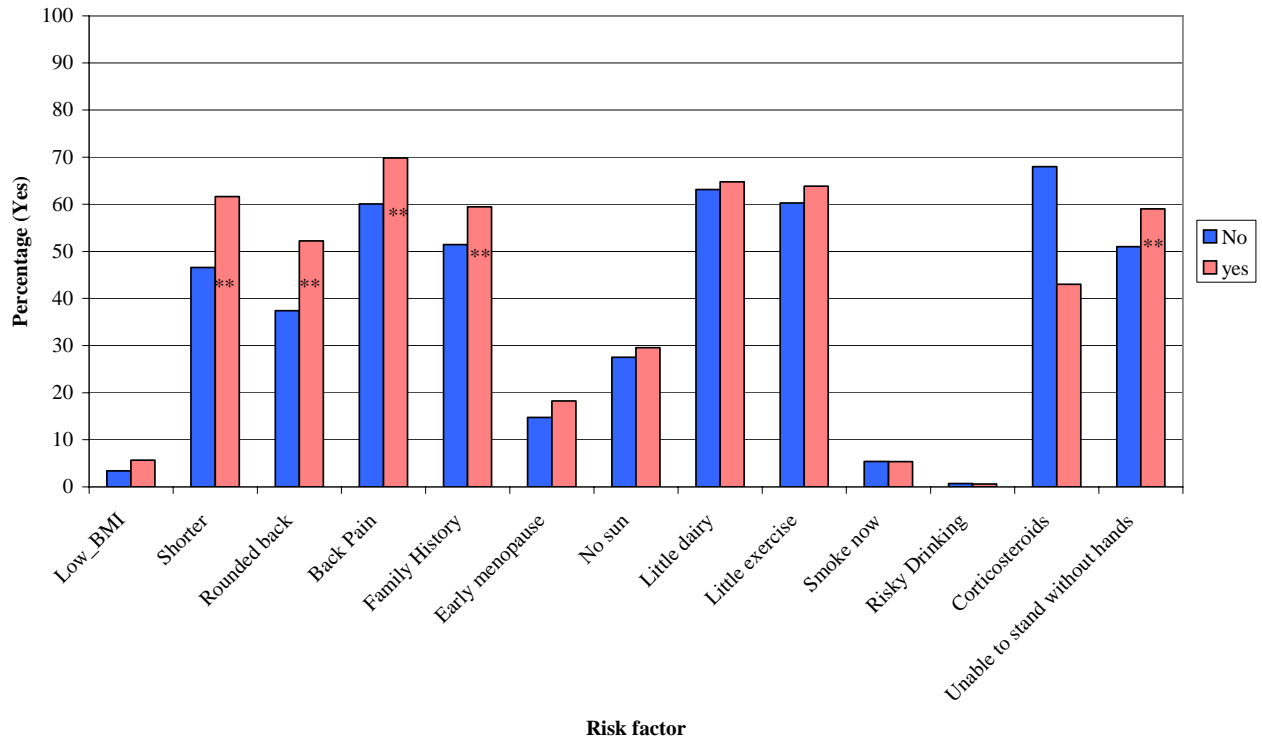


NB: \*\* significant difference p<0.05



Figure 2 shows that respondents who sustained a fracture were more likely to be shorter now than in their youth, have a rounded back, back pain and a family history of osteoporosis as well as being more likely to be unable to stand without using their hands.

Figure 2: Risk Factor Differences Between Those Who Fractured And Those Who Had Not

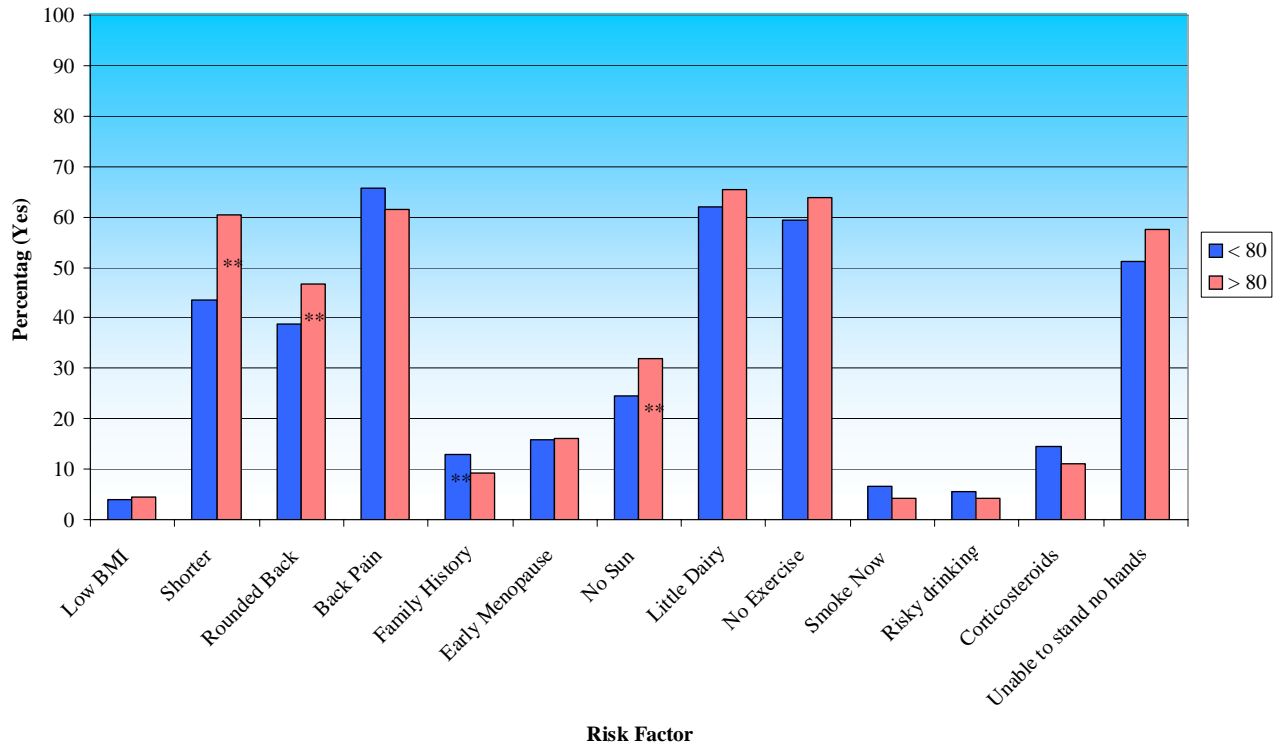


NB: \*\* significant difference  $p < 0.05$

Figure 3 shows that there were some differences in the risk reported by respondents below the mean age and above (80 years). Older respondents greater than 80 years were more likely to be shorter and have a rounded back and no sunlight exposure than younger respondents. Younger respondents were more likely to have a family history of osteoporosis than those who were older.



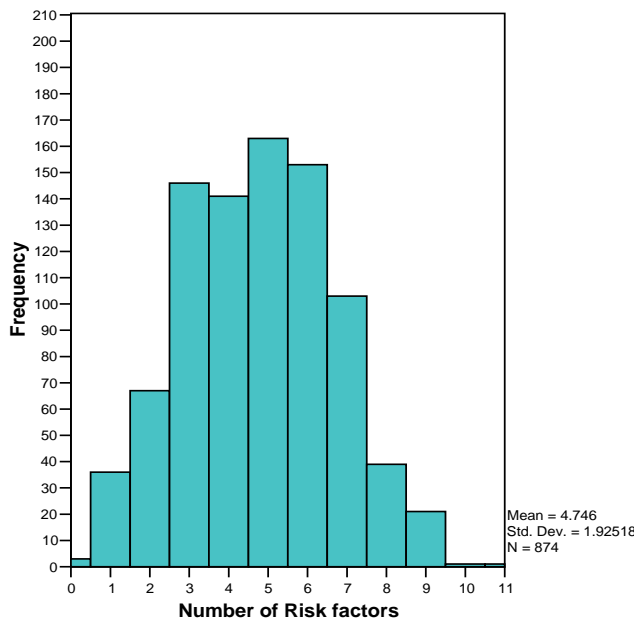
Figure 3: Differences In Risk Factors Of Older And Younger Respondents



NB: \*\* significant difference  $p < 0.05$

Apart from age, which was part of the inclusion criteria for the study, 871 (99.7%) of the survey respondents had at least one risk factor. Figure 4 shows the number of risk factors per individual. The mean number of risk factors was 4.75.

Figure 4: Number Of Risk Factors Per Individual Survey Respondent





There were significant differences in the mean number of risk factors per clients dependent on gender, age and fracture history. Females had significantly more risk factors than males: 5.3 for females versus 3.3 for males ( $p < 0.001$ ). Clients older than 80 had significantly more risk fractures than those younger: 4.97 for older clients versus 4.53 for younger clients ( $p = 0.001$ ). Clients who had a history of fracture had a higher mean number of risk factors than those without: 4.86 versus 4.11 ( $p < 0.001$ ).

### ***Fracture History***

Just over a third (36.7%,  $n=318$ ) of survey respondents recorded that they had had at least one fracture since turning 50. The majority of respondents who fractured were female (83%,  $n=264$ ). Only 54 males (22%) reported a history of previous fracture. This gender difference was found to be significant ( $p < 0.001$ ).

Table 2 summarises the episodes of fracture and the number of fractures. At least one episode of fracture was reported by 36.6% of respondents. Of these (21.9%) reported the fracture of one bone during a single episode of fracture while 9.6% reported 2 episodes of fracture.

*Table 2: Number Of Bones Broken*

<b>Episodes of Fractures</b>	<b>Number of Episodes of Fracture Percentage (n)</b>	<b>Number of Bones Broken Percentage (n)</b>
0	63.4% (548)	63.4% (548)
1	21.9% (189)	21.9% (189)
1-2	9.6% (83)	6.4% (55)
3-5	4.7% (41)	7.1% (61)
More than 5	.3% (3)	1.3% (11)
<b>Total</b>	<b>100.0% (864<sup>2</sup>)</b>	<b>100.0% (864)</b>

Table 3 shows that collectively, the 318 survey respondents recalled fractures to 428 bones. The most commonly fractured bone was the wrist followed by the hip and ankle. Figure 5 shows the difference between fracture sites and the gender of the respondent. Although a greater percentage of females fractured their hip, wrist, spine, humerus and ankle, and more males fractured their ribs, none of these differences was statistically significant.

The effect of age (above the mean age of 80 vs. below) on fracture and fracture site was examined. Respondents older than 80 were significantly more likely to have a fracture than those younger than 80 ( $p = 0.002$ ). In relation to fracture site, there was no significant effect of age apart from those with wrist fractures. Respondents with wrist fractures are significantly more likely to be over 80 years ( $p= 0.004$ ).

---

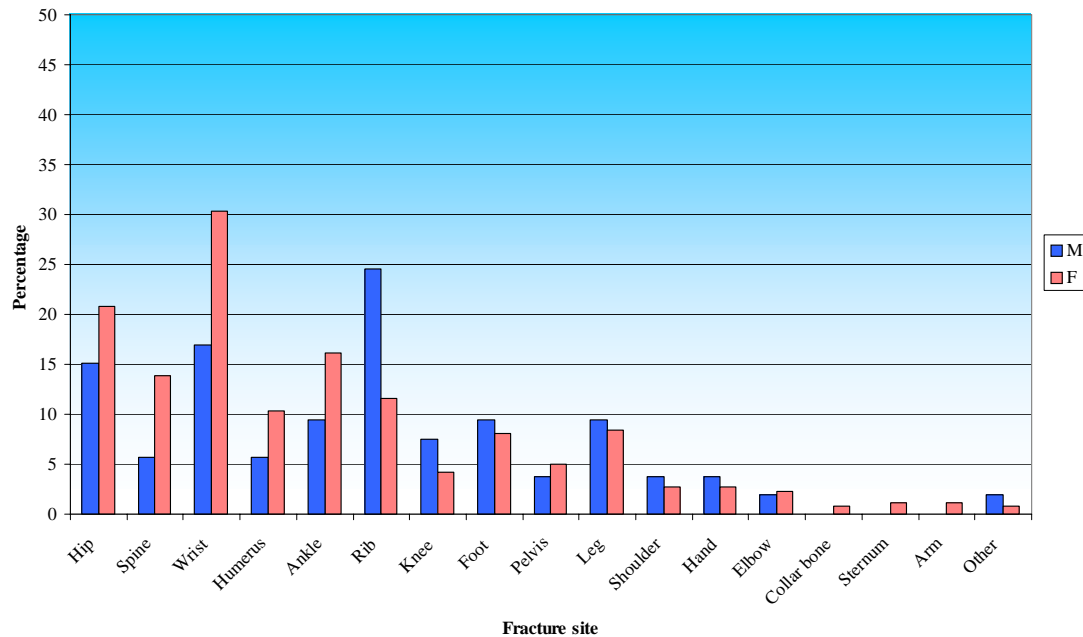
<sup>2</sup> Not all total add up to 874 due to missing data.



Table 3: Site Of Fracture

Site	Number Of Fractures	Percentage of Survey Respondents
Wrist	88	10.07%
Hip	62	7.09%
Ankle	47	5.38%
Rib	43	5.92%
Spine	40	4.58%
Humerus	30	3.43%
Leg	27	3.09%
Foot	26	2.97%
Pelvis	15	1.72%
Knee	15	1.72%
Hand	9	1.02%
Shoulder	9	1.02%
Elbow	7	0.8%
Arm	3	0.34%
Sternum	3	0.34%
Other	2	0.23%
Collar bone	2	0.23%
<b>Total</b>	<b>428</b>	

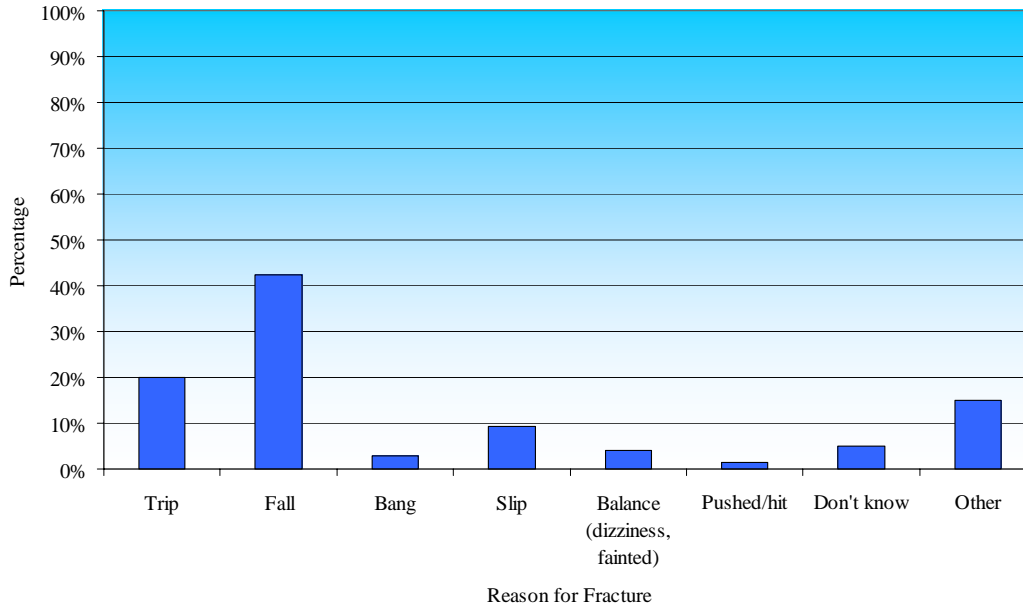
Figure 5: Fracture Site By Gender



Respondents were asked to explain how their fracture occurred. Figure 6 shows that the respondents stated that the majority of fractures were caused by falls (42%), trips (20%) and slips (9%).



Figure 6: Perceived Cause Of Fractures



**Summary Of Differences Between Gender, History Of Fracture And Age**

Table 4 outlines the differences found in the survey results between males and females, whether or not the respondent had sustained a fracture and the differences between older respondents and younger respondents.

Table 4: Differences In Gender, Fracture History And Age

	Gender (Female)	Fracture (Yes)	80+
Low BMI	NS	NS	NS
Shorter	S	S	S
Rounded Back	S	S	S
Back pain	S	s	NS
Family History	S	S	S
Early menopause	-	NS	NS
No Sun	S	NS	S
Little Dairy (< 3 serves per day)	NS	NS	NS
Little exercise	NS	NS	NS
Smoke now	S (Male)	NS	NS
Risky Drinking	S (Male)	NS	NS
Unable to stand without using arms	S	S	NS
Use of corticosteroids	NS	S	NS
Knowledge of osteoporosis diagnosis	S	S	NS
BMD	S	S	S (<80)
Sustained Fracture	S	-	S
Site of Fracture	NS	-	S (wrist)

NS = No significant difference found  
 S = Significant difference between group p < 0.05



### ***Knowledge of Osteoporosis Diagnosis and Assessment***

Just under a third of all respondents (28.4%, n = 248) recalled being told they had osteoporosis. This recollection of diagnosis was more likely if the respondent was female ( $p < 0.001$ ) or had sustained a fracture ( $p < 0.001$ ). Age of the respondent was not found to be a significant factor in being told of having osteoporosis.

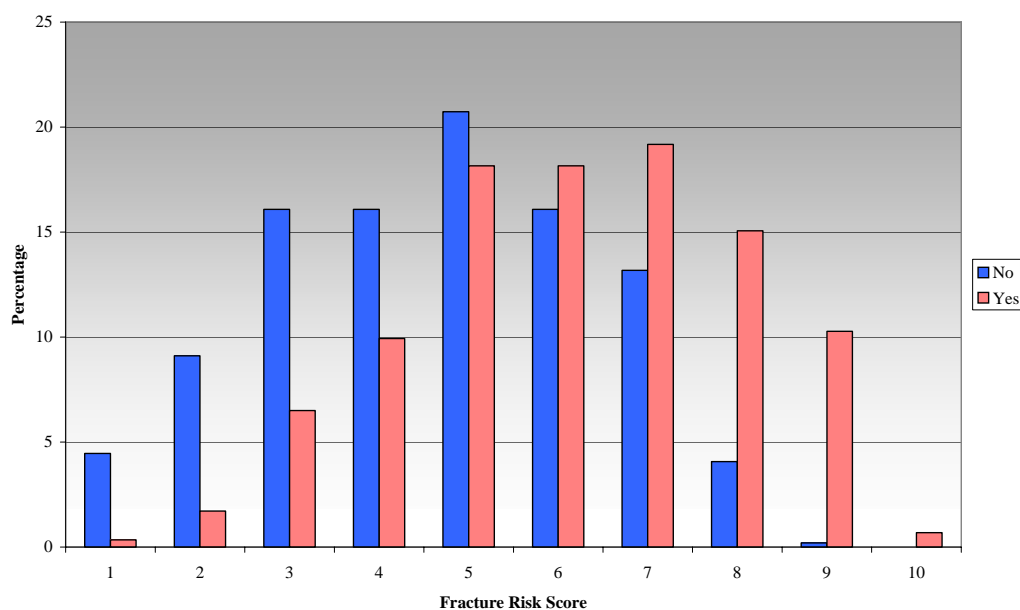
The survey asked if respondents had ever had a bone mineral density test. Just over a third (37.8%, n=330) stated that they had. More than half of those who had been tested (58.3%, n=107) recalled that they had had the BMD within the previous two years. Individuals who had sustained a fracture were significantly more likely to have had a BMD test ( $p < 0.001$ ) than those who had not and females were significantly more likely to have had a BMD test ( $p < 0.001$ ) than males. Respondents who were younger than the mean age of 80 were more likely to have reported having a BMD than those who were older ( $p = 0.009$ ).

### ***Fracture Index***

The fracture risk for each respondent was calculated using the Fracture Index [13] using the scoring for individuals calculated without a BMD result. The Fracture Index included a range of risk factors and can be seen in Appendix I.

The Fracture Index score was compared for those individuals who had reported a fracture and those who had not. Chi squared analysis shows that there was a significant difference of the score obtained and history of fracture ( $p < 0.001$ ). Significantly more individuals who scored 7, 8, 9 or 10 on the Fracture Index had reported a fracture (as seen in Figure 7). As the score increased, the percentage of respondents who had sustained a fracture increased, and those who had not, decreased. The higher the Fracture Index score, the more likely the history of fracture.

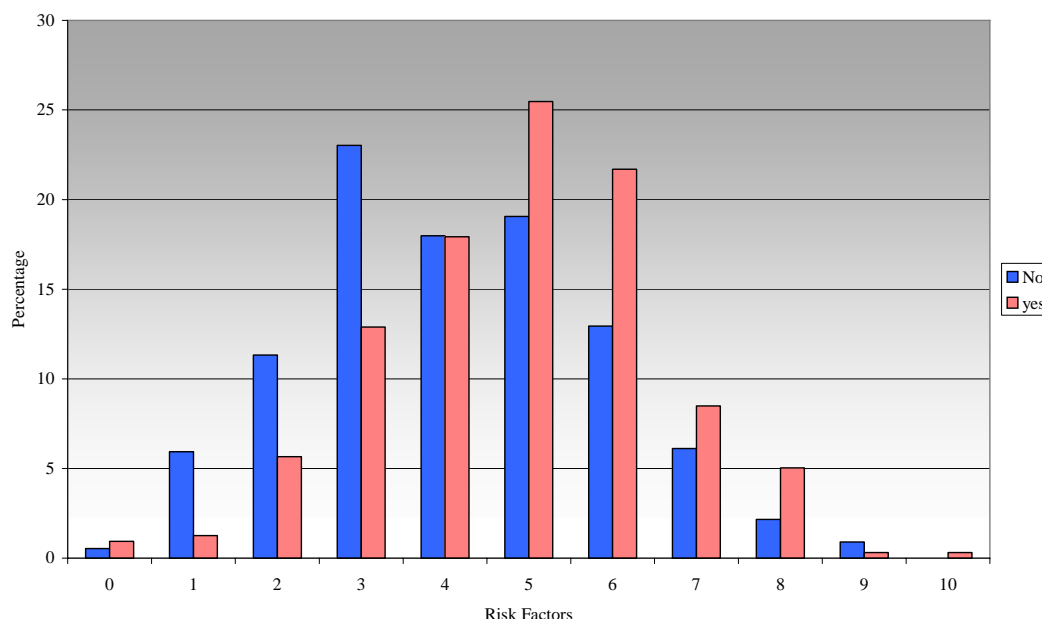
*Figure 7: Fracture Index Score And History Of Fracture*





In order to determine whether the Fracture Index was any more discriminating than a simple count of known risk factors, the same analysis was undertaken to see if there was a significant difference in the number of risk factors per person and whether they had fractured. Analysis showed that as the number of risk factors increased, so too did the proportion of clients who had sustained a fracture ( $p < 0.001$ ). Clients with 5 or more risk factors were significantly more likely to have sustained a fracture. Figure 8 below illustrates this.

Figure 8: Number Of Risk Factors And History Of Fracture



### Treatment After Fracture

Of the 318 respondents who recalled a fracture, 37.4% (n=111) stated they had been referred for an osteoporosis assessment. As seen in Table 5, 44% were referred to their GP and the others were referred to either a medical specialist or an osteoporosis specialist.

Table 5: Referred to Following Fracture

Referred To	Frequency	Percentage
GP	46	44.2%
Medical specialist	41	39.4%
Osteoporosis specialist	32	30.8%
Total	119	100.0%

More than half (54.6%, n = 166) of those who had fractured a bone reported that their doctor had recommended something to reduce their risk of more fractures. Table 6 shows that some clients recalled only one option being recommended, but other had several options recommended to them. Calcium and osteoporosis medications were recommended most frequently both alone and in combination.



Table 6: Recommendations Reported

	Frequency	Percentage
Osteoporosis medication	27	16.3%
Calcium	26	15.7%
Calcium and Osteoporosis medication	21	12.6%
Calcium, Vitamin D and other osteoporosis medication	16	9.7%
Calcium, Vitamin D, Other osteoporosis medication and exercise	14	8.4%
Calcium and Exercise	10	6.0%
Exercise	8	4.8%
Calcium and Vitamin D	7	4.2%
Vitamin D and osteoporosis medication	4	2.4%
Vitamin D supplements	2	1.2%
Other	31	18.6%
<b>Total</b>	<b>166</b>	<b>100.0%</b>

## Interview Results

### *Risk Factors*

Table 7 shows the percentage of interviewees who had risk factors for osteoporosis/fracture. The mean number of risk factors per client was 5.9. Two thirds of the interview participants had lost height since they were younger. The mean height loss was found to be 4.7 cm but ranged up to 13cm. Nearly half (48%) reported noticing a change in their back (becoming more rounded) and the majority of interviewees (72%) reported some back pain. When asked to specify where their pain was – 73% reported lower back pain, 15% reported generalised back pain and 10% reported pain in the middle of their back.

Table 7: Risk Factors Reported

Risk Factor	Percentage with Risk Factor
Shorter than height in youth	64.0%
Back pain	72.0%
Rounded back	48.0%
Menopause <45 Year (females only)	35.2%
Family history of osteoporosis	16.0%
No exercise	44.0%
Less than 3 serves of dairy	59.6%
No sun exposure per day	18.2%

### *Fracture History*

The majority of the interviewees had fractured a bone either once (37%), twice (26%) or three times (17%) during their life time. A small number had fractured more frequently and 7% were unsure as to the number of times they had fractured.



The mean age of the interviewees when they first fractured a bone was 58.2 years (sd = 26). One fifth (20%) of the interviewees were under the age of 50 when they first broke a bone.

The number of bones broken in the most recent episode of fracture is summarised in Table 8. Two-thirds of the interviewees broke only one bone during their last episode of fracture however, 10% broke three or more. Three quarters (76%) of the interviewees most recent fractures occurred more than 12 months ago. If the fracture was more than 12 months ago, the average time since interviewees last broke a bone is 5.7 years (sd = 4.8).

Table 8: Number Of Bones Broken

Number of Bones Broken	Number of Individuals	Percentage
One	47	69.1%
Two	11	16.2%
Three	7	10.3%
Four	0	0.0%
Five	1	1.5%
Six	2	2.9%
<b>Total</b>	<b>68</b>	<b>100.0%</b>

Table 9 shows the site of the fractures of the interviewees. As with the mail survey results, the most commonly fractured sites were wrist, ankle and hip.

Table 9: Site Of Fracture

	Number of Interviewees	Percentage of Interviewees
Wrist	41	41.0%
Ankle	23	23.0%
Hip	21	21.0%
Humerus	13	13.0%
Spine	11	11.0%
Rib	8	8.0%
Pelvis	8	8.0%
Foot	7	7.0%
Leg	7	7.0%
Hand	5	5.0%
Shoulder	4	4.0%
Knee	3	3.0%
Elbow	3	3.0%
Collar bone	1	1.0%
Sternum	1	1.0%
Other	1	1.0%
<b>Total</b>	<b>157</b>	<b>100.0%</b>



Almost all of the interviewees (91.7%) reported that their most recent fracture was caused by falling and all but five of those reported the fall being from standing height. Just under a quarter, 23%, of the interviewees who fractured during a fall stated they had a falls assessment. Table 10 shows where and when the assessment took place.

Table 10: Falls Assessment

		Number	Percentage
Where was the assessment?	Home	14	60.9%
	Hospital	6	26.1%
	Fall clinic	0	0.0%
	Unknown	3	13.0%
	<b>Total</b>	<b>23</b>	<b>100.0%</b>
When was the assessment?	Before fracture	5	21.7%
	As a result of fracture	11	47.8%
	Unrelated	4	17.4%
	Unsure	3	13.0%
	<b>Total</b>	<b>23</b>	<b>100.0%</b>

Table 11 shows what was assessed during the falls assessment. Almost all of the clients undertaking a falls assessment had their home assessed and many had their physical ability assessed, but fewer than half of the interviewees had a medical or medication review.

Table 11: What was assessed?

	Number	Percentage
Client's physical ability	17	73.9%
Client's home	21	91.3%
Medication review	10	43.5%
Medical review	8	34.8%

### **Treatment After Fracture**

More than half of the interviewees (58.1%) said that their fracture had been diagnosed at a hospital emergency department. One third (31.2%) reported that their GP had diagnosed their fracture and the remaining were unsure (6.5%) or in hospital when it happened (3.2%).

Almost all, 91.7%, of interviewees had an X-ray for the fracture and 41.1% had surgery for the fracture.

As recorded in Table 12, most of the interviewees reported that treatment for their fracture was in the emergency department or they had been admitted to hospital following their most recent fracture. Almost a quarter, 22.6%, had been treated by their GP.



Table 12: Where Fracture was Treated

	Number	Percentage
Emergency department	31	33.3%
Admitted to hospital	38	40.9%
General practitioner	21	22.6%
No-one	0	.0%
other	3	3.2%
<b>Total</b>	<b>93</b>	<b>100.0%</b>

### *Osteoporosis Diagnosis And Treatment*

Sixty five per cent of the interviewees reported having had a BMD test. Two of the interviewees first had a Bone Mineral Density test (BMD) within 6 months of the interview while the remainder had their first BMD more than 12 months prior to the interview. Of those who had their first BMD more than 12 months ago, 52% said that there had been no regular follow up BMD however, just over a quarter, 27%, had a regular annual or bi-annual BMD.

Just over half of interviewees (52%) had an x-ray of the spine specifically looking for fractures of the vertebrae.

Two thirds (63%) of interviewees stated they had osteoporosis. This diagnosis was given to the interviewees by their GP (68.3%) or by the hospital (15%)

### *Osteoporosis Treatment*

Two-thirds (66%) of the interviewees were prescribed some sort of therapy for osteoporosis. The therapy included calcium, vitamin D, calcitriol, alendronate, risedronate, raloxifene, etidronate, calcitonin, oestrogen and injections for osteoporosis. Table 13 shows that 38% of interviewees were prescribed Calcium and 37% were prescribed Alendronate. Additionally 24% of interviewees were prescribed Vitamin D. Other treatments were prescribed to a small number of the interviewees.

Table 13: Number Of Interviewees On Each Type Of Treatment

	Number
Calcium (caltrate, calsup, calvita, sandocal, citracal)	38
Alendronate (Fosamax)	37
Vitamin D (Ostelin, Caltrate + D, cod liver)	24
Risedronate (Actonel)	8
Raloxifene (Evista)	4
Calcitriol (Rocatrol)	2
Injections for osteoporosis (sustanon, APD or pamidronate, zoledronate or zometa)	2
Oestrogen (hormone replacement therapy)	1
Etidronate (Didrocal or Didronel)	0
Calcitonin (calcinar, miacalcic, calcitare, cibacalcin)	0



The 66 interviewees that were prescribed treatment for osteoporosis were asked who had prescribed it and when they were prescribed in relation to their fracture. Table 14 shows that most were prescribed by the interviewees' General Practitioner. Table 15 shows that while the majority of clients who were prescribed calcium and vitamin D had it prescribed either before their fracture or at a time which was unrelated to their fracture, Alendronate, Risendronate and Raloxifene were mainly prescribed as a result of the fracture.

Table 14: Medications Prescribed By

Medication	GP		Specialist		Self		Hospital		Other	
	Number	%	Number	%	Number	%	Number	%	Number	%
Calcium	25	67.5%	4	10.8%	3	8.1%	4	10.8%	1	2.7%
Vitamin D	15	65.2%	3	13.0%	1	4.3%	4	17.4%	0	0.0%
Calcitriol	1	50.0%	1	50.0%	0	0.0%	0	0.0%	0	0.0%
Alendronate	28	75.7%	4	10.8%	0	0.0%	5	13.5%	0	0.0%
Risendronate	6	85.7%	1	14.3%	0	0.0%	0	0.0%	0	0.0%
Raloxifene	2	50.0	2	50.0%	0	0.0%	0	0.0%	0	0.0%
Oestrogen	1	100%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Injections*	1	50.0%	1	50.0%	0	0.0%	0	0.0%	0	0.0%

\* For osteoporosis

Table 15: When Medications Were Commenced

Medication	Before Fracture		As a Result of Fracture		Unrelated		Unsure	
	Number	%	Number	%	Number	%	Number	%
Calcium	15	39.5%	10	26.3%	7	18.4%	6	15.8%
Vitamin D	2	9.1%	8	36.4%	9	40.9%	3	13.6%
Calcitriol	2	100%	0	0.0%	0	0.0%	0	0.0%
Alendronate	5	13.5%	18	48.6%	11	29.7%	3	8.1%
Risendronate	0	0.0%	4	50.0%	4	50.0%	0	0.0%
Raloxifene	1	25.0%	3	75.0%	0	0.0%	0	0.0%
Oestrogen	0	0.0%	0	0.0%	1	100%	0	0.0%
Injections*	0	0.0%	0	0.0%	2	100%	0	0.0%

\* For osteoporosis

The combinations of therapy prescribed for the interviewees were compared to treatment pathways for the treatment of minimal trauma fractures developed and used at the tertiary hospital [11].

The protocol for the management of minimal trauma fractures (not including vertebral fractures) include calcium and vitamin D medications plus prescription of a bisphosphonate. Of the interviewees who a non-vertebral fracture, five out of 91 were on the treatments recommended by the guidelines. More interviewees were on partial treatments recommended by the guidelines with 19 prescribed calcium and a bisphosphonate but not vitamin D.



The guidelines for individuals with vertebral fractures are the same as for non-vertebral fractures, but include raloxifene as an alternative option to bisphosphonate. Five of the nine reporting a vertebral fracture were taking both calcium and either a bisphosphonate or raloxifene without vitamin D.

### ***Osteoporosis Knowledge***

The interviews also investigated the home care clients knowledge of osteoporosis. The following is a summary of the results of these questions.

*“Cause of Fractures”*: Just over a quarter (27%) of the interviewees stated that fractures were caused by osteoporosis/thinning of the bones/brittle bones. One fifth, 22%, stated that falls were the cause and a number stated that falls and osteoporosis were the cause of fractures. Fewer (16%) interviewees stated that difficulties in mobility and/or balance were the cause while 14% stated lack of concentration. Another 14% stated that fractures were caused by lack of calcium. Fifteen per cent of interviewees stated they did not know what caused fractures in older people.

*“What Is Osteoporosis”*: Fifty seven per cent of interviewees stated that osteoporosis was thinning or weakening of the bones and 20% stated that it had something to do with the bones. A small number, 9% stated that osteoporosis was loss of calcium and 15% of interviewees were unsure.

*“What Causes Osteoporosis”*: Thirty-one per cent of interviewees stated that osteoporosis was caused by lack of calcium and a further 22% stated that poor diet was the cause. Nineteen per cent of interviewees stated that ageing caused osteoporosis. Small numbers of interviewees stated that lack of exercise or genetics were the cause. Almost a third, 31% of interviewees did not know what causes osteoporosis.

*“What Can You Do To Prevent Osteoporosis”*: Almost a third (30%) of interviewees stated that calcium intake can prevent osteoporosis and 11% stated that dairy was important. Nine per cent stated that medication can be a preventative measure for osteoporosis. Eighteen per cent of interviewees said that diet was important and 27% stated that exercise can prevent osteoporosis. One third (35%) of interviewees did not know what could be done to prevent osteoporosis.

*“Place Of Advice”*: The largest group of interviewees (n=22) got advice as to how to prevent osteoporosis from the media or promotions for osteoporosis. Seventeen per cent stated they got their advice from their GP. A small percentage of clients (15%) reported that their advice was due to themselves or general knowledge or from a specialist (3%). A large proportion of these clients did not receive any advice (29%).

### **General Practitioner Notes Audits**

With permission from both the clients and their GPs, the notes of just over a quarter (n=26) of all of the clients interviewed were audited. All of the GPs approached agreed to take part in the research. The clients were patients of 16 GP practices.



Table 16 shows the results of the audit. Most of the audited notes, apart from four, noted at least one fracture. Half of the audited notes contained evidence of a BMD test at some time in the past, but only 8 of the notes showed that the treatment protocols were followed. Although 17 of the interviewees had a diagnosis of osteoporosis recorded, there was little evidence of prevention/harm reduction information being provided. Only two clients' notes showing that any lifestyle advice had been given in relation to falls prevention, smoking, alcohol use, physical activity and information from Osteoporosis Australia.

There were differences in the information provided by the clients at the interview and what was recorded on the GPs' notes. These differences were regarding evidence of a fracture, BMD test, diagnosis of osteoporosis and medications.

Table 16: GP Notes Audit

	Yes	No
Evidence of fracture	22	4
Evidence of assessment of fracture risk	9	17
Record of BMD Test	13	13
Diagnosis of osteoporosis	19	7
BMD protocol followed as per guidelines	8	18
Record of blood tests to exclude conditions other than osteoporosis	10	16
Medications recorded as described by client	15	11
Medications as per guidelines	10	16
Indication of lifestyle advice given	2	24

## DISCUSSION

The results of this research show that home care clients are at high risk of osteoporosis and subsequent fracture. A third has a history of fracture and almost all of the home care clients who responded to the survey have multiple risk factors known to be highly associated with osteoporosis and fracture. The group of individuals investigated in this research are aged and are receiving home care services from Silver Chain because they have an ongoing functional dependency that makes them eligible for services. According to the Australian Institute of Health and Welfare, these functional dependencies increase the risk that these individuals will be housebound, have difficulty in walking and may have dietary inadequacies which can lead to the increased likelihood of the presence of osteoporosis risk factors [1].

This is supported by these results which show that more than two thirds of this client group have insufficient calcium in their diet and almost a third have no exposure to the sun, therefore increasing their risk of vitamin D deficiency. Additionally, forty percent are unable to stand without using their hands, are sedentary and undertake no exercise on a regular basis. As suggested in the AIHW report mentioned above each of these risk factors for osteoporosis are modifiable and changes in these areas of functioning could reduce the risk of fracture [1].

Only a small percentage of home care clients smoked and drank excessive amounts of alcohol, but there was a gender difference in relation to these risk factors in that males were more likely to undertake these behaviours than females. Female and older clients were more likely to report a family history of osteoporosis and have no daily sun exposure.



Additionally, home care clients who had a history of fracture were more likely than others to be unable to stand without using their hands, have a family history of osteoporosis and a history of corticosteroid use.

Despite the difference in the types of risk factors recorded by gender, age and fracture history, the results show that almost all of the home care clients have multiple risk factors. While the risk for fracture associated with all of the factors mentioned are well documented [2, 3, 6], little is known about how the risk factors work in combination. Whether or not combinations of risk factors can be used to assess fracture likelihood is not well understood [8]. Nevertheless, the identification of whether individuals have significant risk factors for fracture and osteoporosis is a valuable method for case finding and can assist individuals to be able to understand their own potential risk of fracture and adjust their lifestyle and behaviour accordingly.

The Fracture Index [13] was developed as such a strategy. The results of this survey, in which questions from the Fracture Index were included, show that the tool may be reasonable in identifying individuals at high risk of fracture. Individuals with a higher Fracture Index score were more likely to have sustained a previous fracture. However, a simple count of known risk factors is also useful in discriminating individuals who have fractured and those who have not.

More than a third of the home care clients surveyed in this research stated that they had sustained a fracture in later life. The majority of the clients had fractured one or two bones and older clients were more likely to have fractured than younger clients and females were more likely to have fractured than males.

Twenty two percent of males reported a fracture which is similar to other research investigating fractures in males [14]. The site of the fracture was not significantly different for males and females. Although a larger percentage of females fractured their hip, wrist, spine, humerus and ankle, more males fractured their ribs. Age was associated with type of fracture with clients over 80 being more likely to have sustained a fractured wrist.

It was surprising that the most commonly broken bone amongst the survey respondents was the wrist rather than the hip which was the second most common site of fracture. Other research has found that hip and vertebral fractures are more frequent than wrist fractures [15] in older Australians generally. A possible explanation for this may be a sample bias as home care clients who have sustained a hip fracture are more likely to have moved into residential care. A significant proportion of individuals who sustain a hip fracture may be so functionally impaired as a result that they can no longer live independently and therefore move out of their home into a residential facility. It is estimated that approximately 25% of individuals who sustain a hip fracture are admitted into a residential aged care facility permanently [1]. In addition, hip fracture is associated with a high level of mortality. It is estimated that up to 30% of individuals who sustain a hip fracture die within 12 months [16]. Consequently, this group of older people requiring home care may have a smaller number of hip fractures as those that have sustained them are either deceased or in residential care.



Vertebral fractures can occur without symptoms and go undetected in up to 75% of cases [3] and are highly associated with height loss, a rounded back and back pain. More than half of the survey population reported one or more of these markers, but very few reported a fracture of the vertebrae. Despite more than half of the interviewees having had an x-ray specifically looking for fractures of the vertebrae the results show that, consistent with other research [3], the incidence of vertebral fractures may be under estimated. In relation to these markers of vertebral fractures, males were less likely to report having a rounded back, back pain or reduced height and they reported fracture of the vertebrae less frequently than females.

Overall, just under half of the females had at some point, had a Bone Mineral Density test, but few men had. Even males who had sustained a fracture were much less likely to have had a BMD than females. However, while females with a history of fracture were more likely than males to have had a test, just over half could recall having one. The gender bias associated with BMD testing is also apparent in relation to a diagnosis of osteoporosis. While just over a third of females had a diagnosis of osteoporosis, only eleven percent of men had. The percentage of males who had sustained a fracture and had a diagnosis of osteoporosis was twenty percent, while over half of the females who have had a fracture were diagnosed as having osteoporosis. Interestingly, although older individuals were found to be more likely to have a diagnosis of osteoporosis, those who were younger were more likely to have had a BMD test.

While most of the interviewees were treated for their fracture at a hospital or by their GP (90%), Only two thirds recalled having a BMD and recalled having a diagnosis of osteoporosis. Therefore a large proportion of older people who have one of the most obvious and well documented risk factors for osteoporosis (fracture) are not being identified by health providers as potentially having osteoporosis and are not subsequently being tested or diagnosed.

Audit of the GPs' notes showed that guidelines for the management of osteoporosis [10] were not being followed in the majority of cases. Although half of the clients had a BMD and 38% had treatment prescribed, the majority did not. There was little evidence to suggest that future fracture risk had been assessed or advice given regarding fracture prevention strategies such as changes in lifestyle. Assessment of osteoporosis risk factors for prevention of osteoporosis are suggested as part of the Enhanced Primary Care (EPC) Assessment for older people [17]. Although the audit did not specifically look for evidence of an EPC assessment, the small number of clients who had a risk assessment would seem to indicate that either the EPC assessments are not being undertaken by the GPs or they are not generally including an osteoporosis risk assessment. GP visits provide an opportunity to identify clients at risk of fracture and provide information to prevent or reduce bone loss to reduce the risk of fracture [1]; unfortunately the opportunity seems to have been missed.

Despite being at risk of osteoporosis, just under half of the survey respondents and two thirds of the interview group who had a history of fracture were on any osteoporosis therapy to reduce the risk of further fractures. Few were on the treatment as recommended by the treatment pathway guidelines, though many of the group were on partial treatment. The audit of GP notes indicated that for only eight of the 26 clients, the treatment prescribed for osteoporosis was as the protocols recommended. In describing their own treatment, only six of the entire interview group were found to have been prescribed medication and taking the appropriate medication.



Overall, this research has shown that 99% of home care clients have risk factors associated with osteoporosis and 37% have already sustained fractures. Although some clients have had osteoporosis investigations and are being treated to reduce the risk of fracture, the majority certainly are not. It appears that this group of home care clients do not regularly have their fracture risk assessed and having had a fracture does not influence the likelihood of being tested, diagnosed or treated for osteoporosis.

There are a number of possible reasons for the lack of testing, diagnosis and treatment of osteoporosis. Home care clients are quite often frail, have multiple health problems and are likely to visit their GP more than the well aged. It is possible that other health needs take priority when visiting their GP and for various reasons osteoporosis is untreated, acknowledged but ignored or just ignored. By including fracture risk assessment in the clients' annual EPC assessment, this issue could be overcome quite simply. It could also be that GPs and clients are not aware of current treatment/prevention options for osteoporosis. While awareness of the risk of osteoporosis in women is generally good, this is not so for men [14]. Although the clients interviewed on the whole had a good understanding of osteoporosis and its consequences, 31% were unaware of what osteoporosis is and 35% were unsure as to what could be done to prevent it or reduce the harm associated with it.

Ageist attitudes of both GPs and older people themselves may also contribute to the lack of assessment and treatment of osteoporosis. As osteoporosis prevalence increases with age, it may be seen as a disease of older people and essentially as a normal part of ageing. Osteoporosis itself is rarely recorded as the underlying cause of death with only 180 deaths attributed to osteoporosis in 2003 [1]. As a result, it is possible that due to osteoporosis being a disease of the old, and the perception that it is not likely to result directly in the death of a patient, GPs may feel that it is a disease that requires little investigation or treatment. Clients themselves may feel that they can expect to become frailer as they age and not seek any preventative measures or treatment.

### **Limitations Of The Research**

This research has two significant limitations. The survey, while investigating the treatment and medications used by home care clients who had sustained a fracture, did not investigate treatment and medications used by clients who may have been diagnosed with osteoporosis but had not sustained a fracture. This limitation prevents us from having an accurate picture of the treatment of osteoporosis and prevention of fracture of home care clients. By not including those clients who may well be being successfully treated for osteoporosis and taking measures to reduce their risk of fracture, we may be overstating the deficiency. However, the contrary is also possible and we may be under-estimating the problem.

A second limitation of the research is the reliance on the accurate recall of older home care clients. While the audits of the GPs' notes was designed to address this issue in part, it was difficult to ascertain whether discrepancies between what was described by the client and recorded on the client's GP record was attributed to the client's unreliable recollections or incomplete GP notes. Treatment for osteoporosis and fracture could also have been provided by other health providers and not included in the client's GP records.



## **Future Directions**

This research has shown that there are some clear pathways that Silver Chain can take in order to assist in ensuring that our clients are informed about their risk of osteoporosis and fracture as well as providing them with the knowledge of what to do should they be at risk. The possibility of using a tool such as the Fracture Index will be explored with Silver Chain's operational managers. Silver Chain clients could complete the tool themselves and be provided with information about osteoporosis and fracture as well as about what to do if they are at risk of fracture. One of the key objectives of the National Plan for Osteoporosis [3] is to promote self-management to optimise health outcomes for people with osteoporosis. Assisting home care clients to assess their risk of osteoporosis and providing them with information regarding osteoporosis is one way of meeting this objective as well as improving on the clients' level of knowledge of osteoporosis.

Silver Chain will work with the GP Divisions to inform them of the research findings and the outcomes of the research. GPs will be made aware of how Silver Chain is assisting our clients to assess their risk and be ready to refer clients for diagnosis, treatment and discuss prevention strategies.

Further research is also needed to increase our knowledge regarding older home care clients and the effects of osteoporosis. While treatment of clients who had sustained a fracture was investigated in this research, osteoporosis treatment of clients who had not sustained a fracture but may have osteoporosis was not. It may be that this group of home care clients had experienced best practice treatment of fracture risk and osteoporosis which resulted in the prevention of fracture. Using data linkage, the clients involved in this study could be linked to hospital morbidity data, residential aged care data and Medicare data in order to obtain a complete health picture of both the clients who have already fractured and those that currently have not. This will also assist us in overcoming the problems associated with the potentially inaccurate recall of clients or missing information from GPs' notes.

## **CONCLUSION**

The home care clients surveyed in this research have many of the risk factors associated with osteoporosis and fracture and a large number have already sustained fractures that can be attributed to osteoporosis. Despite this, few have been assessed or treated for osteoporosis and very few have been advised as to prevention or reduction in risk of fracture.

Due to the costs associated with fracture, both monetary and human, it is essential that both clients and their primary health care providers ensure that as much is done as possible to prevent and reduce the risk of fracture associated with osteoporosis. As a large home care provider Silver Chain is in the position to assist our clients to understand their risks of fracture and to help educate them regarding what they can do for themselves and support them in seeking assessment, diagnosis and treatment from their health care providers.

As an organisation Silver Chain can also work collaboratively with GPs and other health providers to assist them in understanding the importance of fracture risk assessment of their older clients.



## REFERENCES

1. Australian Institute of Health and Welfare. Arthritis and musculoskeletal conditions in Australia, 2005. Canberra: AIHW; 2005. Report No.: AIHW Cat. No. PHE67.
2. Access Economics. The Burden of Brittle Bones: Costing Osteoporosis in Australia. Canberra: Access Economics for Osteoporosis Australia; 2001.
3. National Arthritis and Musculoskeletal Conditions Advisory Group. Evidence to Support the National Action Plan for Osteoarthritis, Rheumatoid Arthritis and Osteoporosis: Opportunities to Improve Health-Related Quality of Life and Reduce the Burden of Disease and Disability. Canberra: Australian Government Department of Health and Ageing; 2004.
4. Scaf-Klomp W, van Sonderen E, Sanderman R, Ormel J, Kempen G. Recovery of Physical Function After Limb Injuries in Independent Older People Living at Home. *Age and Ageing* 2001;30:213-219.
5. Nguyen T, Center J, Eisman J. Osteoporosis: Underrated, Underdiagnosed and Undertreated. *Medical Journal of Australia* 2004;180(S18-S22).
6. Sambrook P, Seeman E, Phillips S, Ebeling PR. Preventing osteoporosis: Outcomes of the Australian Fracture Prevention Summit. *Medical Journal of Australia* 2002;176:S1-S16.
7. Lin J, Lane J. Osteoporosis: A Review. *Clinical Orthopaedics and Related Research* 2004;425(126-134).
8. Kanis J, Borgstrom F, De Laet C, Johansson H, Johnell O, Jonsson B, et al. Assessment of Fracture Risk. *Osteoporosis International* 2005;16:581-589.
9. Wong P, Spencer D, McElduff P, Manolios N, Larcos G, Howe G. Secondary screening for osteoporosis in patients admitted with minimal-trauma fracture to a major teaching hospital. *Internal Medicine Journal* 2003;33(11):505-510.
10. O'Neil S, MacLennan A, Bass S, Diamond T, Ebeling P, Findlay D, et al. Guidelines for the Management of postmenopausal osteoporosis for GPs. *Australian Family Physician* 2004;33(11):910-917.
11. Department of Rehabilitation and Aged Care. Protocol For The Management of Patients Following a Minimal Trauma Fracture: Sir Charles Gairdner Hospital; 2005.
12. Inderjeeth C, Glennon D, Petta A. A study of Osteoporosis Awareness, Investigation and Treatment of Patients Discharged from a Tertiary Public Teaching Hospital. Under consideration with *Internal Medicine Journal*.
13. Black DM, Steinbuch M, Palermo L, Dargent-Molina P, Lindsay R, Hoseyni MS, et al. An Assessment Tool for predicting fracture risk in postmenopausal women. *Osteoporosis International* 2001;12:519 - 528.
14. Seeman E. Invest in your bones: Osteoporosis in Men. The "Silent epidemic" strikes men too. Melbourne: International Osteoporosis Foundation; 2004.
15. Sanders K, Seeman E, Ugoni A, Pasco J, Martin T, Skoric B, et al. Age and Gender Specific Rate of Fractures in Australia: A Population-Based Study. *Osteoporosis International* 1999;10:240-247.
16. Woolf A, Pfleger B. Burden of major musculoskeletal conditions. *Bulletin of the World Health Organization* 2003;81(9):646-656.
17. Royal Australian College of General Practitioners. Standards & guidelines for the Enhanced Primary Care Medicare Benefits Schedule items. Melbourne: RACGP; 2000.