

17<sup>TH</sup> ANNUAL CONFERENCE OF THE  
BRITISH HIV ASSOCIATION (BHIVA)

British HIV Association  
**BHIVA**

**Dr Andrew Scourfield**  
Chelsea and Westminster Hospital, London

6-8 April 2011, Bournemouth International Centre


**SSAT**  
ST STEPHEN'S AIDS TRUST

**The use of calcaneal stiffness index to screen  
for osteoporosis in HIV-infected individuals**

A Scourfield, L Waters, R Jones, A Jackson, A Hughes,  
B Gazzard and M Nelson

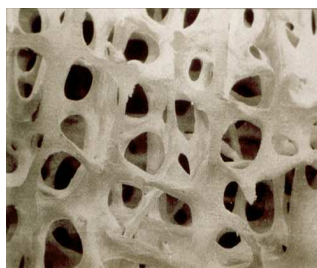
Chelsea and Westminster Hospital, London, UK

Chelsea and Westminster Hospital **NHS**  
NHS Foundation Trust



## Background

- Osteoporosis is characterized by a reduction in bone density and deterioration in the microarchitecture leading to increased risk of fracture



Normal bone



Osteoporosis

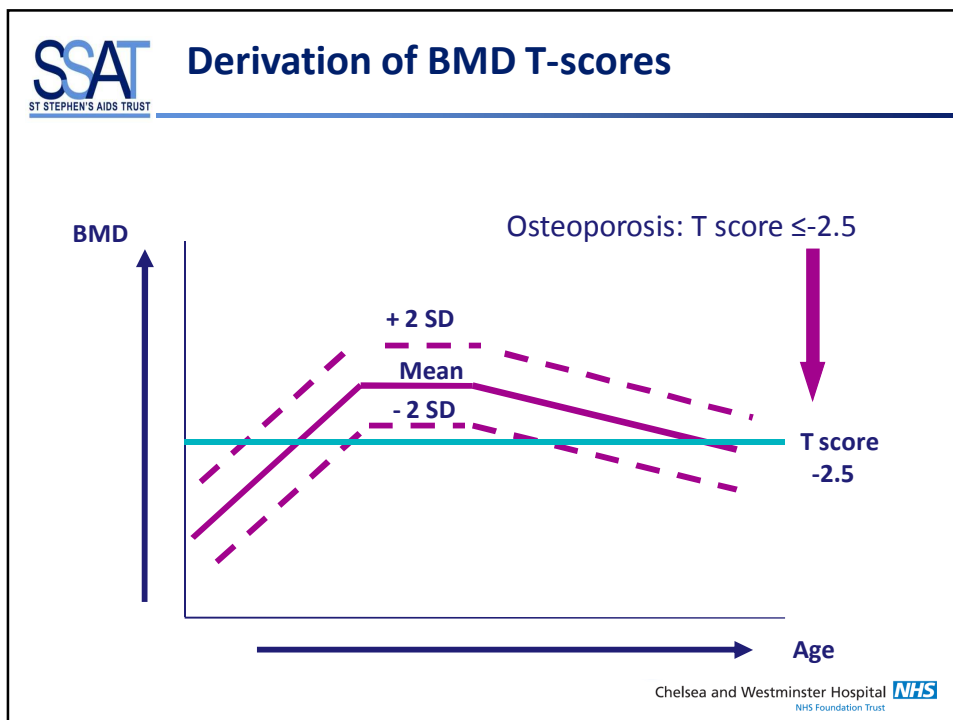
Chelsea and Westminster Hospital **NHS**  
 NHS Foundation Trust

## DEXA is gold standard for BMD measurement in Clinical Practice

### WHO Criteria for Diagnosing Osteoporosis (T-scores)

Normal	-1 and above
Low bone mass (osteopaenia)	-1 to -2.5
Osteoporosis	<-2.5

Chelsea and Westminster Hospital **NHS**  
 NHS Foundation Trust

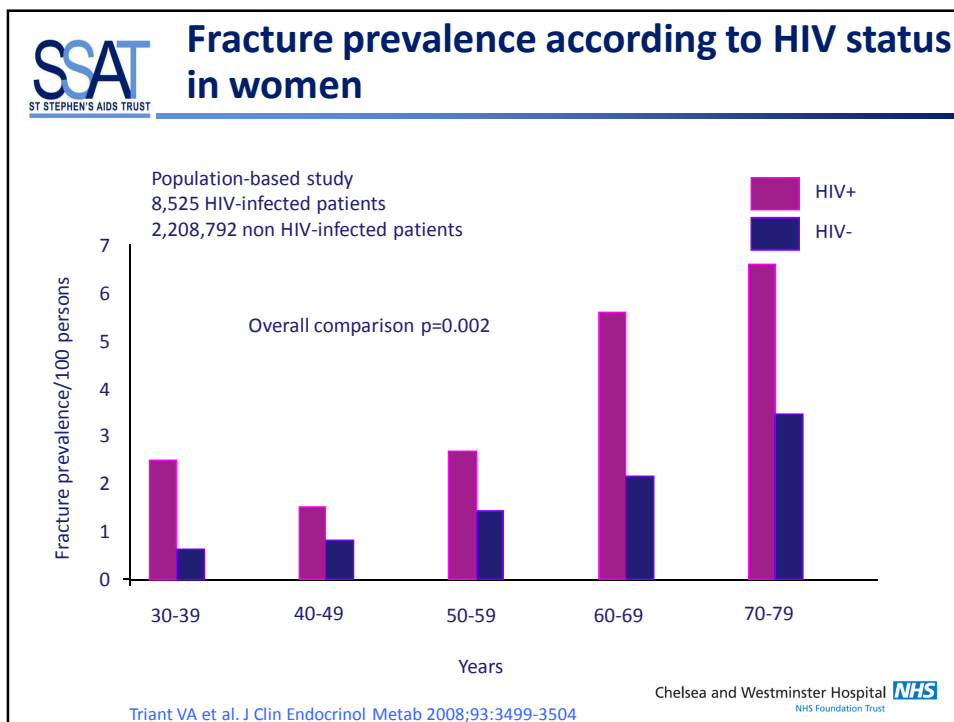
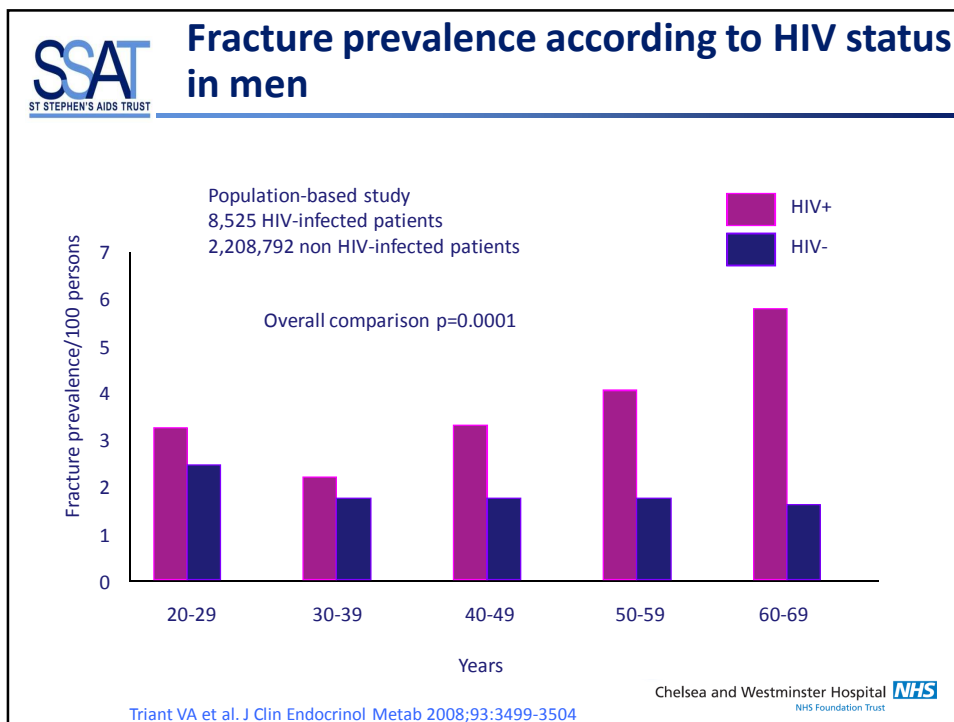


**SSAT** ST STEPHEN'S AIDS TRUST **Meta-analysis of risk of reduced bone mineral density in HIV and controls**

Publication	Number of patients		% ↓ BMD	
	HIV+	HIV-	HIV+	HIV-
Amiel <i>et al</i> 2004	148	81	<b>82.5</b>	35.8
Brown <i>et al</i> 2004	51	22	<b>63</b>	32
Bruera <i>et al</i> 2003	111	31	<b>64.8</b>	13
Dolan <i>et al</i> 2004	84	63	<b>63</b>	35
Huang <i>et al</i> 2002	15	9	<b>66.6</b>	11
Knobel <i>et al</i> 2001	80	100	<b>87.5</b>	30
Loiseau-Peres <i>et al</i> 2002	47	47	<b>68</b>	34
Madeddu <i>et al</i> 2004	172	64	<b>59.3</b>	7.8
Tebas <i>et al</i> 2000	95	17	<b>40</b>	29
Teichman <i>et al</i> 2003	50	50	<b>76</b>	4
Yin <i>et al</i> 2005	31	186	<b>77.4</b>	56

Chelsea and Westminster Hospital **NHS**  
NHS Foundation Trust

Adapted from Brown TT & Qaqish RB. *AIDS* 2006; 20:2165-2174





## Background

- DEXA is the gold standard screening test and proven to correlate with fracture risk
- Disadvantages include
  - Expense
  - Extra patient attendance
  - Radiation safety approval

Chelsea and Westminster Hospital   
NHS Foundation Trust



## Background

- The GE-Achilles Insight uses calcaneal ultrasound to calculate calcaneal stiffness index (CSI) to give an estimated t-score
- Calcaneus ideal site as weight bearing bone
  - Highly trabeculated
- CSI is proven to predict hip fracture risk and vertebral fracture in post-menopausal women
- No data of its use in HIV infected individuals

Chelsea and Westminster Hospital   
NHS Foundation Trust



## GE- Lunar Achilles Insight



Chelsea and Westminster Hospital   
NHS Foundation Trust



## Advantages

- Portable
- Quick to perform (acquisition in 15 seconds)
- Minimal inter-operator variability

Chelsea and Westminster Hospital   
NHS Foundation Trust

## SSAT Aims

ST STEPHEN'S AIDS TRUST

- To determine:
  - Correlation between calcaneal stiffness index and DEXA in an HIV positive population
  - Value as a screening tool for osteoporosis in order to reduce the number of DEXA scans
  - Cost effectiveness

Chelsea and Westminster Hospital   
NHS Foundation Trust

## SSAT Methods

ST STEPHEN'S AIDS TRUST

- We performed CSI measurements on 100 subjects at random who had undergone a DEXA scan for any indication (within 6 months) using the GE-Achilles Insight®
- CSI scores were analysed to determine optimum sensitivity
- We then performed a cost effectiveness analysis

Chelsea and Westminster Hospital   
NHS Foundation Trust

**SSAT** **Demographics**  
ST STEPHEN'S AIDS TRUST

	Median values (IQR)
Gender	85% male
Age	51 years (46-58)
Duration HIV	15 years (11-20)
BMI	24 kg/m <sup>2</sup> (21-26)

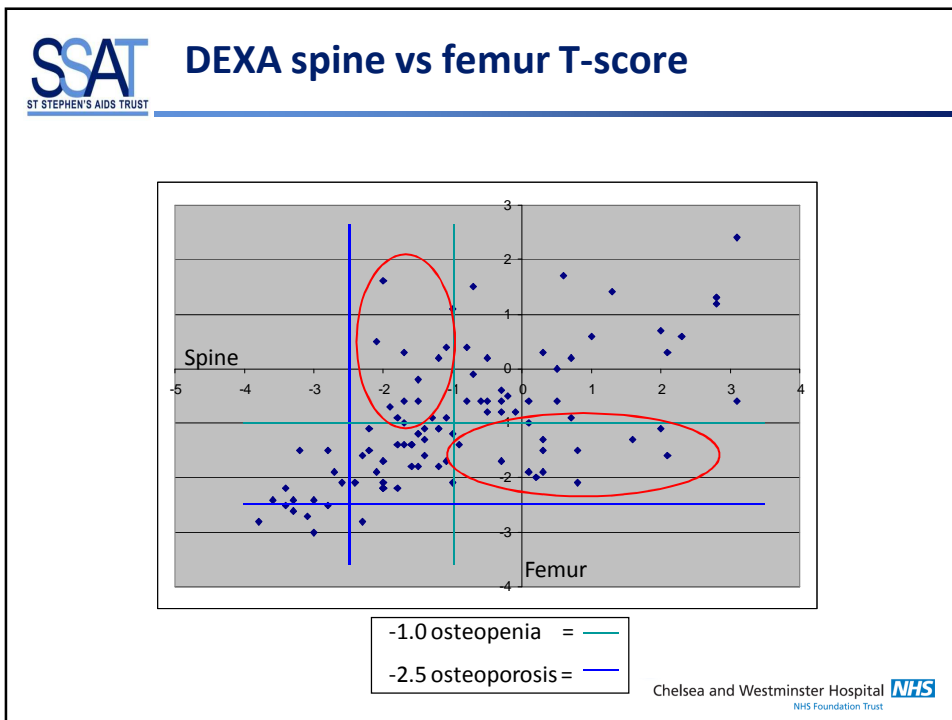
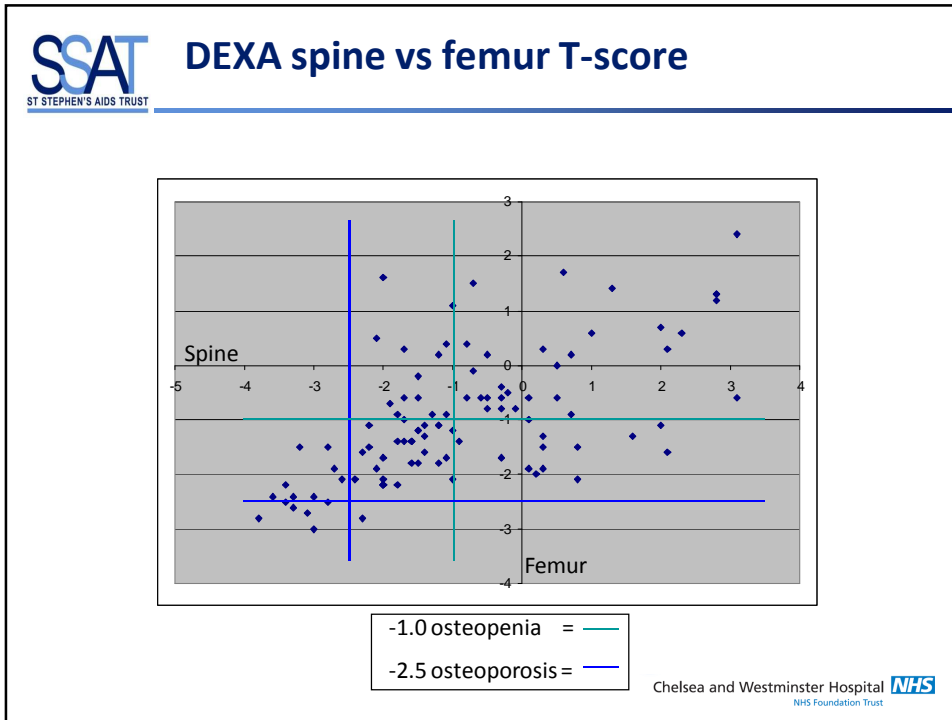
Chelsea and Westminster Hospital **NHS**  
NHS Foundation Trust

**SSAT** **Demographics**  
ST STEPHEN'S AIDS TRUST

Ethnicity	Number
White Caucasian	83
Black African	10
South East Asian	4
Black Caribbean	1
Middle Eastern	1
Indian Asian	1

Chelsea and Westminster Hospital **NHS**  
NHS Foundation Trust





## SSAT Results

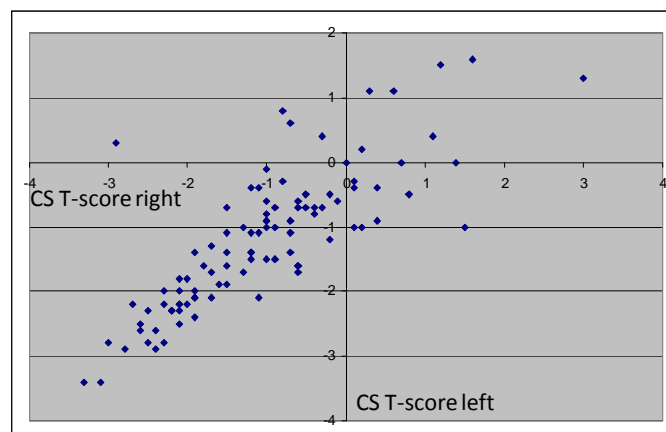
ST STEPHEN'S AIDS TRUST

- In these 100 subjects the prevalence by DEXA of
  - Osteoporosis was 15%
  - Osteopaenia was 55%

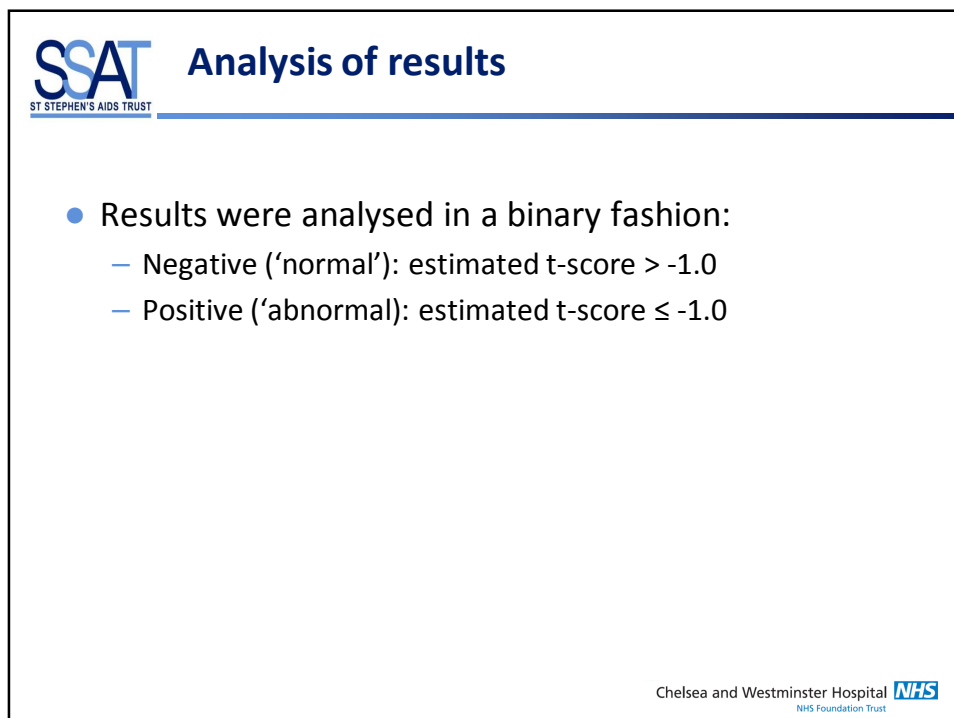
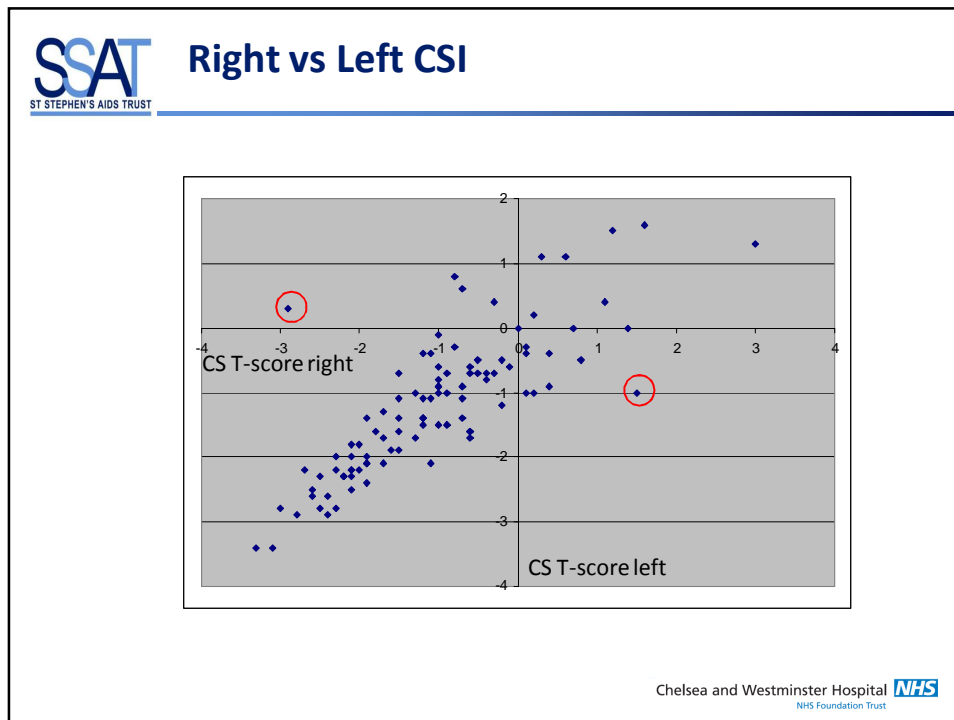
Chelsea and Westminster Hospital   
NHS Foundation Trust

## SSAT Right vs Left CSI

ST STEPHEN'S AIDS TRUST



Chelsea and Westminster Hospital   
NHS Foundation Trust



**SSAT** ST STEPHEN'S AIDS TRUST

**CSI T-score  $\leq -1.0$  to correctly identify osteoporosis at LS or FN using DEXA**

CSI T-score	Osteoporosis ( $\leq -2.5$ )	No Osteoporosis
Positive $\leq -1.0$	15	42 (36 osteopaenic)
Negative $> -1.0$	0	43 (19 osteopaenic)

Sensitivity = 100%    Specificity = 51%

Chelsea and Westminster Hospital **NHS**  
NHS Foundation Trust

**SSAT** ST STEPHEN'S AIDS TRUST

**CSI T-score  $\leq -1.0$  to correctly identify osteoporosis at LS or FN using DEXA**

CSI T-score	Osteoporosis ( $\leq -2.5$ )	No Osteoporosis
Positive $\leq -1.0$	15	42 (36 osteopaenic)
Negative $> -1.0$	0	43 (19 osteopaenic)


Sensitivity = 100%    Specificity = 51%

NPV = 100%

Chelsea and Westminster Hospital **NHS**  
NHS Foundation Trust

**SSAT** Results  
ST STEPHEN'S AIDS TRUST

- The positive predictive value of a CSI score of  $\leq -2.5$  for osteoporosis was 30%



Chelsea and Westminster Hospital **NHS**  
NHS Foundation Trust

**SSAT** Cost effectiveness  
ST STEPHEN'S AIDS TRUST

- GE-Achilles Insight = approx £12,000
- DEXA scan = £65
- If those requiring DEXA underwent screening with calcaneal stiffness first and were only referred for DEXA if estimated T-score less than -1.0
- 324 subjects
- May be significantly less if repeat screening 3-5 yearly is performed as recommended in EACS guidelines

Chelsea and Westminster Hospital **NHS**  
NHS Foundation Trust



## Conclusion

- CSI is reliable and cost effective
- If our 100 subjects undergoing DEXA were screened with CSI first using a cut-off of  $\leq -1.0$ :
  - 43 fewer DEXA scans
  - 19 missed cases of osteopaenia
  - 0 missed cases of osteoporosis

Chelsea and Westminster Hospital   
NHS Foundation Trust



## Acknowledgements

- Thank you to all the patients at Chelsea & Westminster Hospital



Chelsea and Westminster Hospital   
NHS Foundation Trust