

# FRAX: Clinical uses, adjustments and developments



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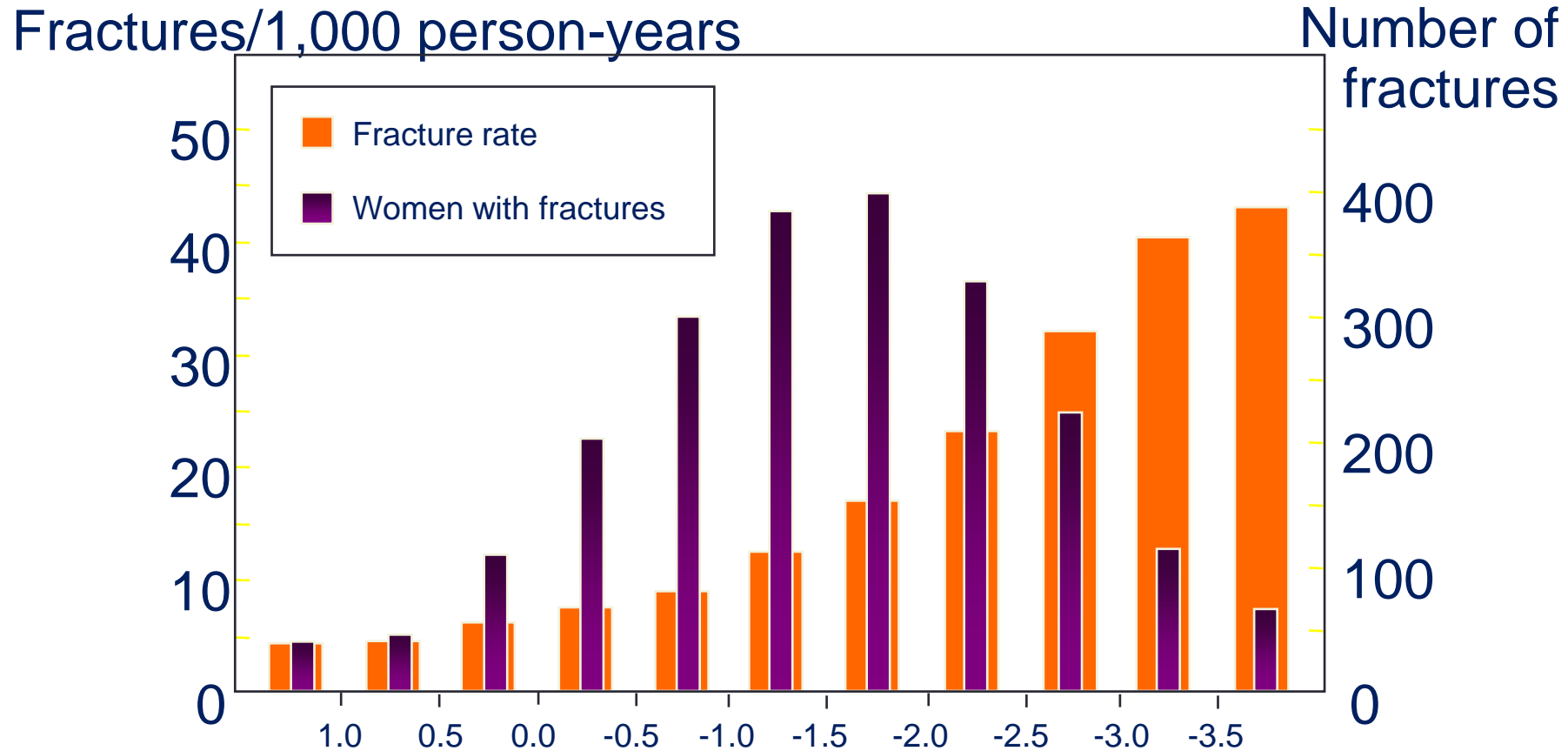
# Disclosures

- Consultant/Advisor/Speaker for:
  - Amgen, AstraZeneca, Consilient Healthcare, Fresenius Kabi, GSK, Hologic, Internis, Lilly, ObsEva, Pfizer, UCB
- Research support:
  - Including above plus Versus Arthritis, I3 Innovus, MRC, IOF, Unilever
- Financial holdings:
  - None

# What is the intended use of FRAX®?

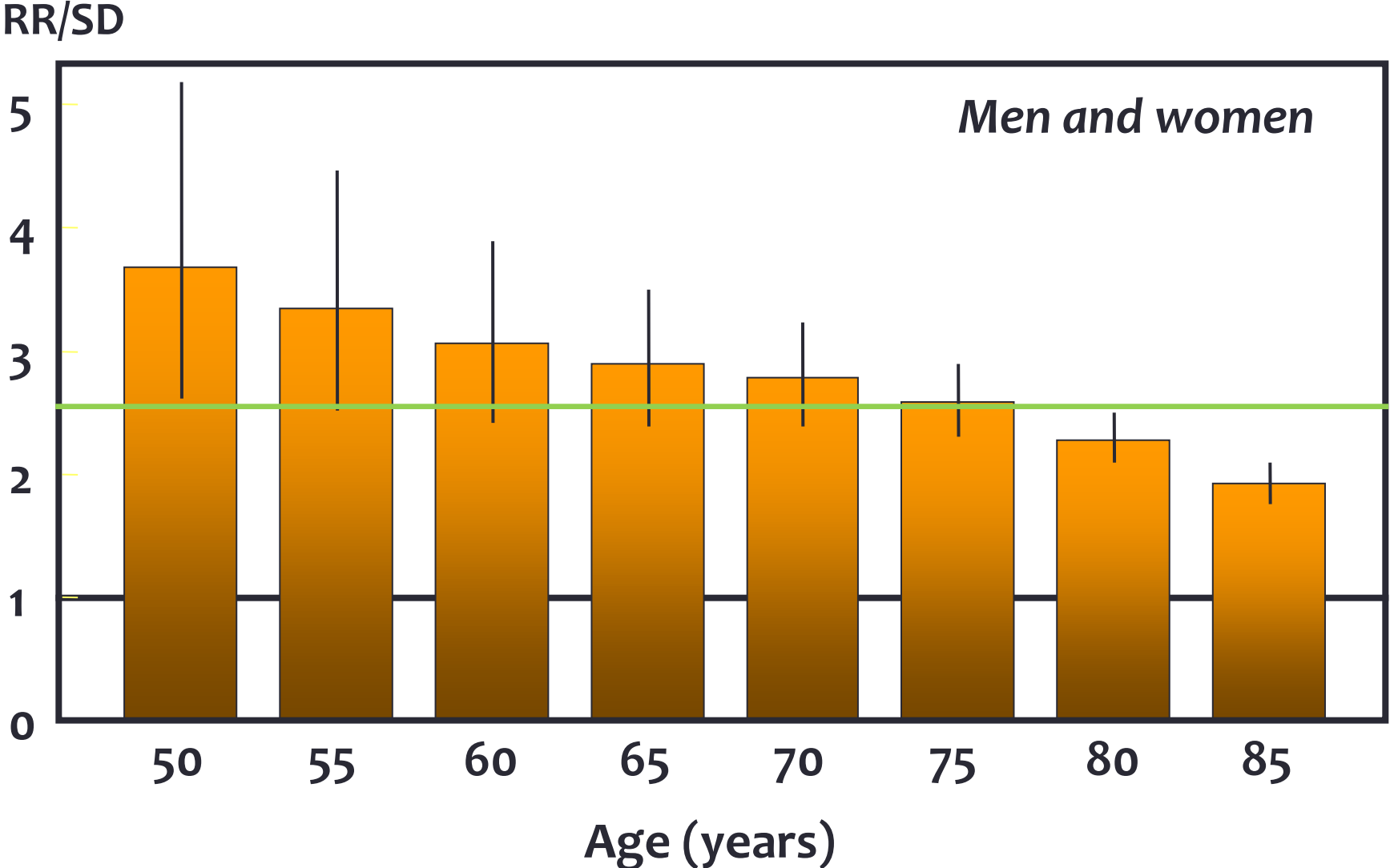
- Osteoporosis is a common disease
  - It should largely be managed in primary care.
- Experts in osteoporosis are used to integrating information derived from multiple risk factors, but
  - Most primary care physicians in many countries have little expert knowledge.
  - It is this constituency for which FRAX® is primarily designed
- To increase awareness and knowledge of osteoporosis and to initiate appropriate treatment in patients at highest risk of fracture.

# Osteoporotic fracture and BMD

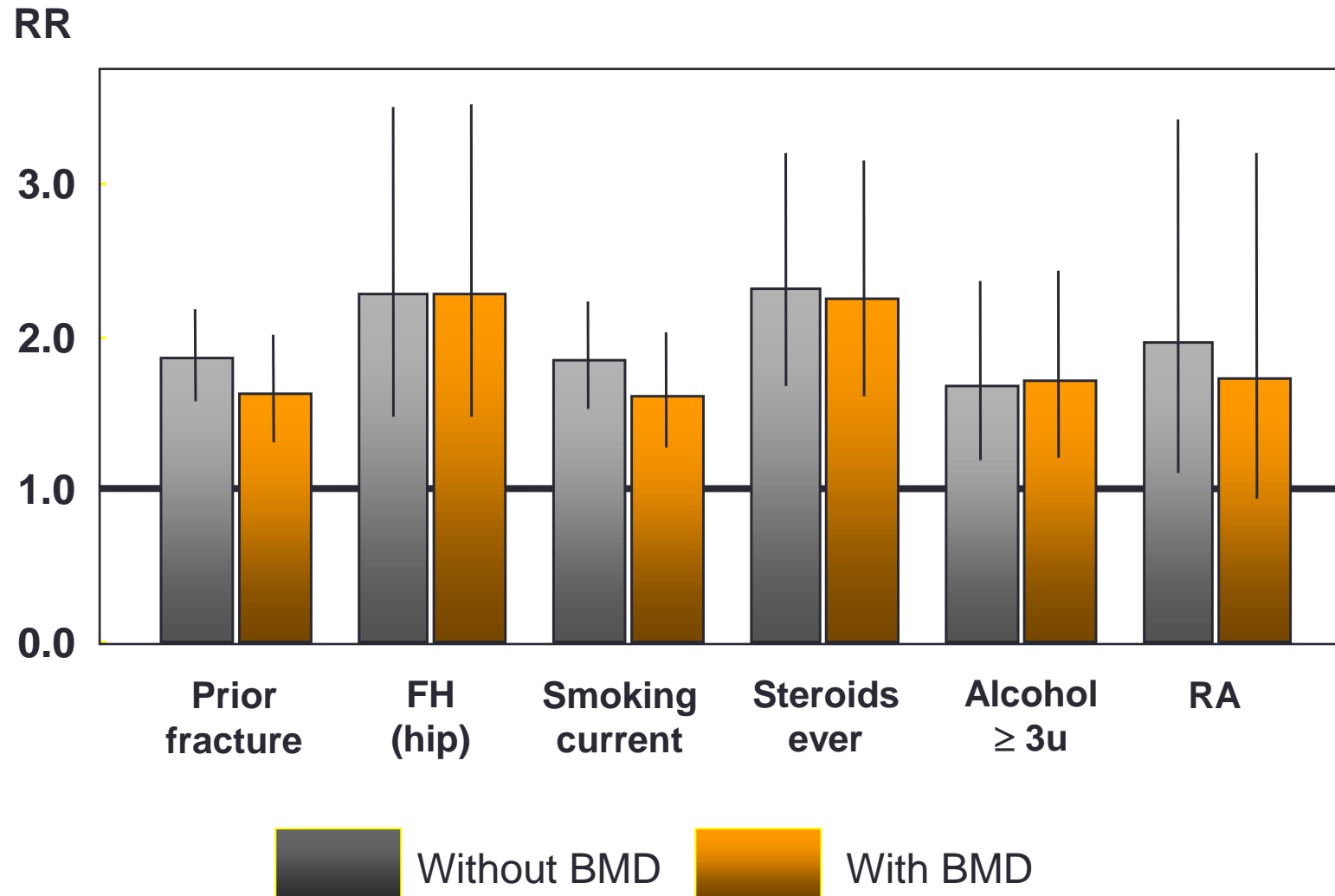


*Siris. Surgeon General's Workshop on Osteoporosis and Bone Health, December 2002*

# Femoral neck BMD and hip fracture prediction



# Risk factors for hip fracture in men and women



### Calculation Tool

Please answer the questions below to calculate the ten year probability of fracture with BMD.

Country: **Ukraine**

Name/ID:

[About the risk factors](#)

#### Questionnaire:

1. Age (between 40 and 90 years) or Date of Birth

Age:

Date of Birth:

Y:

M:

D:

2. Sex

Male  Female

3. Weight (kg)

4. Height (cm)

5. Previous Fracture

No  Yes

6. Parent Fractured Hip

No  Yes

7. Current Smoking

No  Yes

8. Glucocorticoids

No  Yes

9. Rheumatoid arthritis

No  Yes

10. Secondary osteoporosis

No  Yes

11. Alcohol 3 or more units/day

No  Yes

12. Femoral neck BMD (g/cm<sup>2</sup>)

Select BMD



Clear

Calculate



#### Weight Conversion

Pounds kg

Convert

#### Height Conversion

Inches cm

Convert

00038555

Individuals with fracture risk assessed since 1st June 2011

81 Country/Territory models

# FRAX Website 2008-2023 (accessed 15:00 28/04/23)

## Welcome to FRAX<sup>®</sup>

The FRAX<sup>®</sup> tool has been developed to evaluate fracture risk of patients. It is based on individual patient models that integrate the risks associated with clinical risk factors as well as bone mineral density (BMD) at the femoral neck.



Dr. John A Kanis  
Professor Emeritus,  
University of  
Sheffield

The FRAX<sup>®</sup> models have been developed from studying population-based cohorts from Europe, North America, Asia and Australia. In their most sophisticated form, the FRAX<sup>®</sup> tool is computer-driven and is available on this site. Several simplified paper versions, based on the number of risk factors are also available, and can be downloaded for office use.

The FRAX<sup>®</sup> algorithms give the 10-year probability of fracture. The output is a 10-year probability of hip fracture and the 10-year probability of a major osteoporotic fracture (clinical spine, forearm, hip or shoulder fracture).

### Clarification

The University of Sheffield launched the FRAX tool in 2008. At that time the University hosted the The World Health Organisation (WHO) Collaborating Centre for Metabolic Bone Diseases (1991-2010), and the FRAX tool is based on data generated from that centre. However, FRAX

### FRAX Desktop Application

Click here to view the applications available



### Web Version 4.3

View Release Notes  
UDI:  
(01)05065010474000(8012)4.3



### Links

[www.iofbonehealth.org](http://www.iofbonehealth.org)



[www.nof.org](http://www.nof.org)



[www.jpof.or.jp](http://www.jpof.or.jp)



[www.esceo.org](http://www.esceo.org)



**41759760**

Individuals with fracture risk assessed since  
1st June 2011



# Strengths and limitations of FRAX

**FRAX<sup>®</sup> Fracture Risk Assessment Tool**

Home Calculation Tool Paper Charts FAQ References CE Mark English

## Calculation Tool

Please answer the questions below to calculate the ten year probability of fracture with BMD.

Country: **UK** Name/ID:  [About the risk factors](#)

**Questionnaire:**

1. Age (between 40 and 90 years) or Date of Birth  
 Age:  Date of Birth: Y:  M:  D:

2. Sex  Male  Female

3. Weight (kg)

4. Height (cm)

5. Previous Fracture  No  Yes

6. Parent Fractured Hip  No  Yes

7. Current Smoking  No  Yes

8. Glucocorticoids  No  Yes

9. Rheumatoid arthritis  No  Yes

10. Secondary osteoporosis  No  Yes

11. Alcohol 3 or more units/day  No  Yes

12. Femoral neck BMD (g/cm<sup>2</sup>)  
 T-Score:

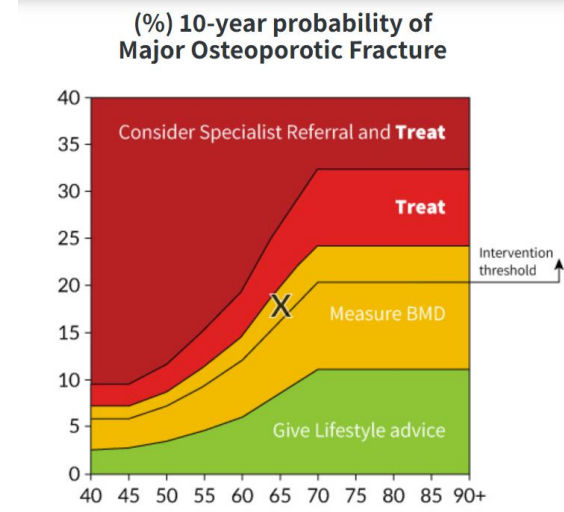
**BMI: 25.0**  
 The ten year probability of fracture (%)

with BMD	
Major osteoporotic	<b>11</b>
Hip Fracture	<b>2.3</b>

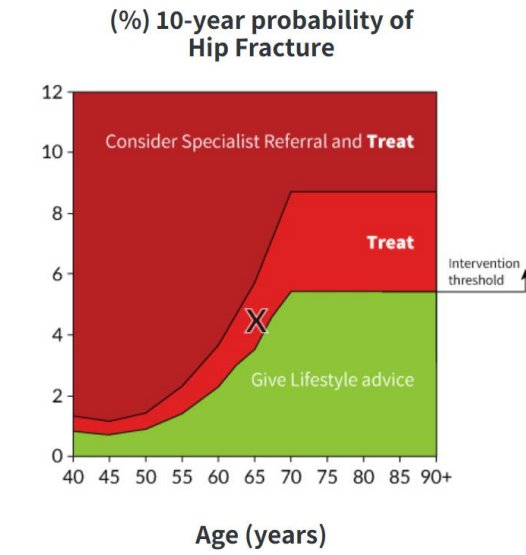
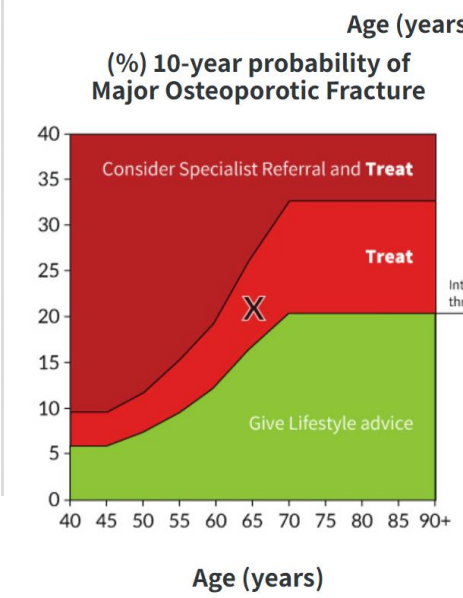
**Weight Conversion**  
 Pounds  $\leftrightarrow$  kg

**Height Conversion**  
 Inches  $\leftrightarrow$  cm

**09898686**  
 Individuals with fracture risk



**UK NOGG**  
 Assessment  
 and intervention  
 thresholds



# Limitations of FRAX

## No dose response

Glucocorticoids

Smoking

Prior fracture

## Some variables not considered

Diabetes

Falls

Lumbar spine BMD

Trabecular bone score

## Time dependency

Recency of fracture

# Limitations of BMD

- Does not accommodate all known risk factors
  - Age, fractures, falls, glucocorticoids, RA, biochemical markers, QUS etc.
- Lacks detail?
  - Interpretation of DXA, image quality, confounders etc.
- Depends on adequacy of epidemiological information
- Model relevant only for untreated patients?
- Does not replace clinical judgment

# FRAXplus® - Beta version

Please select one of the available adjustment algorithms:

Adjust probability according to recent fractures



Adjust probability according to the dose of oral glucocorticoids



Adjust probability according to TBS value



Adjust probability according to duration of diabetes



Adjust probability according to recent falls



Adjust major osteoporotic fracture probability according to differences between femoral neck and lumbar spine BMD T-scores



Adjusting FRAX hip fracture probabilities according to the hip axis length (HAL)



# FRAXplus® - Beta version

In addition to **FRAX score adjustments**, FRAXplus® offers many helpful features accessible via 'My FRAX':

## **1/** User Account

Enter and manage your personal data in order to save time when connecting in the future.

## **3/** History / Log

Keep track of your past tests to easily access a history of your activities and results.

## **5/** Send by email feature

An intuitive way to share your results by email.

## **2/** Results are saved

Your results, scores and risk variables will be saved in your personal user account for future reference and use.

## **4/** PDF export

Easily export your results in a pdf file to avoid transcription errors and any loss of data.

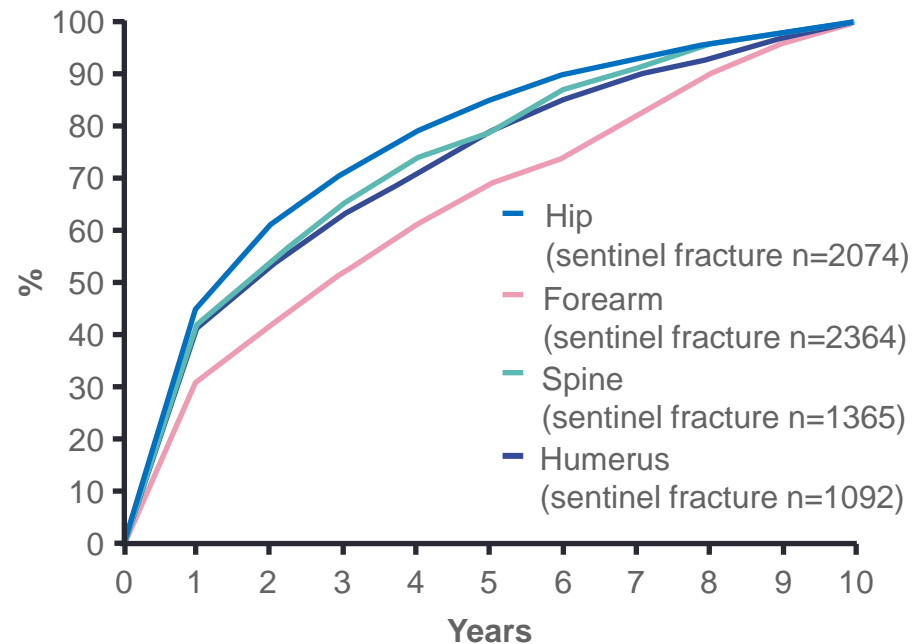
## **6/** Synchronisation between devices

Benefit from an automatic synchronisation of your results between several devices (phone, tablet, computer, etc.)

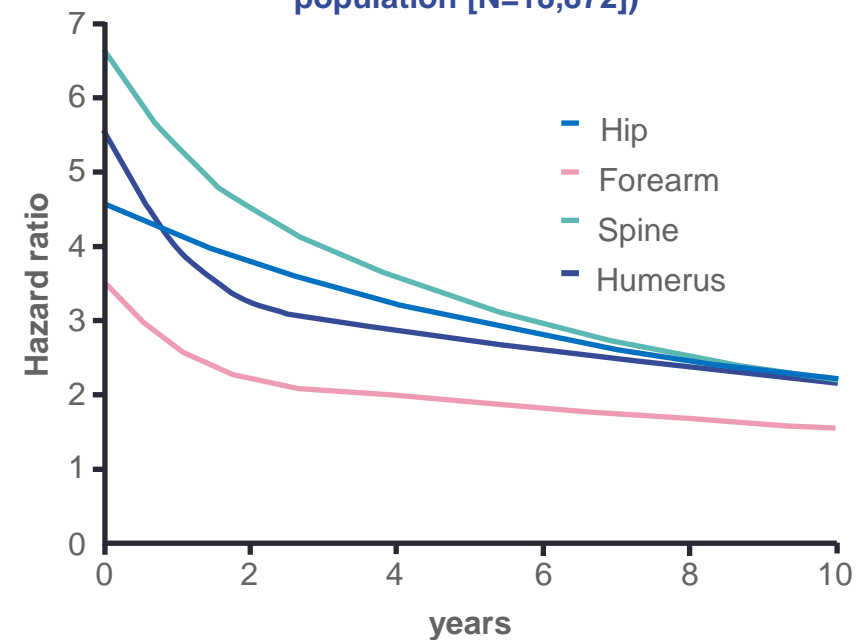
# Recency of fracture

## Recurrent fractures following individual sentinel fractures

Course of recurrent fractures in men and women

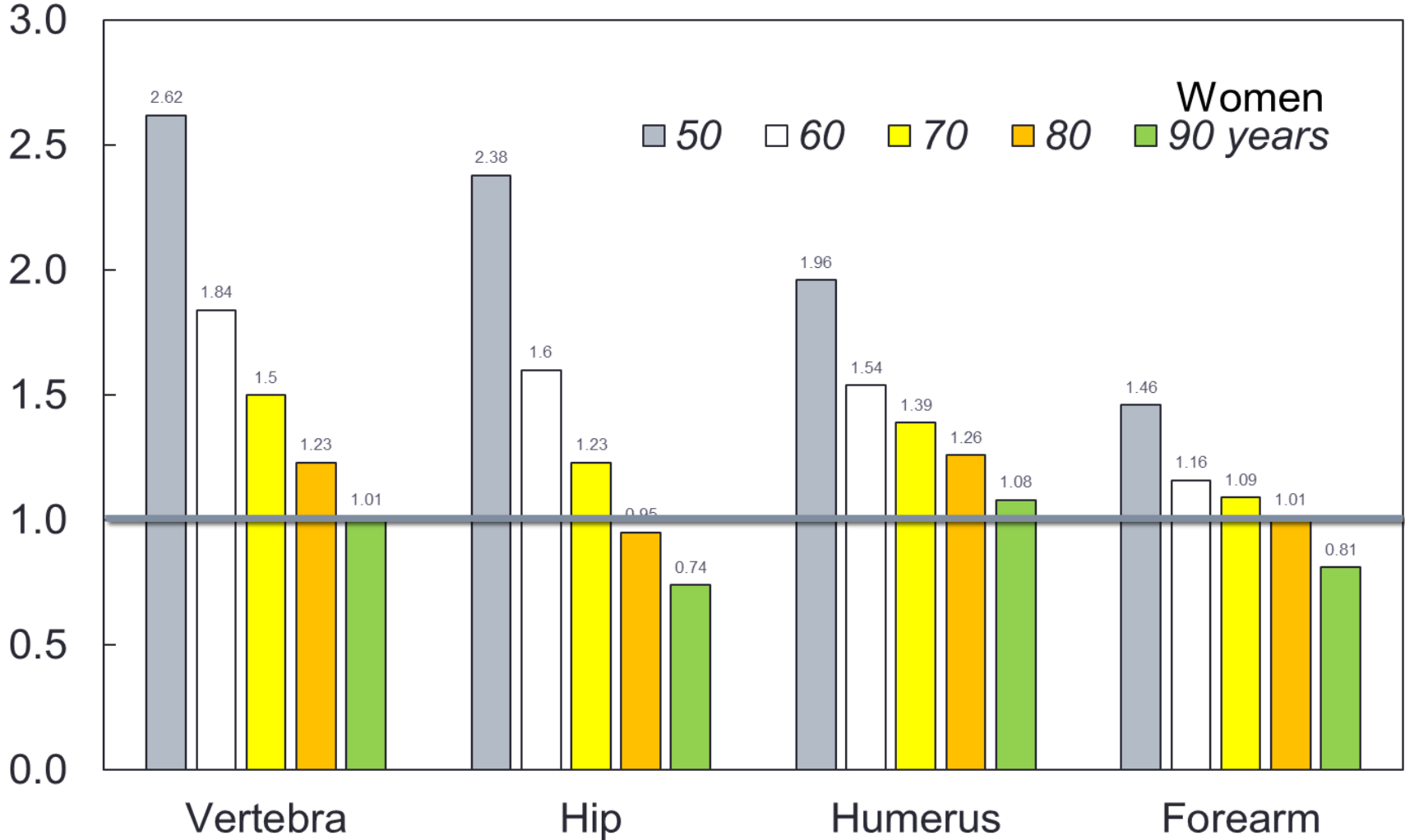


Hazard ratio (compared with whole population [N=18,872])



# Probability ratios for recency vary by sentinel fracture site

FRAX multiplier for MOF probability



# FRAX® and FRAXplus®

## Questionnaire

1. Age (between 40 and 90 years) or Date of Birth

2. Sex  Female  Male

3. Weight  kg

4. Height  cm

5. Previous Fracture  YES

6. Parent Fractured Hip  NO

7. Current Smoking  YES

8. Glucocorticoids  NO

9. Rheumatoid arthritis  NO

10. Secondary osteoporosis  NO

11. Alcohol 3 or more units/day  NO

12. Femoral neck BMD

Calculate

Clear

BMI : 30

with BMD

### THE TEN-YEAR PROBABILITY OF FRACTURE

Major osteoporotic 17%

Hip 5%

[View NOGG guidelines](#)

Adjust your results, try FRAX plus®

[What does FRAX plus® do ? Click here](#)



# FRAXplus® - Beta version

In addition to **FRAX score adjustments**, FRAXplus® offers many helpful features accessible via 'My FRAX':

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# Where next for FRAX?

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	FRAX <sup>1</sup>	FRAX2 <sup>2</sup>
Cohorts	9	64
Total	46,340	2,138,428
Person-years	189,852	≈ 20,000,000
% female	68	69
% Europe	56	69
Hip fractures	850	42,468
Osteoporotic fractures	4,168	194,369

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FRAX, Fracture Risk Assessment Tool.

<sup>1</sup>Kanis et al The use of clinical risk factors enhances the performance of BMD in the prediction of hip and osteoporotic fractures in men and women. (2007) Osteoporos Int 18:1033-1046

<sup>2</sup>Vandenput et al. Update of the fracture risk prediction tool FRAX: A systematic review of potential cohorts and analysis plan. (2022) Osteoporos Int (under review)

# Summary

- FRAX has become an established clinical tool, widely used in the assessment of fracture risk and treatment decisions
- Similar to all such clinical tools, FRAX has limitations that are well recognised
- Modification of existing risk factors is possible, though the level of evidence is lower (currently) than for FRAX itself
- The next generation of FRAX, including novel and updated existing risk factors, is being developed

