

Research Symposium– Thursday 8 November 2012

# North West Adelaide Health Study - Musculoskeletal

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# Introduction

- Musculoskeletal pain significant in the population
- Limited cross-sectional and longitudinal data from cohort studies
- Opportunity for factors to be examined in detail

# Musculoskeletal data

## Stage 2

- Have you ever had pain, aching, stiffness on most days for more than a month in the:
  - Feet
  - Hands
  - Back
  - Knees
  - Hips
  - Shoulders



# Musculoskeletal data

- Have you ever been told by a doctor that you have:
  - Arthritis
  - Osteoporosis
- Fracture as a result of fall from standing height
- Shoulder range of movement, grip strength, hand photos
- DXA scans



# Musculoskeletal data

## Stage 3

- Have you had pain, aching, stiffness on most days for at least a month in the:
  - Feet
  - Hands
  - Back
  - Knees
  - Hips
  - Shoulders



# Musculoskeletal data

- Grip strength
- Have you ever been told by a doctor that you have:
  - Arthritis
  - Osteoporosis
  - Gout



## Results - Prevalence Stage 2

	Prevalence (%)	(95% CI)
Back	34.9	(33.3-36.5)
Shoulder	22.3	(20.9-23.7)
Knee	16.0	(14.8-17.3)
Foot	15.0	(13.8-16.2)
Hand	13.7	(12.6-14.9)
Hip	9.5	(8.6-10.5)



# Results - Hands

- Hand pain in Stage 2 associated with:
  - Females
  - Older age
  - Lower education level\*
  - Sedentary\*
  - Obesity\*
  - Diabetes\*
  - Shoulder, hip, knee, foot†

\*adjusted for age and sex; †adjusted for age, sex, BMI  
Cole et al; Scand J Rheum, 2011





# Results - Hands

- Grip strength assessment
- Higher grip strength associated with higher BMI in those under 30 years and over 70 years
- Inversely related to BMI between these ages
- Grip strength values lower than international convenience samples



# Results - Feet

- Foot pain in Stage 2 associated with:
  - Females
  - Older age
  - Obesity\*
  - Hip\*
  - Knee\*
  - Back\*

\*adjusted for age and sex

Hill et al; J Foot Ankle Res, 2008



## Results - Feet

- Use of podiatry services examined
- Overall, 9.5% of the total sample and 17.7% of those who reported foot pain had attended a podiatrist in the past year
- Accessed podiatry treatment more likely to be female, aged over 45 years, obese, and have major chronic medical conditions (osteoporosis, arthritis, diabetes, cardiovascular disease and high blood pressure)
- Those who reported foot pain but had not accessed a podiatrist were more likely to be male and be aged 20 to 34 years



# Results - Feet

- Explore age and gender differences in the proportion of people with disabling foot pain using three different case definitions of the Manchester Foot Pain and Disability Index (MFPDI)
- A random sample of 223 participants aged 27 to 90 years (88 males and 135 females)
- The proportion of people with disabling foot pain according to each definition was as follows: Definition A (100%), Definition B (95.1%) and Definition C (77.6%)



# Results - Feet

- Age significantly affected both the pain intensity and functional limitation items, with younger people more likely to report their foot pain being worse in the morning, and older people more likely to report functional limitations
- Women were more likely report functional limitations than men



# Results - Shoulder

- Shoulder pain in Stage 2 associated with:
  - Females
  - Older age
  - Lower education level\*
  - Obesity\*
  - Smoking\*
  - Sedentary\*

\*adjusted for age and sex

Hill et al; Int J Rheum Dis, 2010



## Results - Shoulder

- Those with diabetes had higher prevalence of shoulder pain/stiffness (27.39% vs. 21.3%,  $p=0.025$ )
- After adjustment for age, sex, obesity, smoking prevalence was not significantly different
- Range of movement significantly reduced in those with diabetes



# Results - Shoulder

- Validation of the Shoulder Pain and Disability Index (SPADI) in a population sample using principal components factor analysis
- The internal consistency of the SPADI subscales were high (Cronbach's alpha > 0.92)
- Two factors, explaining 61.4% of the total variance were extracted - disability and pain





# Results - Shoulder

- There was a strong negative correlation between SPADI disability subscale scores and shoulder range of motion
- SPADI disability, but not pain, subscale scores were correlated with age



## Results - Shoulder

- Examined leisure time physical activity and shoulder pain
- Of the 1502 working participants, 16% reported having current shoulder pain
- Shoulder pain associated with older age (OR 1.98, 95% CI: 1.31–2.99), smoking (OR 1.44, CI: 1.02–2.04), secondary-level educational attainment (OR 1.68, 95% CI: 1.07–2.65), high BMI (OR 1.54, 95% CI: 1.14–2.08) and depression (OR 2.42, 95% CI: 1.60–3.64)
- Lack of association between leisure time physical activity and occupational shoulder pain



# Results - Shoulder

- Shoulder pain in Stage 2 and 3
  - 11.5% (95% CI 9.8-13.4)
- Associated with Stage 2 variables:
  - Current smoking
  - Depressive symptoms
  - Shoulder flexion and abduction
  - Knee pain
  - Hip pain
  - Back pain
  - Hand pain

\*Multivariate analysis adjusted for age, sex, BMI



# Results - Osteoporosis

- Self reported osteoporosis 50 years and over (Stage 2)
  - 8.8% (95% CI 7.2-10.3)

**Table 1: Prevalence of dual energy X-ray absorptiometry (DXA)-diagnosed osteoporosis and osteopenia in patients aged  $\geq 50$  years**

	n	% (95% CI)
Normal DXA scan	867	81.3 (79.1-83.4)
Osteopenic (-1.0 > T-score > -2.5)	161	15.1 (13.2-17.1)
Osteoporosis (T-score $\leq$ -2.5)	38	3.6 (2.6-4.9)
Total	1066	100.0



# Results - Osteoporosis

**Table 2: Self-reported versus dual energy X-ray absorptiometry (DXA)-diagnosed osteoporosis and osteopenia in patients aged  $\geq 50$  years**

	No/don't know		Self reported osteoporosis	
	n	% (95% CI)	n	% (95% CI)
Normal DXA scan	825	84.8 (82.5-86.8)	49	52.9 (43.4-62.1)
Osteopenic ( $-1.0 > \text{T-score} > -2.5$ )	120	12.4 (10.6-14.4)	35	38.1 (29.1-48.6)
Osteoporosis ( $\text{T-score} \leq -2.5$ )	28	2.9 (2.0-4.1)	8	9.0 (5.0-15.7)
Total	973	100.0	93	100.0



## Results – Prevalence Stage 3

- Stage 3, 74% had pain in at least one of hand, foot, shoulder, knee, hip, back

Table 3: Number of areas of musculoskeletal pain

Number of areas	n	% (95% CI)
No pain/don't know	645	26.0 (24.3-27.7)
One joint	563	22.6 (21.0-24.3)
Two joints	461	18.5 (17.1-20.1)
Three joints	375	15.1 (13.7-16.6)
More than three joints	441	17.1 (16.3-19.3)
<b>Total</b>	<b>2484</b>	<b>100.0</b>



## Results – Vitamin D

- 21.9% (95%CI 20.3-23.6) classified as vitamin D insufficient, 0.9% (95% CI 0.6-1.3)
- No significant difference between those with joint pain and those without in terms of vitamin D levels
- Higher the number of areas of pain, the higher the proportion classified as deficient or insufficient

Table 4: Proportion classified as deficient/insufficient by number of areas of pain

	No pain/ don't know (%)	One joint (%)	Two joints (%)	Three joints (%)	Four or more joints (%)
<b>Deficient/ Insufficient</b>	<b>20.6</b>	<b>21.3</b>	<b>24.5</b>	<b>24.8</b>	<b>24.1</b>
Sufficient	79.4	78.7	75.5	75.2	75.9



## Results – Vitamin D

- Unadjusted odds ratios, vitamin D insufficiency associated with hand pain (OR 1.35; 95%CI 1.09-1.66,  $p=0.005$ ) and back pain (OR 1.22; 95%CI 1.01-1.49,  $p=0.044$ )
- Association remained only for hand pain when adjusted by age, sex, season (OR 1.32; 95%CI 1.06-1.65,  $p=0.013$ )





# Conclusion

- First cross-sectional and longitudinal data of specific joint symptoms in an Australian population study



# Future

- Test-retest Stage 2 and Stage 3 musculoskeletal questions
- Longitudinal analysis of hip, knee, hand, foot, back pain
- Analysis of gout and associated factors
- Analysis with inflammatory markers, serum urate, other blood test markers



# Publications

1. Gill TK, Taylor AW, Hill CL, Phillips PJ (2012): Osteoporosis in the community – Sensitivity of self report estimates and medication use of those diagnosed with the condition. *Bone and Joint Research*. 1:93-98.  
<http://www.bjr.boneandjoint.org.uk/content/1/5/93.full>
2. Menz HB, Gill TK, Taylor AW, Hill CL (2011): Age and sex differences in disabling foot pain prevalence using different definitions of the Manchester Foot Pain and Disability Index. *BMC Musculoskeletal Disorders*. 12:243.
3. Massy-Westropp N, Gill TK, Taylor AW, Bohannon R, Hill CL (2011): Hand Grip Strength: age and gender stratified normative data in a population-based study. *BMC Research Notes*. 4:127.
4. Hill CL, Lester S, Taylor AW, Shanahan EM, Gill TK (2011): Factor structure and validity of the Shoulder Pain and Disability Index in a population-based study of people with shoulder symptoms. *BMC Musculoskeletal Disorders*. 12:8 doi:10.1186/1471-2474-12-8.
5. Cole A, Gill TK, Taylor AW, Hill CL (2011): Prevalence and associations of hand pain in the community: results from a population based cohort study. *Scandinavian Journal of Rheumatology*. 40:145-9. Epub 2010 Oct 15
6. Hill CL, Gill TK, Shanahan EM, Taylor AW (2010): Prevalence and correlates of shoulder pain and stiffness in a population-based study: the North West Adelaide Health Study. *International Journal of Rheumatic Diseases*. 13:215-22
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8. Hill C, Gill TK, Appleton S, Cleland LG, Taylor AW, Adams RJ (2009): The use of fish oil in the community: results of a population-based cohort study. *Rheumatology*. 48:441-2. Epub 2009 Jan 27
9. Cole A, Gill TK, Shanahan EM, Phillips P, Taylor AW, Hill CL (2009): Is diabetes associated with shoulder pain or stiffness? Results from a population based study. *Journal of Rheumatology*. 36:371-7.
10. Menz HB, Gill TK, Taylor AW, Hill CL (2008): Predictors of podiatry utilisation in Australia: the North West Adelaide Health Study. *Journal of Foot and Ankle Research*. 1:8.
11. Hill CL, Gill TK, Menz HB, Taylor AW (2008): Prevalence and correlates of foot pain in Australia: the North West Adelaide Health Study. *Journal of Foot and Ankle Research*. 1:2.



# Contact details

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- North West Adelaide Health Study website

<http://www.nwadelaidhealthstudy.org>

- Population Research & Outcome Studies Unit  
(The University of Adelaide)

<http://health.adelaide.edu.au/pros/data/nwahs/>

- The Health Observatory (The University of Adelaide)

<http://www.thehealthobservatory.org.au/>