

# VERTEBRAL FRACTURE INITIATIVE

## Part I

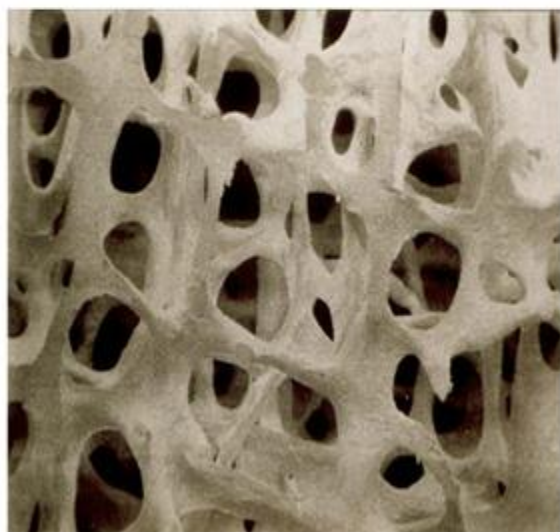
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*Overview of osteoporosis:  
Epidemiology and clinical management*

*By Pawel Szulc and Mary Bouxsein*

# Definition of osteoporosis

A disease characterized by low bone mass and micro-architectural deterioration of bone tissue leading to reduced bone strength and a consequent increase in fracture risk.



Normal bone



Osteoporosis

# OSTEOPOROSIS: THE SIZE OF THE PROBLEM

# Osteoporosis is a prevalent disease

- Estimated to affect 200 million women worldwide
    - 1/10 of women aged 60
    - 1/5 of women aged 70
    - 2/5 of women aged 80
    - 2/3 of women aged 90
- } From European, North American, Japanese and Australian cohorts<sup>1</sup>
- Worldwide, an osteoporotic fracture occurs every 3 seconds, a vertebral fracture every 22 seconds<sup>2</sup>
  - 20-25% Caucasian women and men over the age of 50 years have a prevalent vertebral fracture<sup>3</sup>, 12% in Latin American women and men<sup>4</sup>

<sup>1</sup>Kanis JA (2007) WHO Technical Report, University of Sheffield, UK: 66

<sup>2</sup>Johnell O & Kanis JA (2006) *Osteoporos Int* 17: 1726

<sup>3</sup>O'Neill et al. (1996) *J Bone Miner Res* 11:1010; Jones G et al. (1996) *Osteoporos Int* 6:233

<sup>4</sup>Clark et al. (2009) *Osteoporos Int* 20(2): 275

# Lifetime risk at the age of 50

	Women	Men
Osteoporotic fracture <sup>1,2</sup>	46-53%	21-22%
Hip fracture <sup>2,3</sup>	15-23%	5-11%
Radiographic vertebral fracture <sup>4</sup>	27%	11%
Clinical vertebral fracture <sup>2</sup>	15%	8%
Breast cancer	10-13%	
Prostate cancer		9-11%

NB: variable between countries

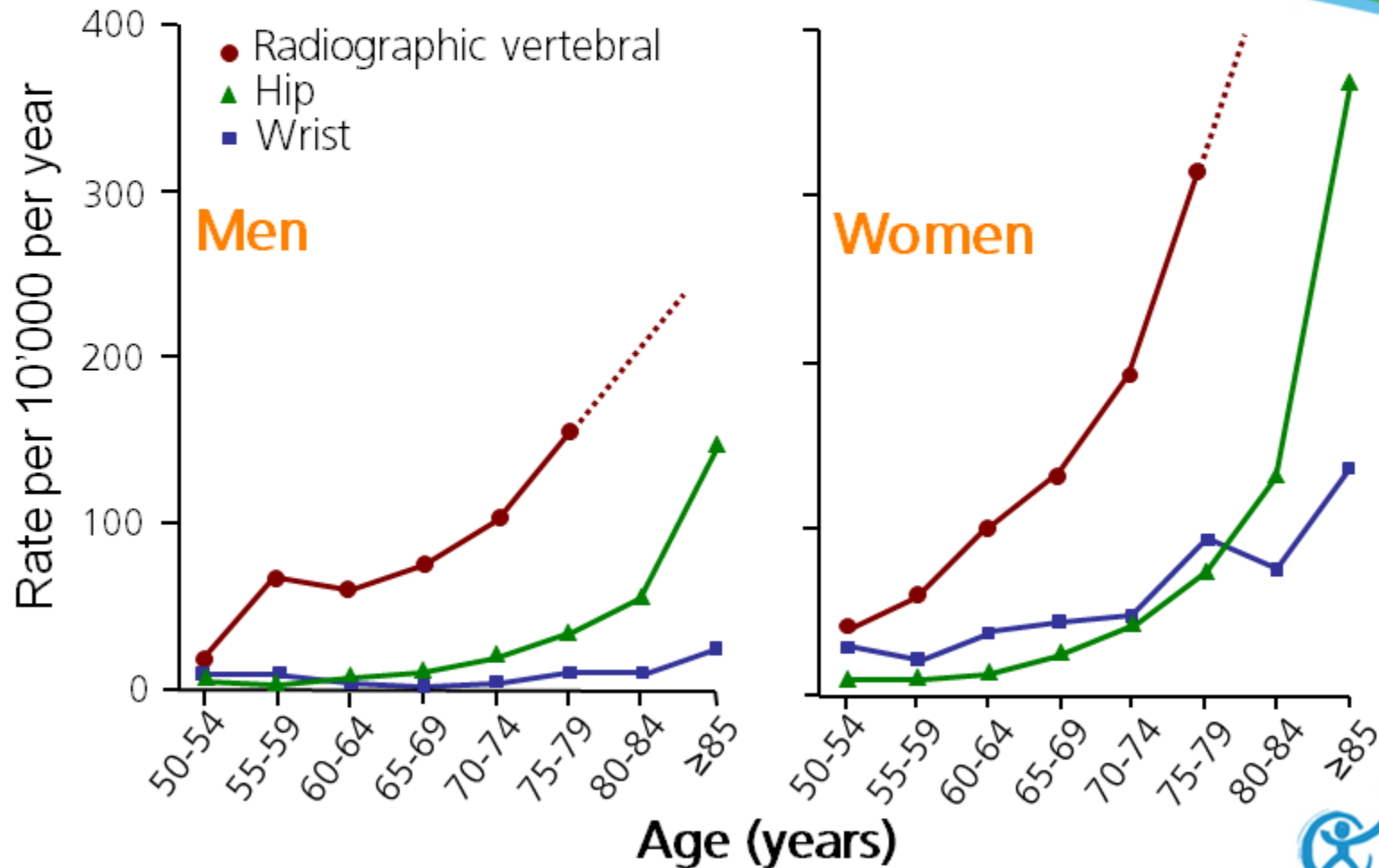
<sup>1</sup>Van Staa TP et al (2001) Bone 29: 517

<sup>2</sup>Kanis JA et al (2000) Osteoporos Int 11: 669

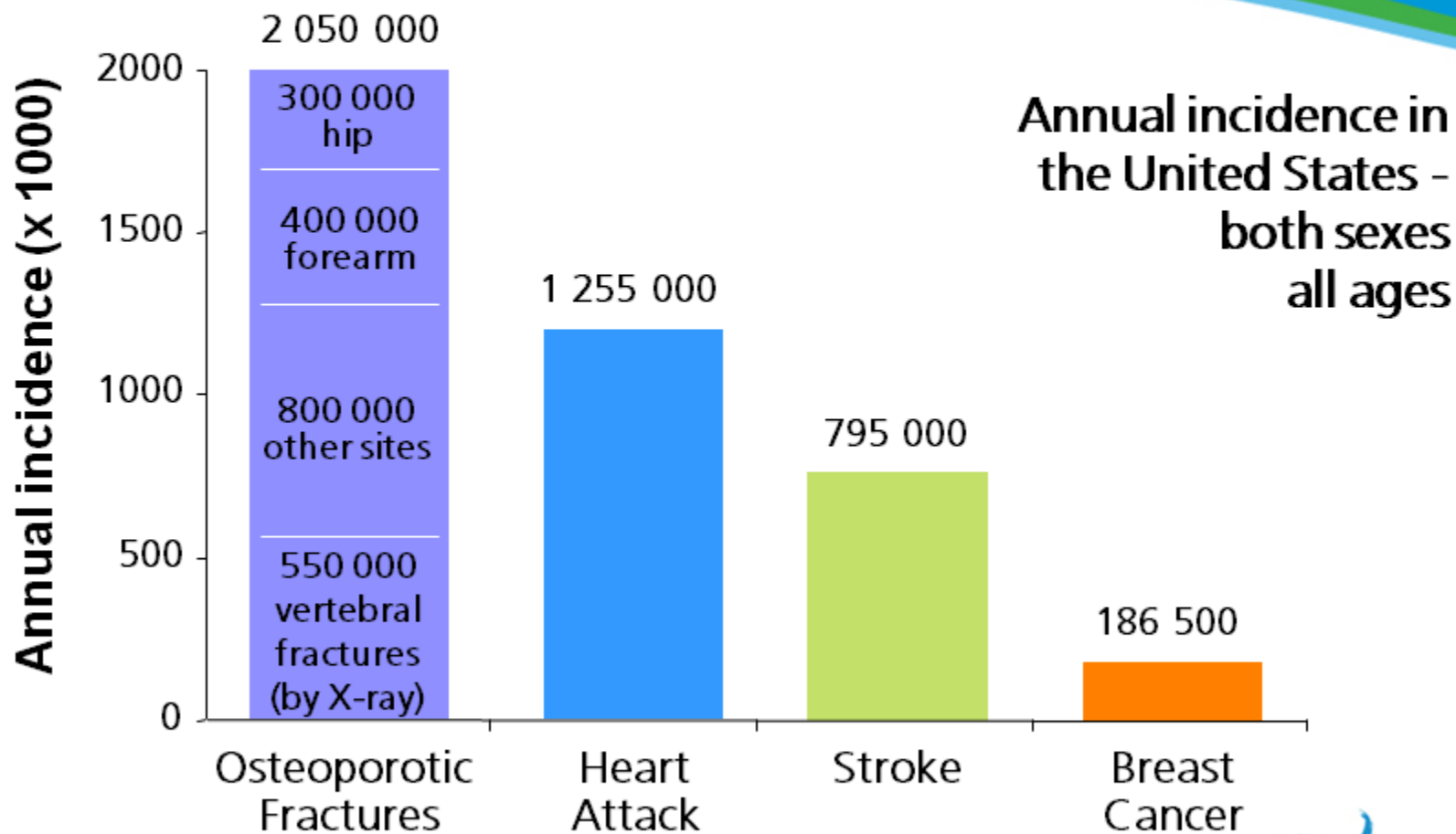
<sup>3</sup>Samelson EL et al (2007) J Bone Miner Res 22: 1449

<sup>4</sup>Samelson EL et al (2006) J Bone Miner Res 21: 1207

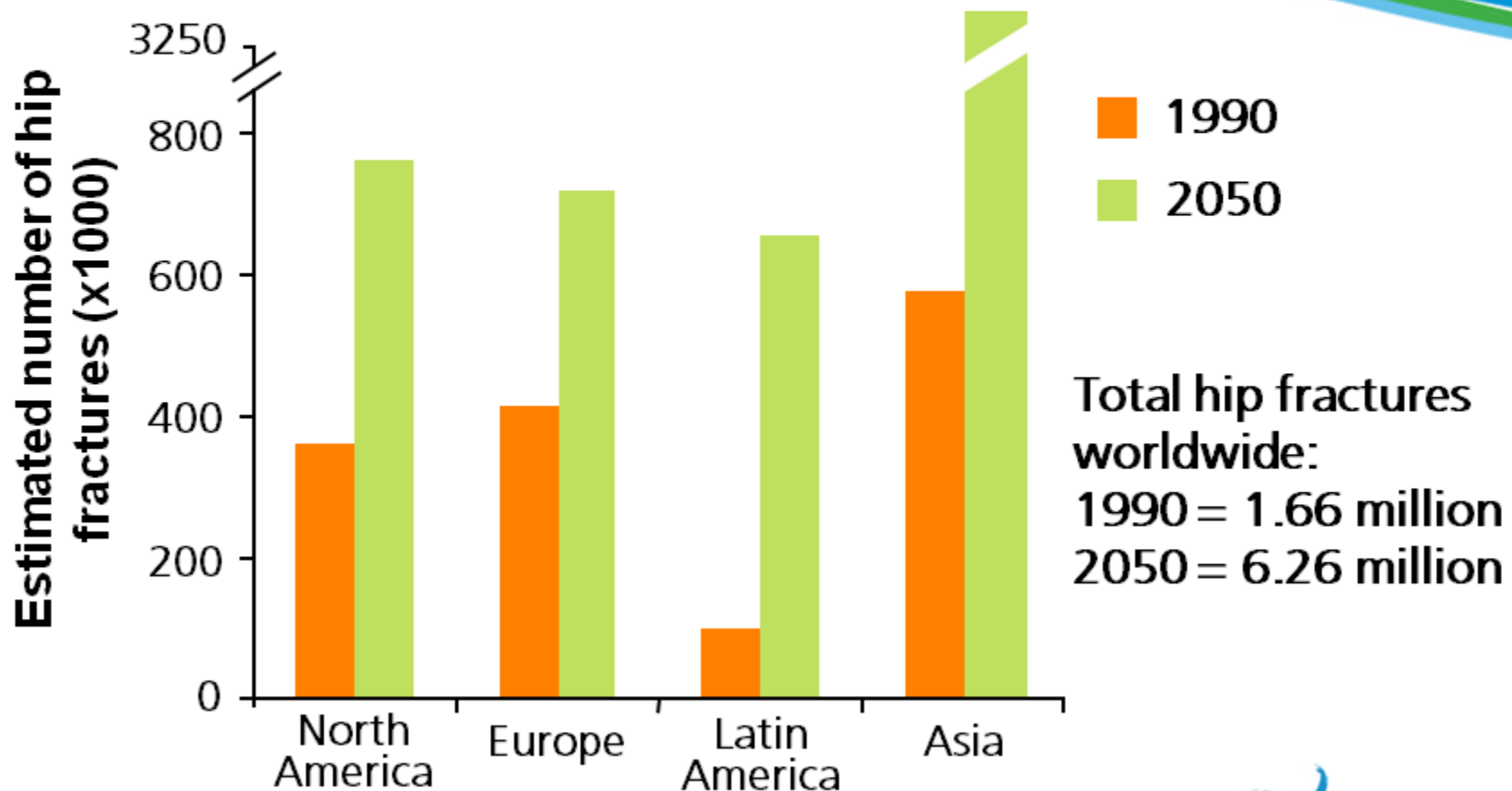
# Age-specific and sex-specific incidence of osteoporotic fractures



# Comparison of osteoporotic fractures with other common diseases



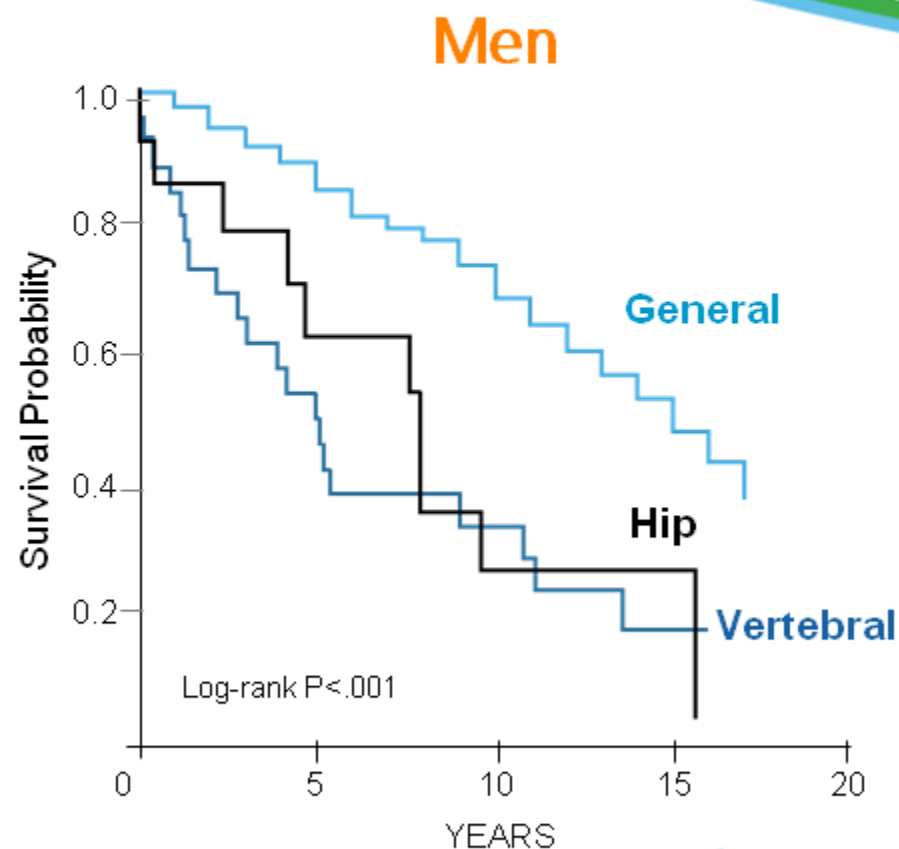
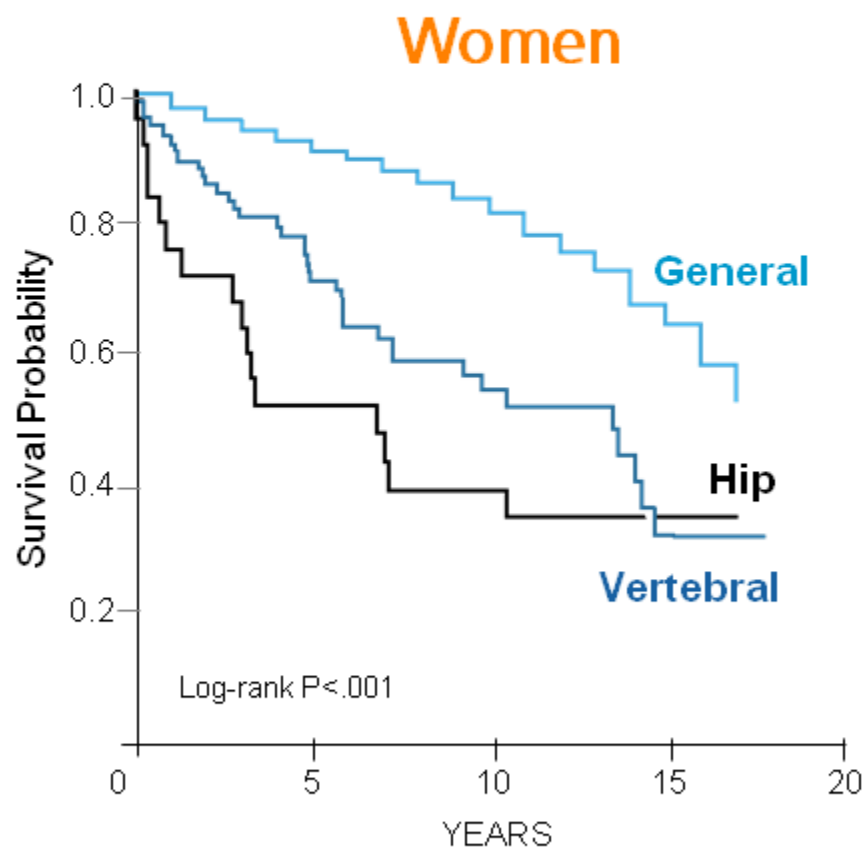
# Increased burden of osteoporotic fractures worldwide





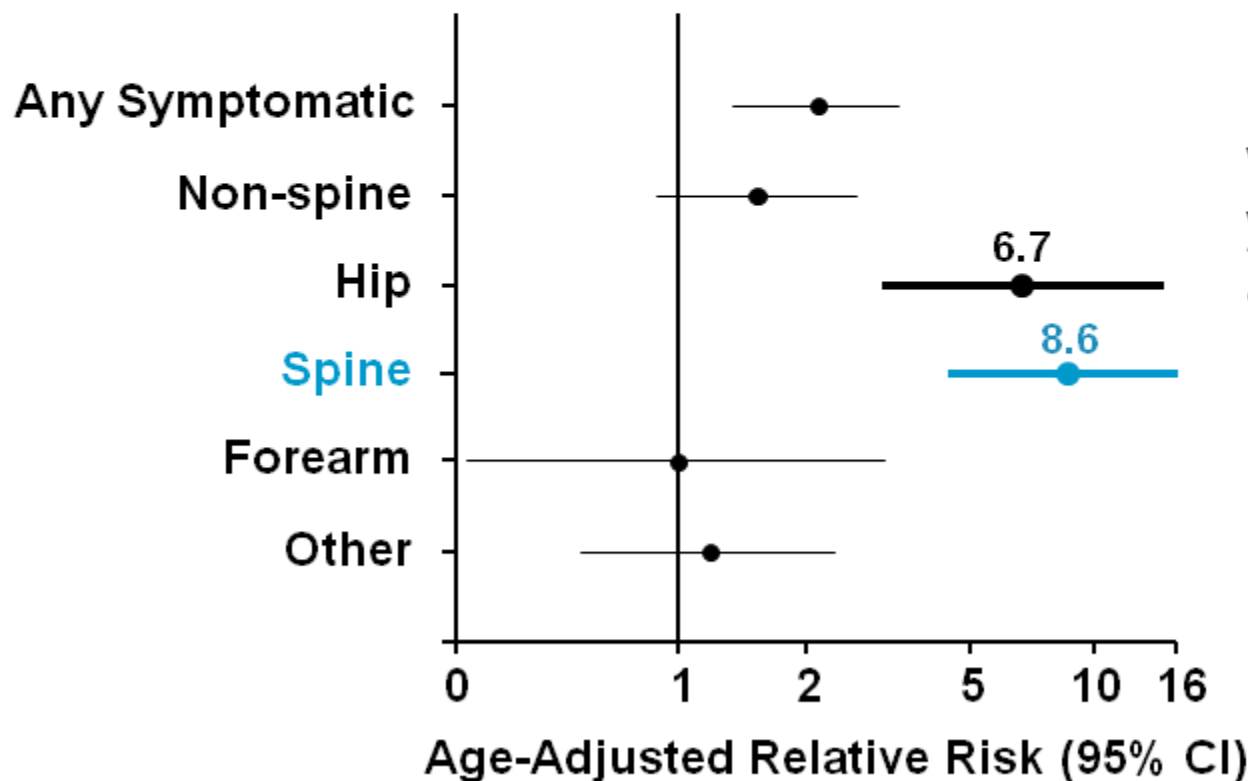
# OSTEOPOROSIS: MORTALITY & MORBIDITY

# Similar mortality in patients with vertebral fractures and in those with hip fractures



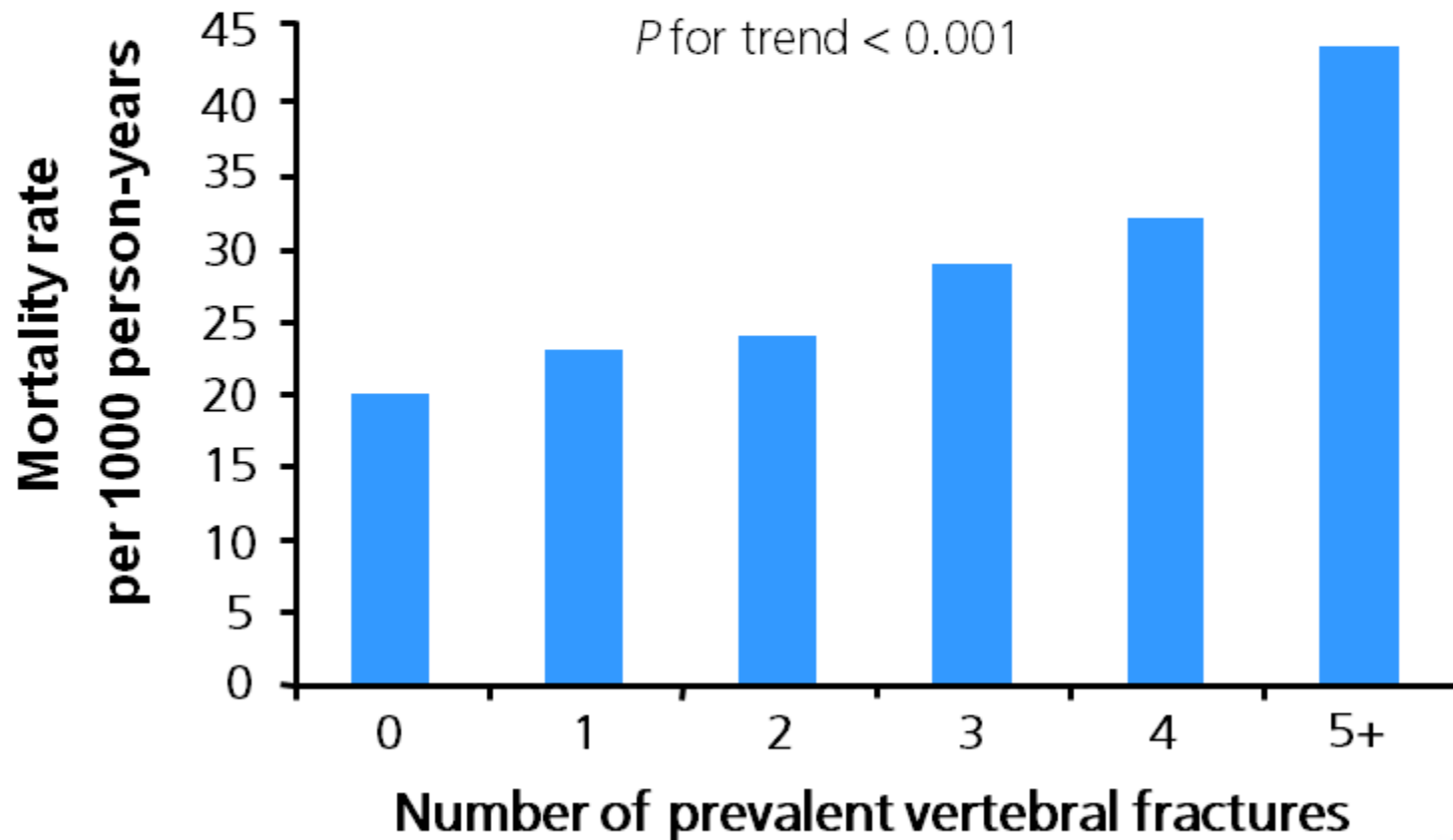
# Relative risk of death following clinical osteoporotic fractures

## Fracture Intervention Trial (FIT)\*

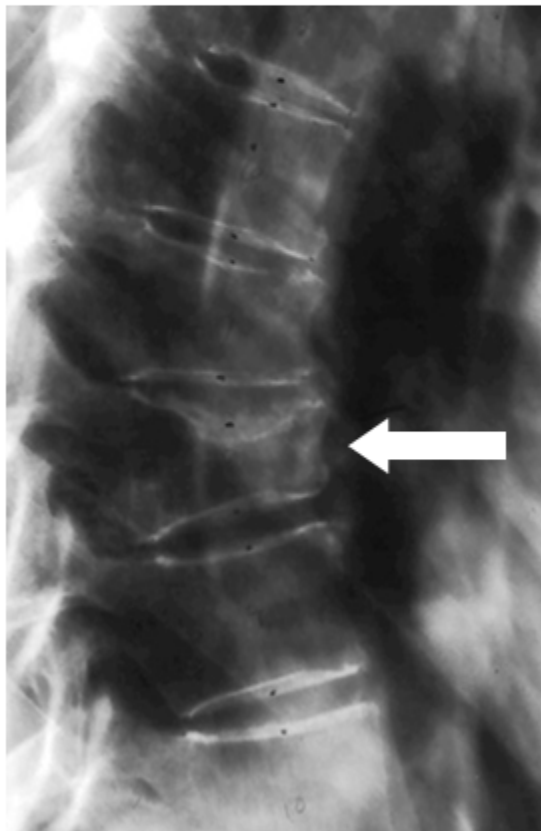


\*6459 postmenopausal women ages 55-81 years followed for an average of 3.8 years

# Mortality rate increases with the number of prevalent vertebral fractures



# Vertebral fractures increase the risk of subsequent fragility fracture



- **Women with vertebral fractures have a 5-fold increased risk of a new vertebral fracture and a 2-fold increased risk of hip fracture**

*Black DM et al. (1999) J Bone Miner Res 14: 821*

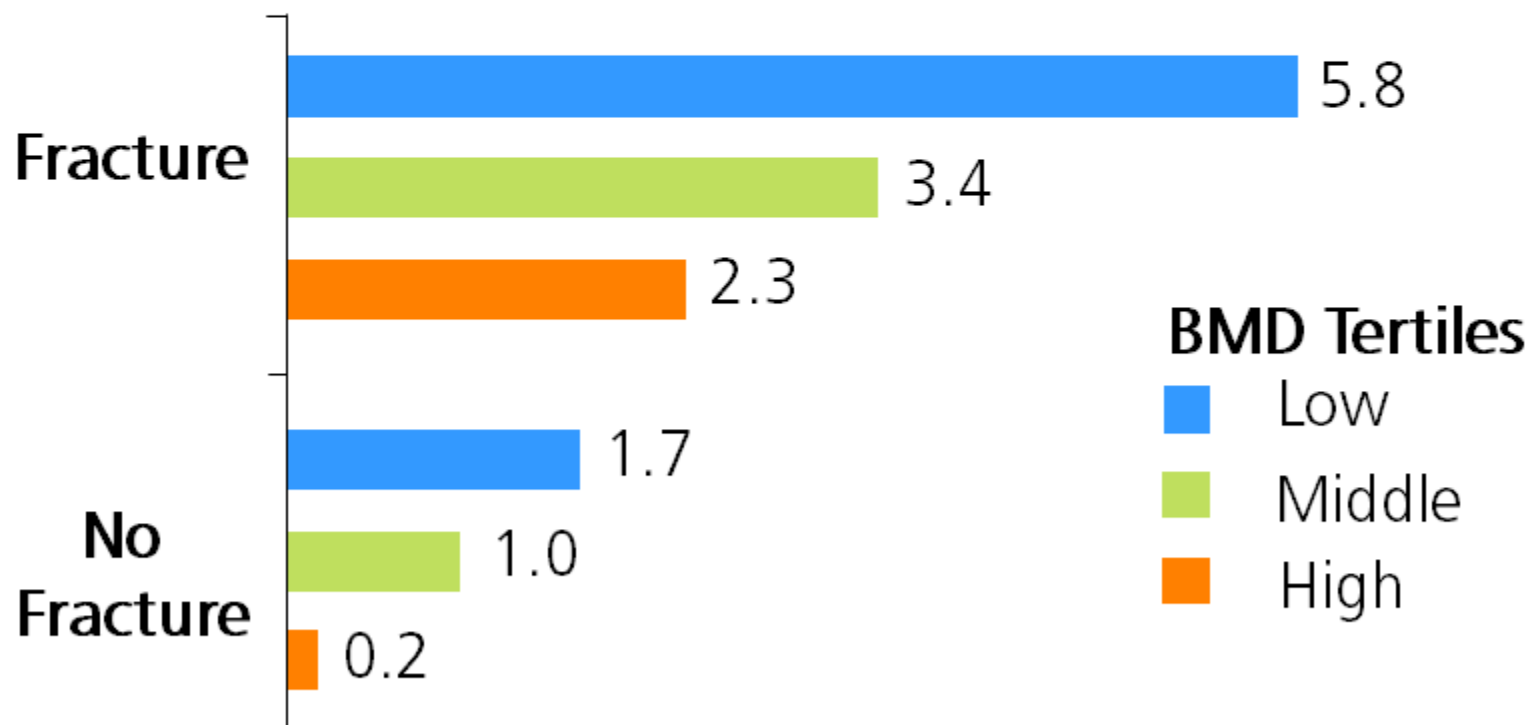
*Melton LJ 3rd et al. (1999) Osteoporos Int 10: 214*

- **Of women who suffer a vertebral fracture, 1 in 5 will suffer another vertebral fracture within a year**

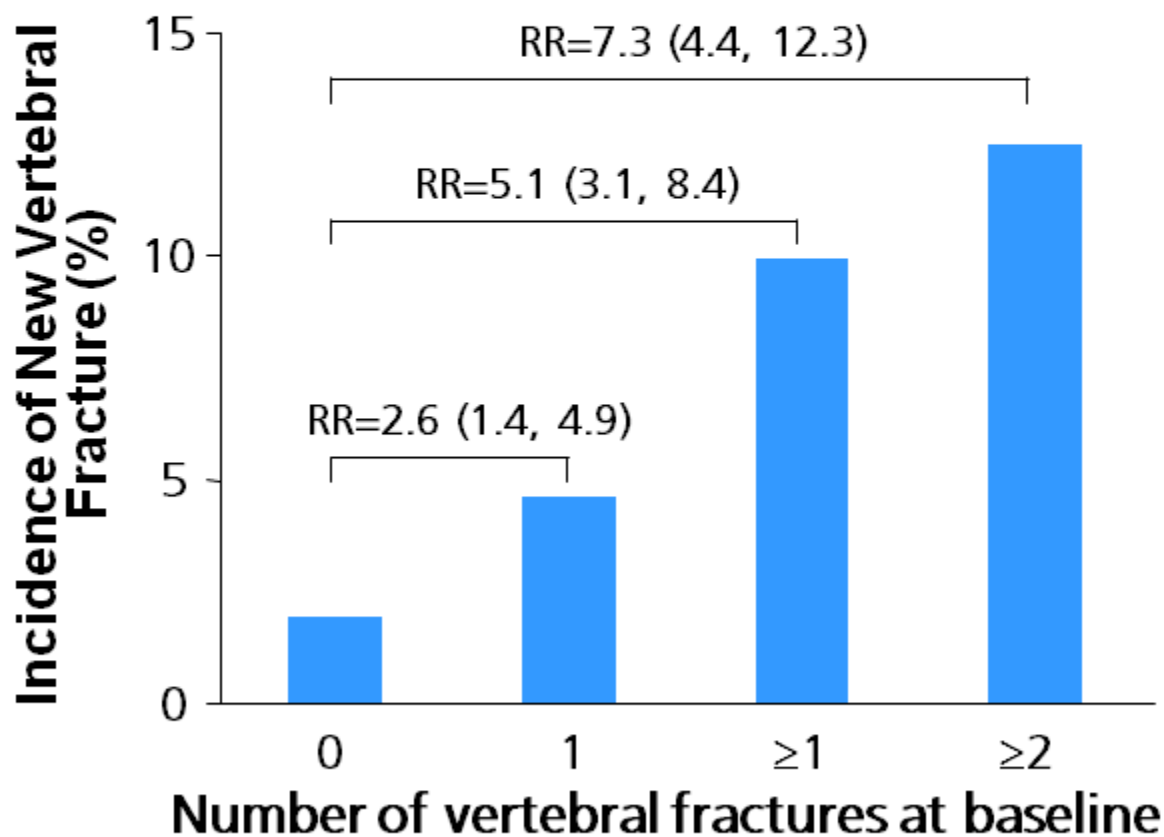
*Lindsay et al. (2001) JAMA 285(3): 320*

# Prior fracture increases the risk for future vertebral fracture, independent of BMD

Risk of vertebral fractures (% per year)

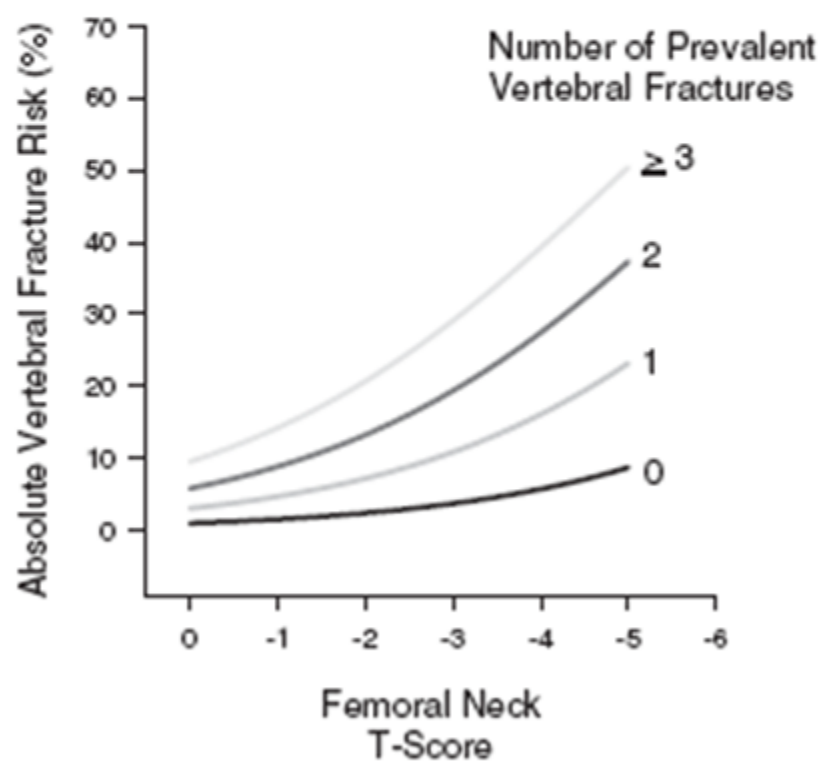
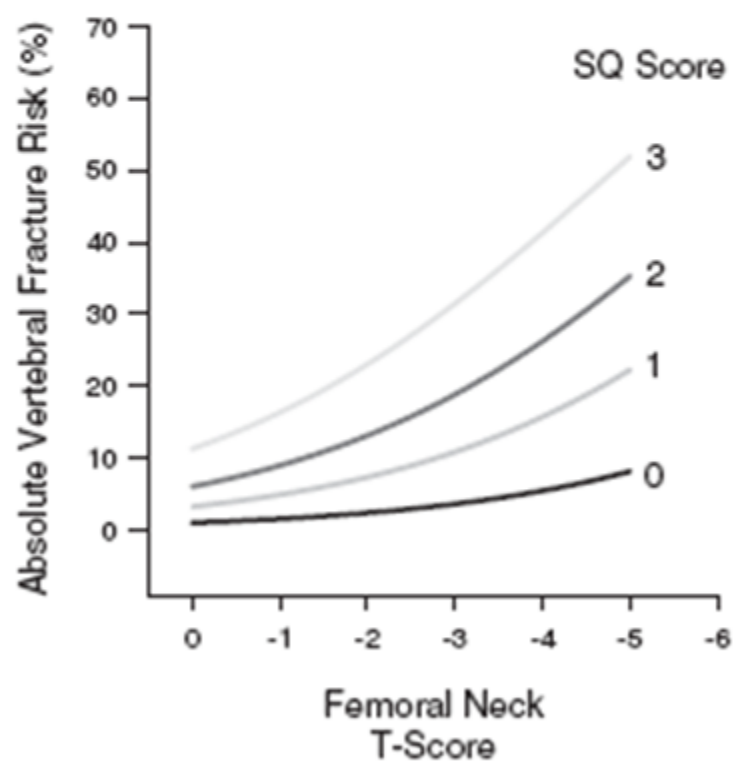


# Prior vertebral fracture increases the risk of subsequent vertebral fracture



# Incident vertebral fracture risk: effect of BMD and prevalent vertebral fractures

SQ score: worst grade of any fractured vertebra according to Genant semi-quantitative scale



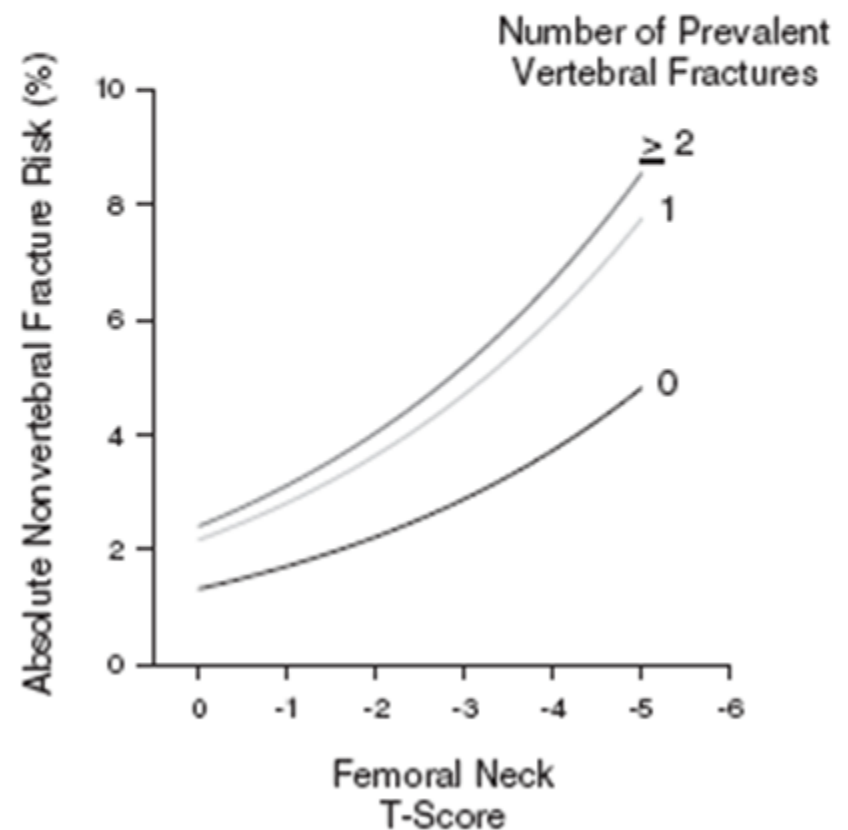
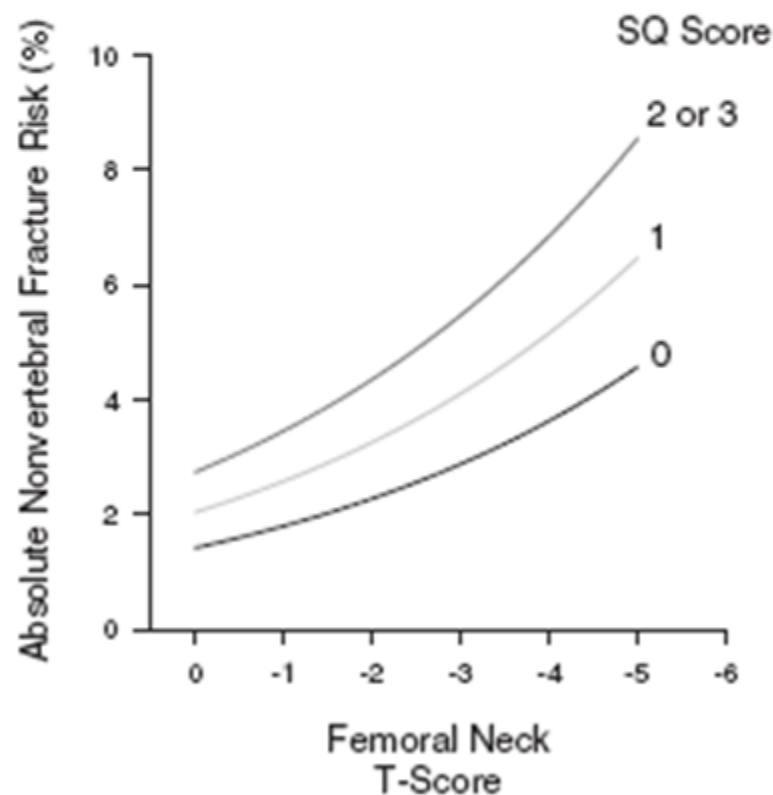
Siris ES et al. (2007) *Osteoporosis Int* 18: 761

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# Incident non-vertebral fracture risk: effect of BMD and prevalent vertebral fractures

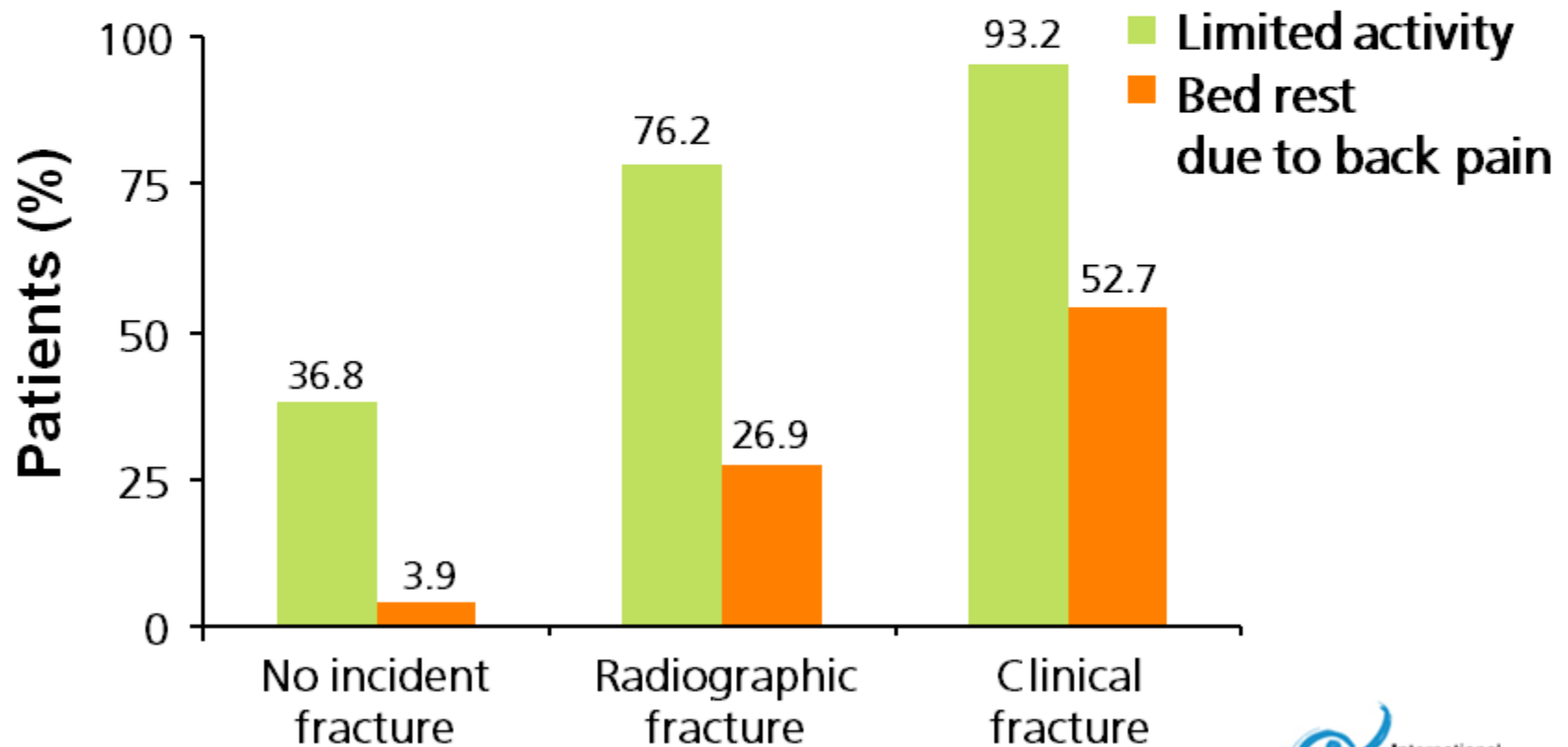
SQ score: worst grade of any fractured vertebra according to Genant semi-quantitative scale



Siris ES et al. (2007) *Osteoporosis Int* 18: 761

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# All types of vertebral fractures are associated with morbidity



# Consequences of vertebral fractures

- Kyphosis
- Loss of height
- Bulging abdomen
- Acute and chronic back pain
- Breathing difficulties
- Depression
- Reflux and other GI symptoms
- Difficulty with activity of daily living (bending, rising, dressing, climbing stairs)
- Need to use a walking aid



**REDUCED INDEPENDENCE  
AND QUALITY OF LIFE**

# Treatment of symptomatic vertebral fractures

- Bed rest (in the case of severe pain)
- Pharmacological treatment
  - analgesics
  - opioids
- Physical therapy
- Bracing
- Local steroid injections
- Vertebral augmentation
  - Vertebroplasty
  - Kyphoplasty

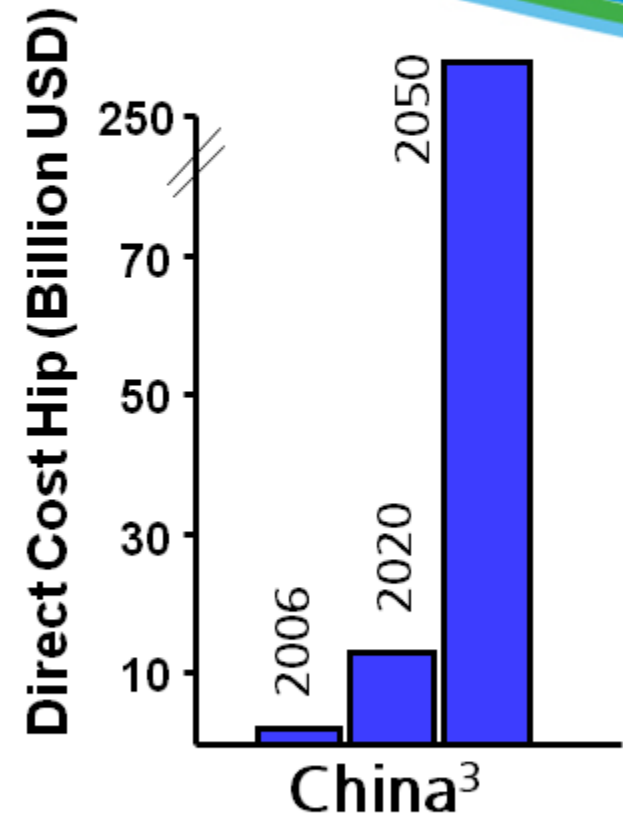
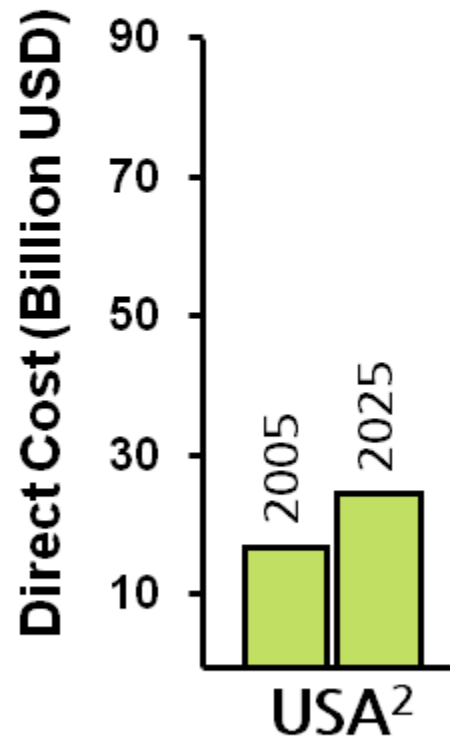
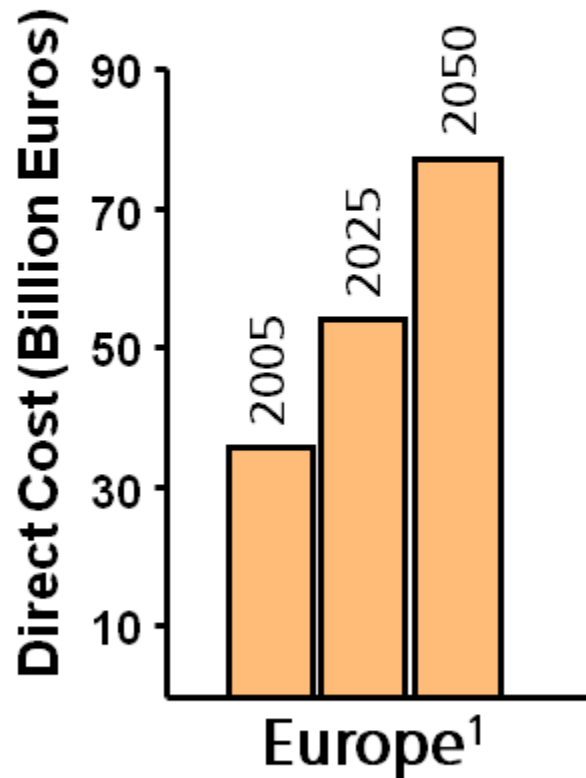
# Summary

## Vertebral Fractures

- Are the most common osteoporotic fracture
- Are associated with excess mortality
- Are associated with significant morbidity, even if they do not come to clinical attention
- Increase the risk of subsequent vertebral fractures by 5-fold and the risk of other fragility fractures (including hip) by 2 to 4-fold

# COST OF OSTEOPOROSIS

# Projected costs of osteoporotic fractures

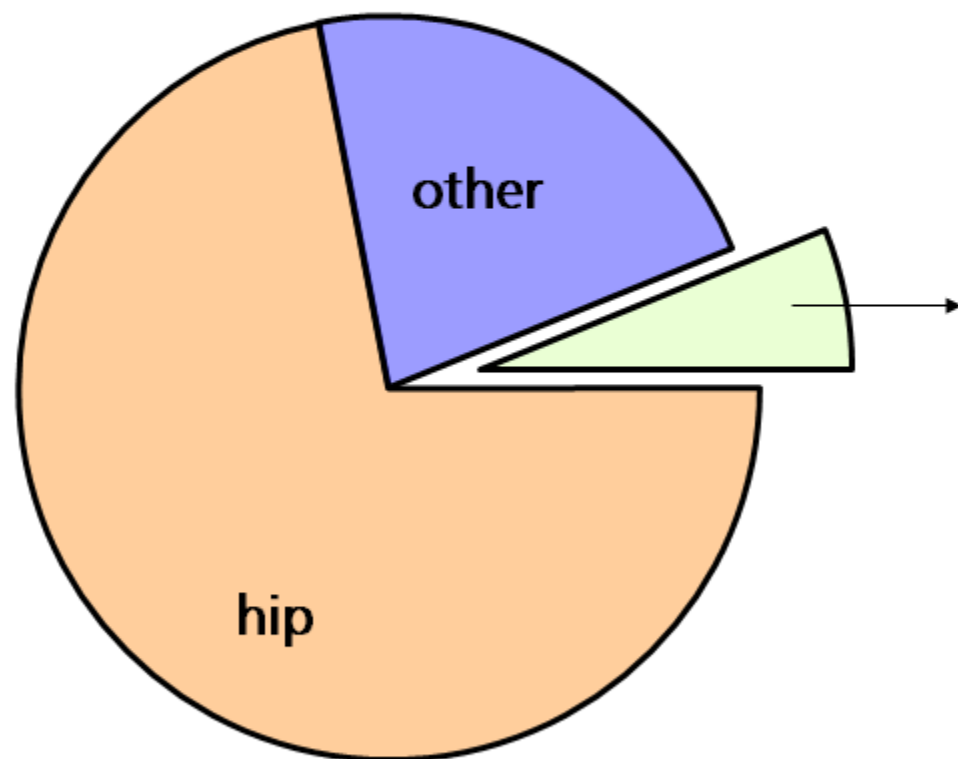


1. Kanis JA, Johnell O (2005) *Osteoporos Int* 16: 229

2. Burge R et al. (2007) *J Bone Miner Res* 22: 465

3. Mithal A et al. (2009) *The Asian Audit, IOF*: 15

# Direct costs of vertebral fractures



**Vertebral fractures:**  
6% of the total direct cost of osteoporotic fractures, costing **1 billion USD** in the US in 2005

In Europe, the cost was 719 million EUR in 2005

Adapted from Burge R et al. (2007) *J Bone Miner Res* 22: 465

Kanis JA, Johnell O (2005) *Osteoporos Int* 16: 229



# Vertebral fractures induce back pain and disability

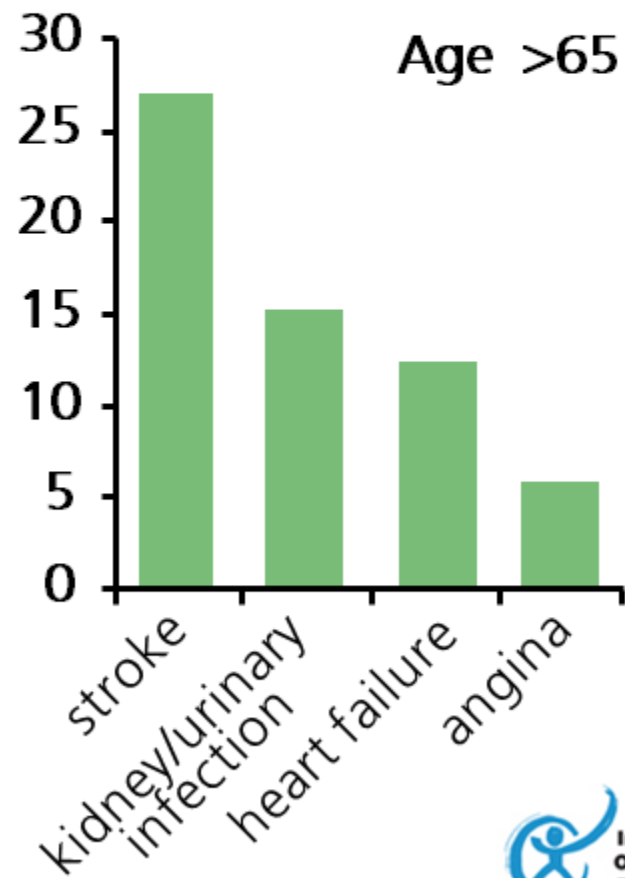
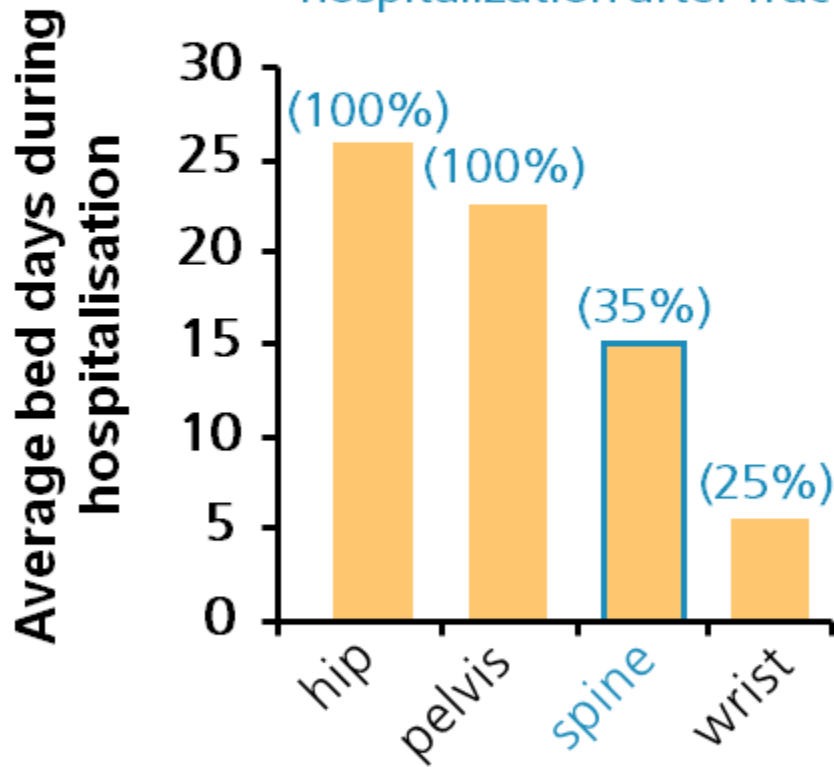
**Risk associated with incident vertebral fracture (Odd's Ratio)**  
**7223 women >65 yrs, 3.7 yrs follow-up**

Vertebral fracture at baseline	NO	YES
Back pain	2.0	2.7
Back disability	1.8	4.1
≥ 1 day bed rest	4.9	7.5
≥ 7 days limited activity	2.7	7.4

**Incident vertebral fracture** → **+ 1 to 2 days per year of bed rest**  
**+ 10 days per year of limited activity**

# Average hospital utilisation for osteoporotic fractures in the UK

\*percentage of patients requiring hospitalization after fracture

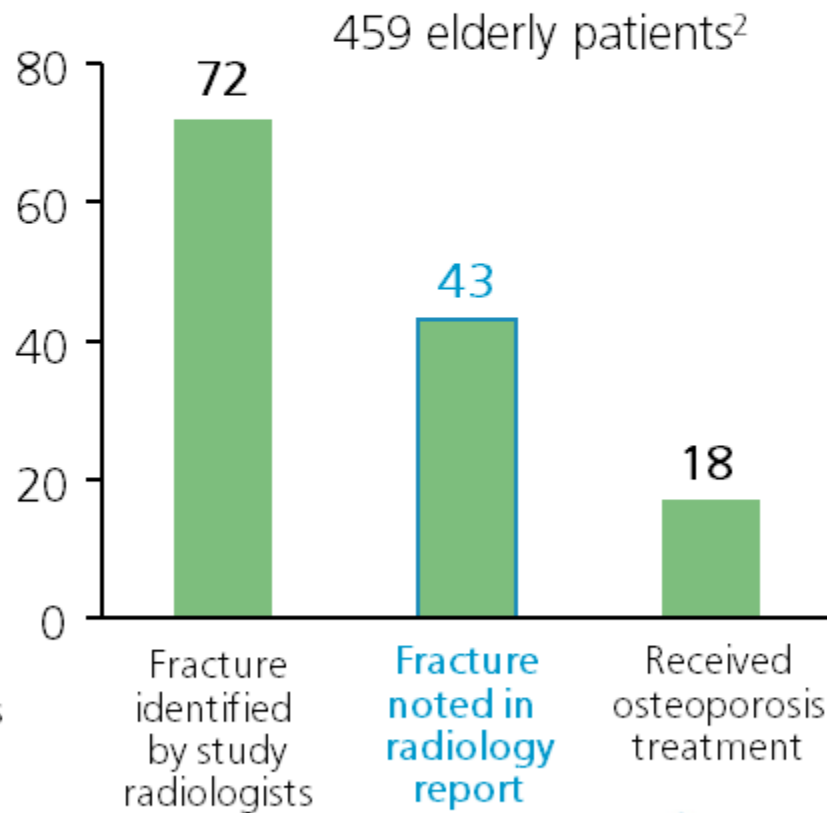
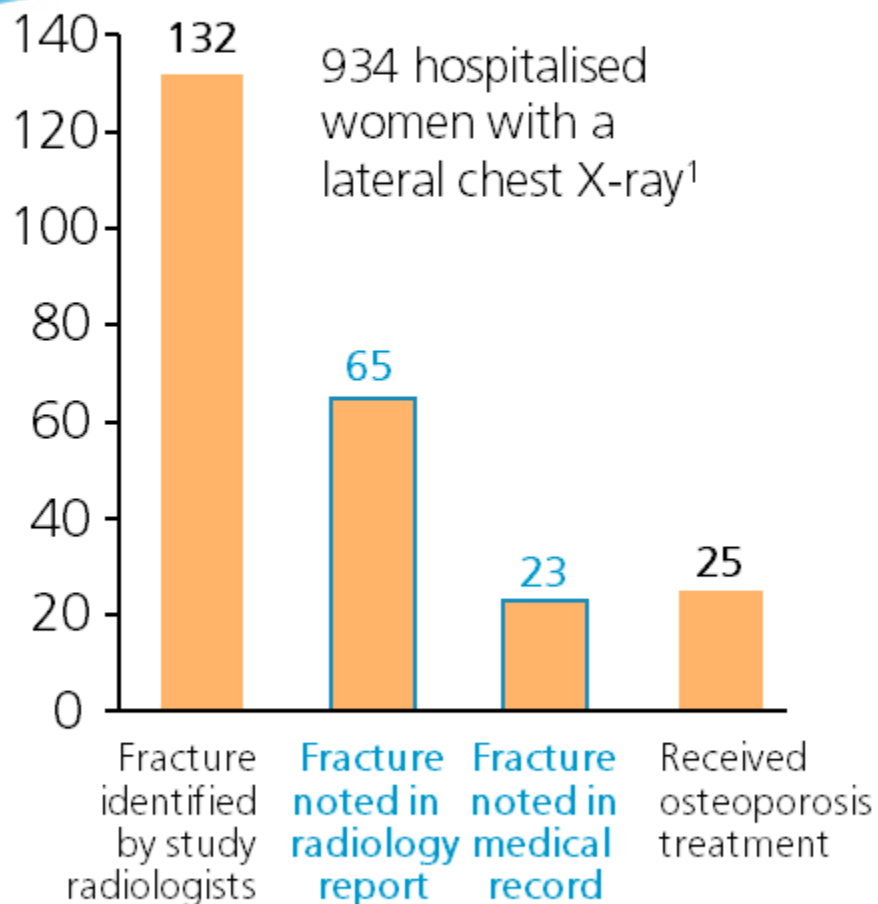


Stevenson M et al. (2006) *Wom Health Med* 3(4): 149

Ham C et al. (2003) *Brit Med J* 327(7426): 1257

# UNDER-DIAGNOSIS OF VERTEBRAL FRACTURES: A MISSED OPPORTUNITY

# Under-diagnosed vertebral fractures



<sup>1</sup>Gehlbach SH et al. (2000) *Osteoporos Int* 11: 577

<sup>2</sup>Majumdar SR et al. (2005) *Arch Intern Med* 165: 905

# Under-diagnosis of vertebral fractures is a worldwide problem

- **Vertebral fractures are under-diagnosed in all geographic regions**

## Missed diagnosis of vertebral fracture

North America	<b>45.2%</b>
Latin America	<b>46.5%</b>
Europe/South Africa/Australia	<b>29.5%</b>
<b>Global rate</b>	<b>34.0%</b>

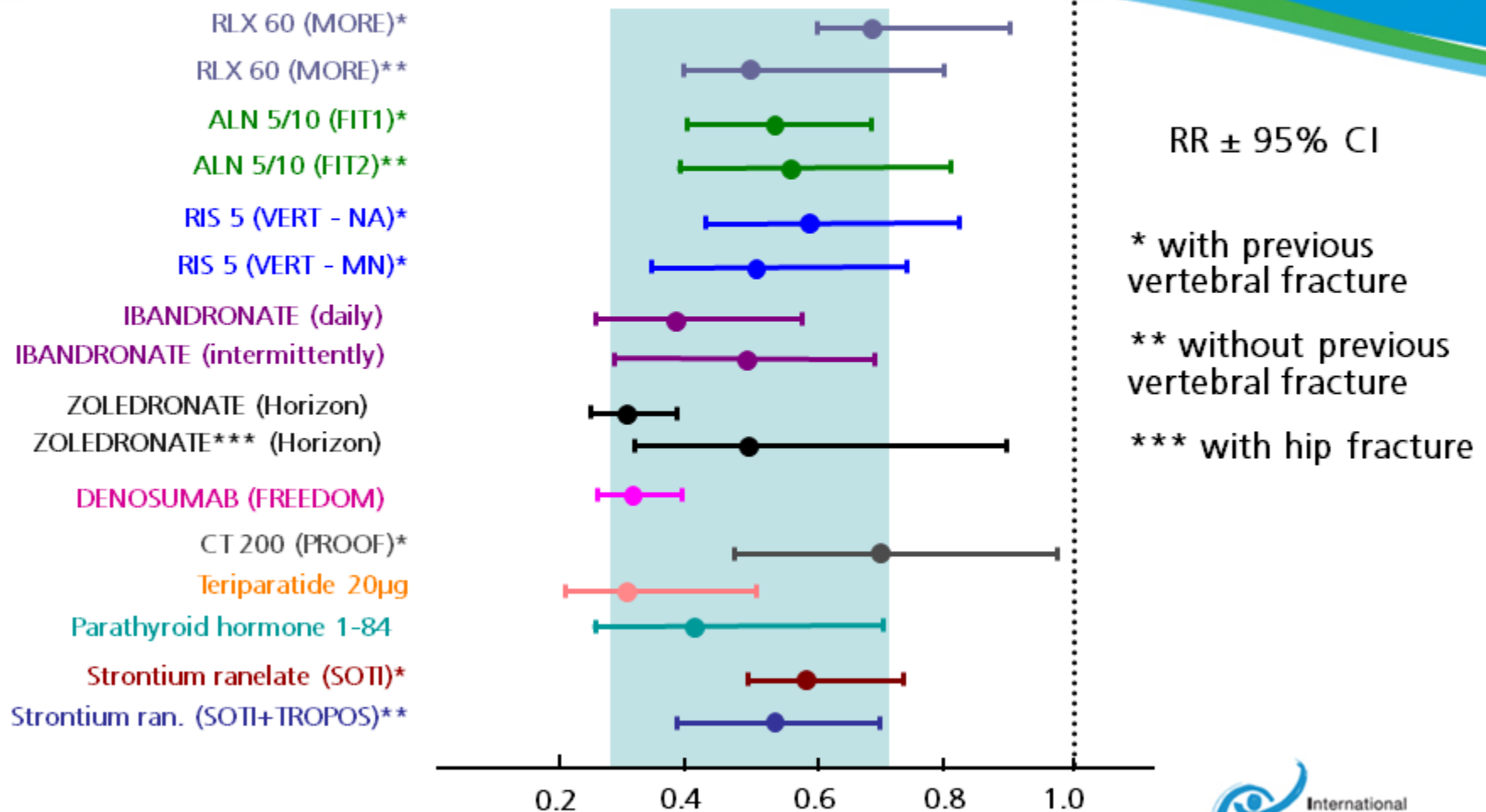
- Attributable both to **poor identification** of vertebral fractures and, when a fracture is identified, use of ambiguous terminology in the patient's medical record that **does not clearly state vertebral fracture.**

# Awareness and treatment of vertebral fractures is low despite...

- Known disability associated with vertebral fractures
- Excess mortality associated with vertebral fractures
- Every year, over 1 billion USD spent in the US and over 750 million EUR in Europe for treating vertebral fractures alone (direct costs)
- Validated radiologic techniques for diagnosis
- **Effective and safe treatments**
- Evidence based guidelines for diagnosis and management of osteoporosis, including vertebral fractures

Effective therapies are widely available  
and can reduce vertebral fractures by  
30% to 70%.

# Effect of osteoporosis drugs on new vertebral fractures





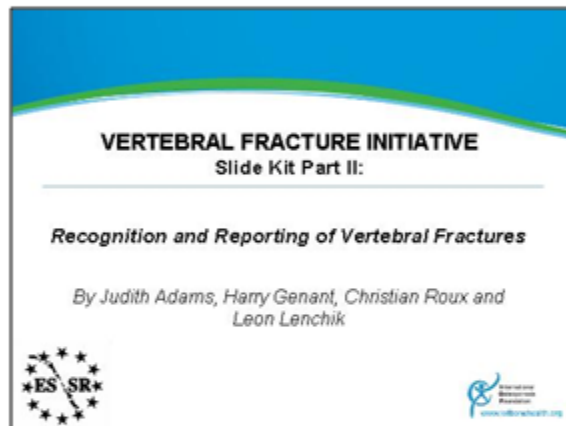
# Conclusions

- Vertebral fractures are a common complication of osteoporosis and markedly increase the likelihood of subsequent fractures
- Mild and moderate vertebral fractures are often not being recognised and reported, leading to under-diagnosis and under-treatment
- Lateral spine radiographs or by lateral DXA imaging are the best ways to confirm the presence of vertebral fractures in clinical practice
- Early radiographic diagnosis followed by appropriate therapy will help prevent subsequent fractures
- Effective therapies are widely available and can reduce vertebral, hip and other fragility fractures by 30% to 70%.

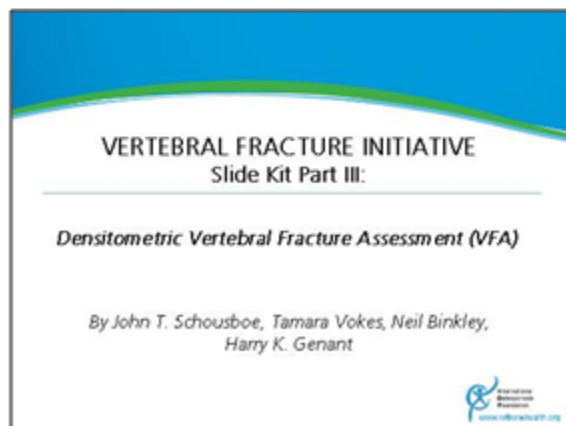
# Action is needed by radiologists and other clinicians to ensure:

- Recognition of vertebral fractures using radiography, DXA-VFA or other imaging techniques
- Reporting as **FRACTURED** to avoid ambiguity
- These actions will help patients receive effective treatment and prevent subsequent fractures

# RECOGNITION & REPORTING OF VERTEBRAL FRACTURES



## Part II Recognition and Reporting of Vertebral Fractures



## Part III DXA-based Vertebral Fracture Assessment