

# BROKEN BONES, BROKEN LIVES:

A roadmap to solve the fragility  
fracture crisis in Europe



# FOREWORD

With fragility fractures affecting one in three women and one in five men aged 50 or above, nearly everyone has a family member or friend who has been affected by a fragility fracture. Yet how many of us stop to question the true cause of fragility fractures and simply assume them to be a 'normal' sign of aging rather than the result of weakened bone? How many of us understand that an initial fracture may be a gateway to further fractures and should be treated as a warning sign and prompt us to seek out preventative treatment?

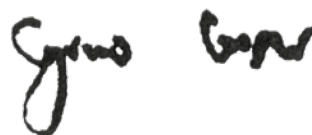
As Europe's population ages, the incidence and contribution of fragility fractures to the overall healthcare spend continue to increase. Every year, 2.7 million fractures occur across the EU6 nations (France, Germany, Italy, Spain, Sweden, and the UK) with an associated healthcare cost of €37 billion. This annual expenditure is predicted to increase by 23% (to €47 billion) by 2030.

Beyond the immediate distress, healing time, and recovery associated with a fracture, an initial fracture significantly increases the risk of subsequent fractures and can trigger a negative spiral of healthcare dependence, escalating expense, and impaired quality of life, despite the existence of treatments and programs for secondary prevention of fragility fractures.

This report, **Broken bones, broken lives: A roadmap to solve the fragility fracture crisis in Europe**, explores the clinical, societal, and cost burden associated with fragility fractures across the EU6 nations. The findings provide evidence that, despite the availability of effective preventative therapies and management approaches for fragility fractures, 60–85% of women do not receive appropriate care.

Secondary prevention of fragility fractures has been neglected for too long. There is an urgent need to recognize fragility fractures as a public health priority, and to establish secondary fracture prevention and management as an integral component of healthy aging.

In addition to providing the latest state of play of fragility fracture care, the report serves as a roadmap, which includes country-specific policy recommendations that can assist policymakers in offering the best possible care for their citizens in order to reduce the number of fractures and their impact on patients and healthcare systems.



Cyrus Cooper, IOF President

The International Osteoporosis Foundation (IOF) is a registered not-for-profit, non-governmental foundation based in Switzerland that has been granted Roster Consultative Status with the Economic and Social Council of the United Nations. IOF functions as a global alliance of patient societies, research organizations, healthcare professionals, and international companies working to prevent osteoporosis and fragility fractures worldwide. Striving for a world without fragility fractures, in which healthy mobility is a reality for all, IOF is dedicated to advancing research and education, promoting policy change, increasing awareness of bone health, and improving patient care.

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Full publication of the data included in this report is currently in development.

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## GLOSSARY

<b>BMD</b>	Bone Mineral Density
<b>CI</b>	Confidence interval
<b>COPD</b>	Chronic obstructive pulmonary disease
<b>CTF®</b>	Capture The Fracture®
<b>DALY</b>	Disability-adjusted life year
<b>EU6</b>	France, Germany, Italy, Spain, Sweden, and the UK
<b>FLS</b>	Fracture Liaison Service
<b>GDP</b>	Gross domestic product
<b>ICER</b>	Incremental cost-effectiveness ratio
<b>ICUROS</b>	International Costs and Utilities Related to Osteoporotic Fractures Study
<b>IOF</b>	International Osteoporosis Foundation
<b>MOF</b>	Major osteoporotic fracture (hip, spine, humerus, or forearm fractures)
<b>QALY</b>	Quality-adjusted life year



# EXECUTIVE SUMMARY

This report provides an overview and comparison of the burden and management of fragility fractures in six European countries (France, Germany, Italy, Spain, Sweden, and the UK), hereafter referred to as EU6. The aim of the report is not only to shed light on the burden of fragility fractures, but also to improve efficiencies in fragility fracture management and ultimately improve the care that patients deserve.

As European societies are slowly aging, preserving the independence and active lifestyles of the aging population has become a multifaceted challenge that technology, social initiatives, and healthcare policy can help tackle.

With **2.68 million new broken bones** every year in the EU6, fragility fractures are a major obstacle to healthy aging, impacting the independence and quality of life of **20 million women and men** living with osteoporosis.

Fragility fractures can be avoided, but their prevention and management have long been neglected despite the massive associated costs on healthcare systems (**€37.5 billion**). Fragility fracture costs exceed those of many other chronic diseases (e.g. chronic obstructive pulmonary disease [COPD], rheumatoid arthritis, hypertension) and are set to increase to €47.4 billion by 2030.

After a fragility fracture, patients are **five times** more likely to experience a second fracture within the next 2 years. Despite this, **60–85%** of women over 50 years of age with osteoporosis do not receive treatment. This massive treatment gap, which is consistently observed in all geographies, reflects the low importance that has been given to fragility fractures to date, creating an extreme urgency to prioritize post-fracture care in aging societies before costs get out of control.

As the number of fractures is expected to increase by 23% by 2030, **now** is the time to **break** the cost spiral, and take action to put an end to the dire consequences of fractures on patients.

Policies have a significant role to play in promoting, funding, and implementing care solutions, such as coordinated care models for patients following a fracture, with the most common coordinated care model being a 'Fracture Liaison Service', or FLS. The FLS model has been proven to be both clinically effective and cost-effective: reducing further fractures, and lessening the burden on both healthcare and individuals at a reasonable level of investment.

While coordinated care models appear as a universal solution to improve patients' diagnosis, treatment, and follow-up, local policy solutions adapted to the specificities of healthcare systems and policies – within and across countries – should also be considered. Each country-specific report that has been developed to complement this EU6 summary will include a roadmap prioritizing policy activities that can make a difference for patients with fragility fractures.





## DID YOU KNOW THAT...

- Osteoporosis (which means 'porous bone') is a disease that weakens the density and quality of the bone, thus increasing the risk of fracture. The loss of bone is symptomatically silent and progressive, until the first fragility fracture occurs due to a low-trauma event, such as a fall from standing height or even a minor bump<sup>1</sup>
- One in five men and one in three women aged  $\geq 50$  years will experience a fragility fracture in their remaining lifetime<sup>2</sup>
- A fragility fracture is a warning sign that has to be taken seriously: a fracture increases the risk of a subsequent fracture, which can occur at a different site<sup>3</sup>
- It is not only important to treat the existing fragility fracture but also to prevent subsequent ones, i.e. secondary fracture prevention<sup>4</sup>
- *"By missing the opportunity to respond to the first fracture, healthcare systems around the world are failing to prevent the second and subsequent fractures"* (Professor Kristina Åkesson)<sup>5</sup>

“

I was in constant pain and had major problems in my professional life.

Edmund, Germany



”

# THE SILENT BURDEN OF FRAGILITY FRACTURES FOR INDIVIDUALS AND HEALTHCARE SYSTEMS

## Fragility fractures affect men and women throughout Europe

### Prevalence of osteoporosis across the EU6

Approximately...

16 million

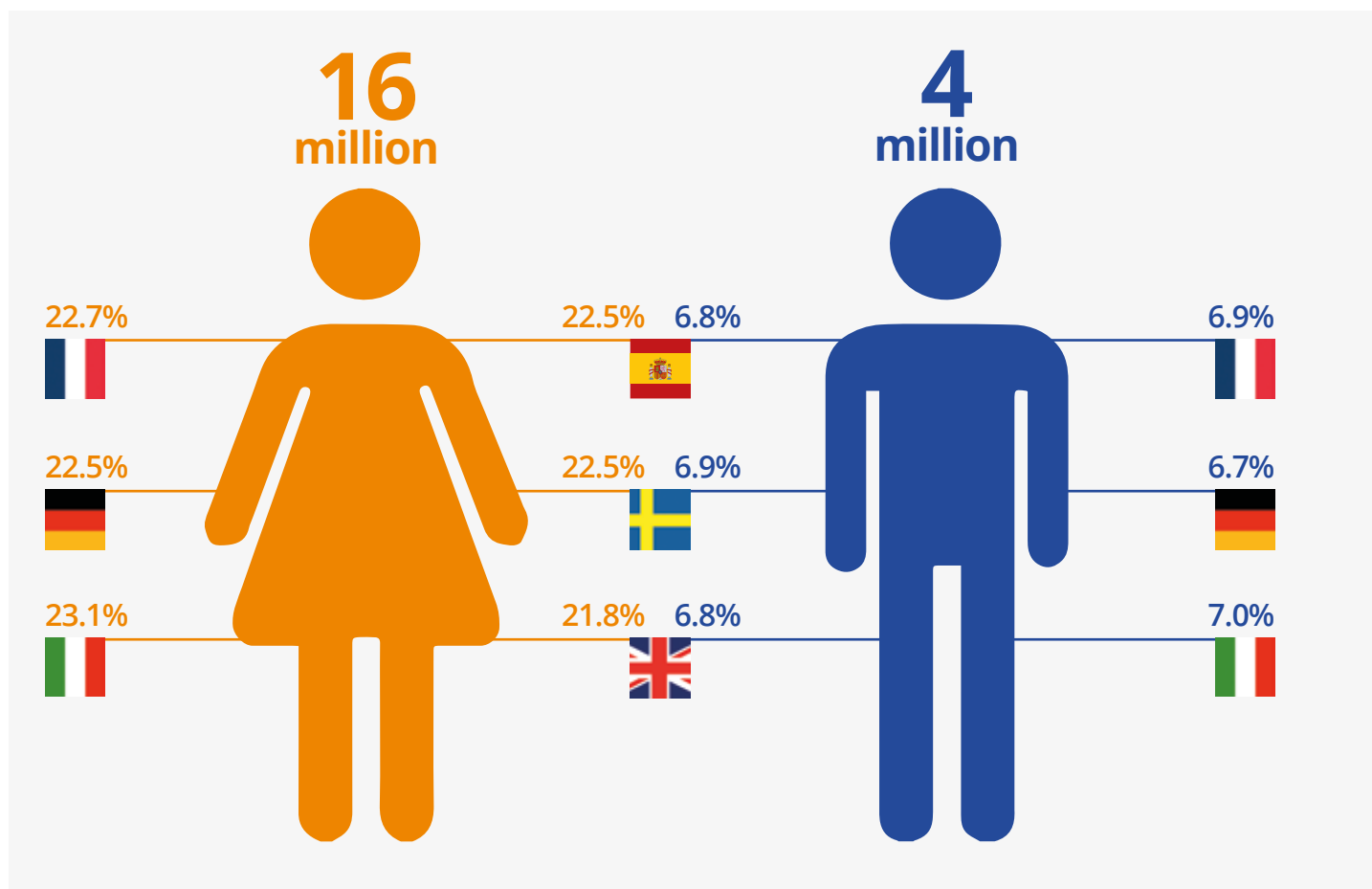


4 million



...have osteoporosis in the EU6 (assessed in 2015).<sup>6-10</sup>

Osteoporosis prevalence in adults aged ≥50 years is consistent across Europe:



## Lifetime risk of fragility fractures

The estimated lifetime risk of experiencing a hip fracture for:<sup>11</sup>



women aged 50 years is between

9.8% to 22.8%



men aged 50 years is between

6.1% to 13.7%

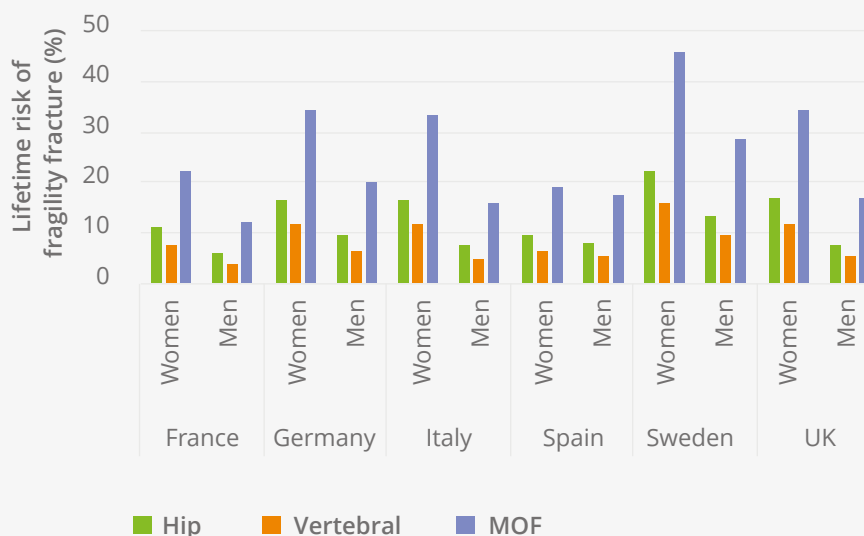
The lifetime risk of sustaining a fragility fracture varies for women and men, by fracture site, and by country.

There is a marked difference in the risk of fracture between the EU6 countries, with Northern European countries having the highest fracture rates observed worldwide.

The reasons for the difference in fracture risk between countries are unknown and cannot be explained by differences in bone density. However, plausible factors include differences in body mass index, low calcium intake, reduced sunlight exposure and, perhaps the most crucial factor, socio-economic prosperity, which, in turn, may be related to low levels of physical activity.<sup>12,13</sup>

Regardless of differences in fracture risk, the number of fractures in all countries is expected to increase due to an increasingly elderly population.

### Lifetime risk of fragility fracture from the age of 50 years, by country

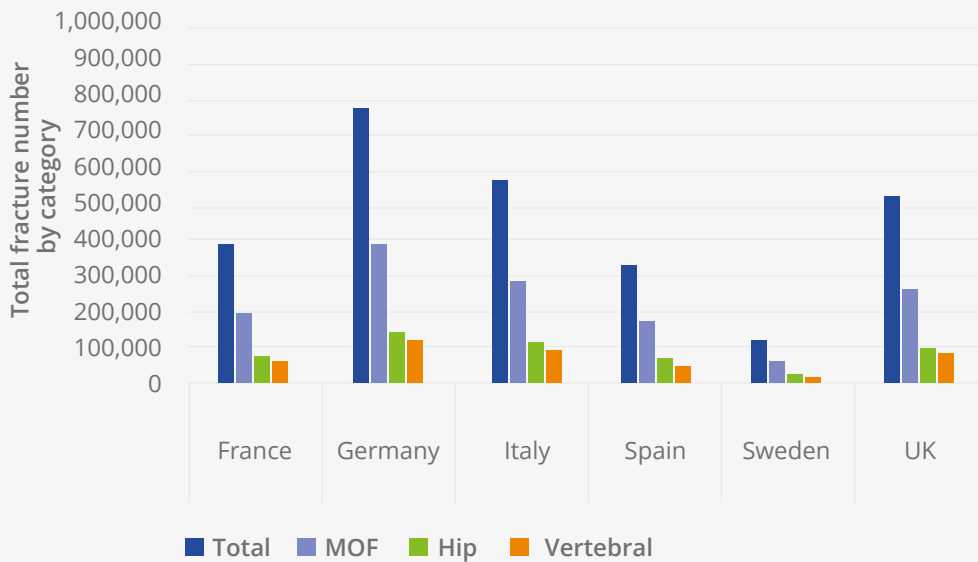




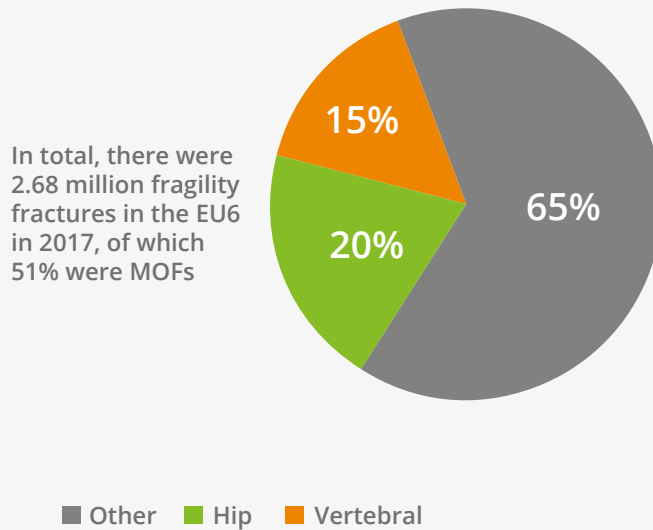
## Fragility fracture incidence

Across the EU6, approximately **3% of women over the age of 50** suffer a new fragility fracture every year.<sup>11,14</sup>

### Estimated number of fragility fractures by fracture category and country in 2017



### Total fragility fracture number and relative distribution across the EU6



## Fragility fractures incur substantial healthcare costs

### Fragility fractures are associated with significant healthcare costs

In 2017, fracture-related costs totaled an estimated **€37.5 billion** across the EU6 nations.

Fracture-related costs:<sup>15,16</sup>



mostly occur in the first year following a fracture



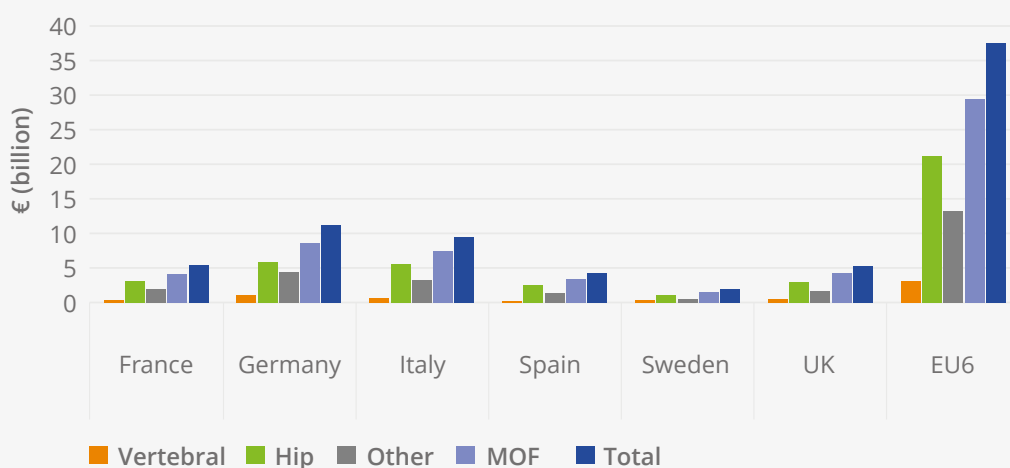
differ between fracture sites and, to some extent, reflect the severity of fracture



tend to be highest with hip fractures, as this is the most severe fracture site

Estimated annual fracture-related costs vary significantly by fracture site.

### Estimated annual fracture-related costs for the EU6 in 2017



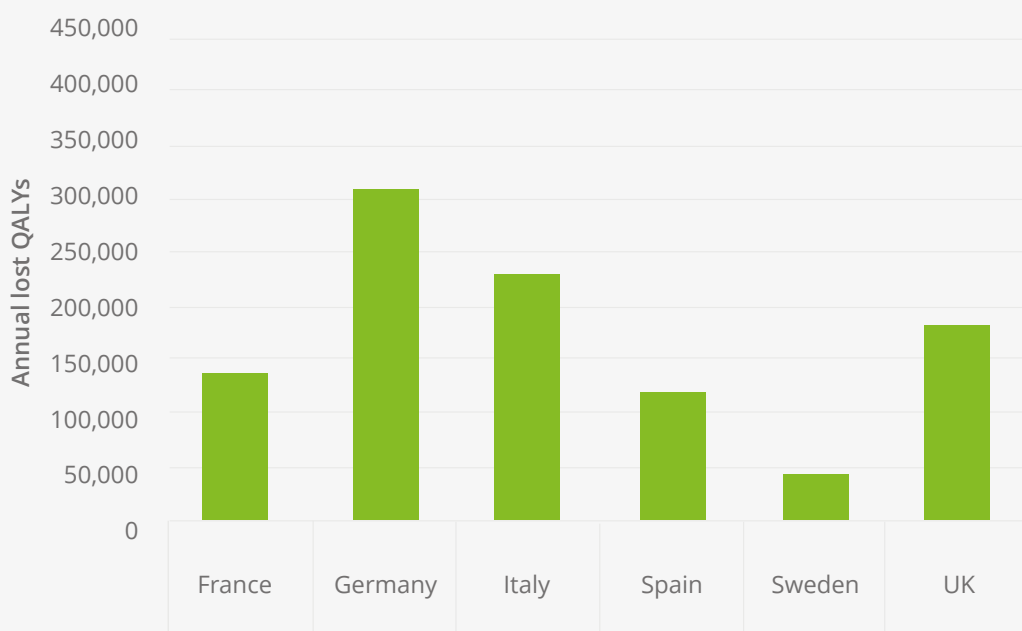
## Fragility fractures place a high burden on patients and healthcare systems

The burden of fragility fractures on individuals is demonstrated here with the annual loss of quality-adjusted life years (QALYs).

QALYs are a measure of the state of health of a person or group in which the benefits, in terms of length of life, are adjusted to reflect the quality of life. One QALY is equal to 1 year of life in perfect health. QALYs are calculated by estimating the years of life remaining for a patient following a particular treatment or intervention and weighting each year with a quality-of-life score (on a 0 to 1 scale). It is often measured in terms of the patient's ability to carry out the activities of daily life, and freedom from pain and mental disturbance.<sup>17</sup>

The loss of QALYs as a result of fragility fractures varies across the EU6 countries. These differences are largely driven by variations in the risk of fractures and age distribution between countries.<sup>11</sup>

**Total annual loss of QALYs by country in 2017**



## Fragility fractures have a multifaceted impact on the individual and society

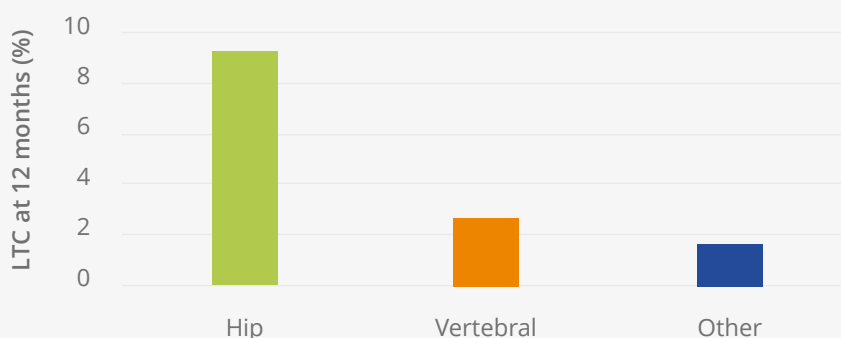
### Reduced independence and lifestyle impairment

Reduced independence can be one of the most distressing outcomes for fracture patients. The disability associated with hip fractures can be severe. One year after hip fracture, 40% of patients are still unable to walk independently, and 80% are restricted in other activities, such as driving and grocery shopping.<sup>18</sup>

A fracture not only affects people physically, but also emotionally. Knowledge of their increased fracture risk can negatively affect patients' outlook, causing them to change their levels of social interaction and to avoid certain activities: impairing their overall quality of life.<sup>19</sup>

The long-term loss of independence and mobility can put physical, emotional, and financial strain on patients themselves, as well as relatives and friends, potentially leading to the need for institutional care.<sup>20</sup>

**Proportion (%) in long-term care (LTC) at 12 months after a fracture by fracture type (ICUROS\* Europe)<sup>11</sup>**



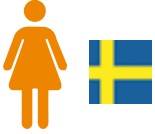
\*International Costs and Utilities Related to Osteoporotic Fractures Study Proportion (ICUROS) Europe: Austria, Estonia, Spain, France, Italy, and Sweden

The proportion of patients moving into LTC following a hip fracture increases significantly with age, from 2.1% at age 50–60 years and **35.3%** above 90 years.

## Fragility fractures can significantly impact the working population



My daily life has changed completely. I now walk with two canes. I can't bend down and I'm constantly in pain. I cannot carry things and, therefore, cannot go shopping. I miss my active life, very, very much.

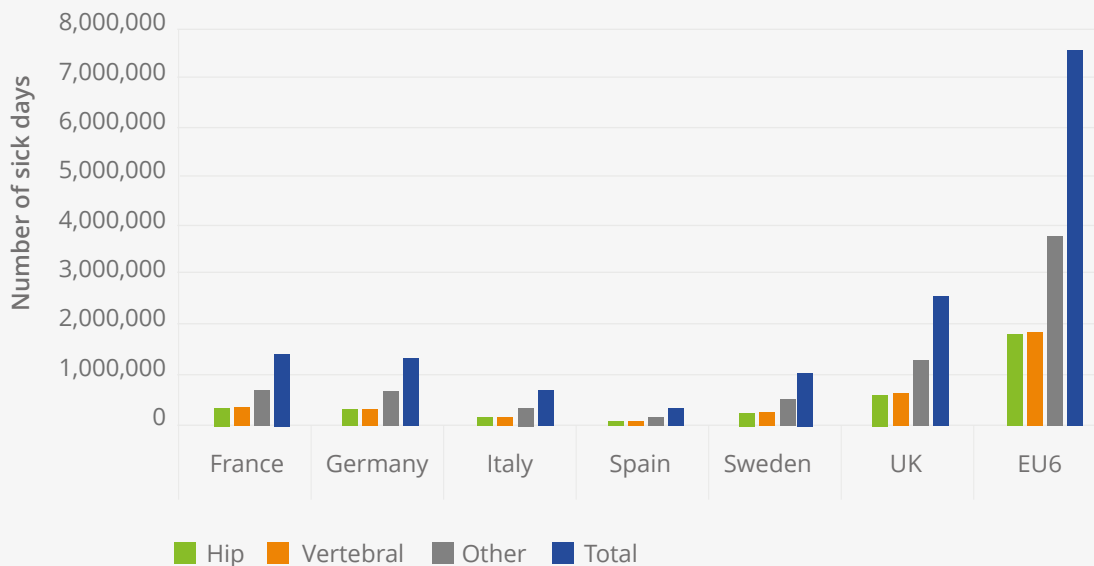


*Inger, Sweden*



Although fragility fractures mostly affect people in later life, by which time they have retired, there are a significant number of people of working age with the condition.<sup>21</sup> Sick days taken in 2017 by non-retired individuals in the EU6 due to fragility fractures totaled **7,615,720 days**.<sup>11</sup>

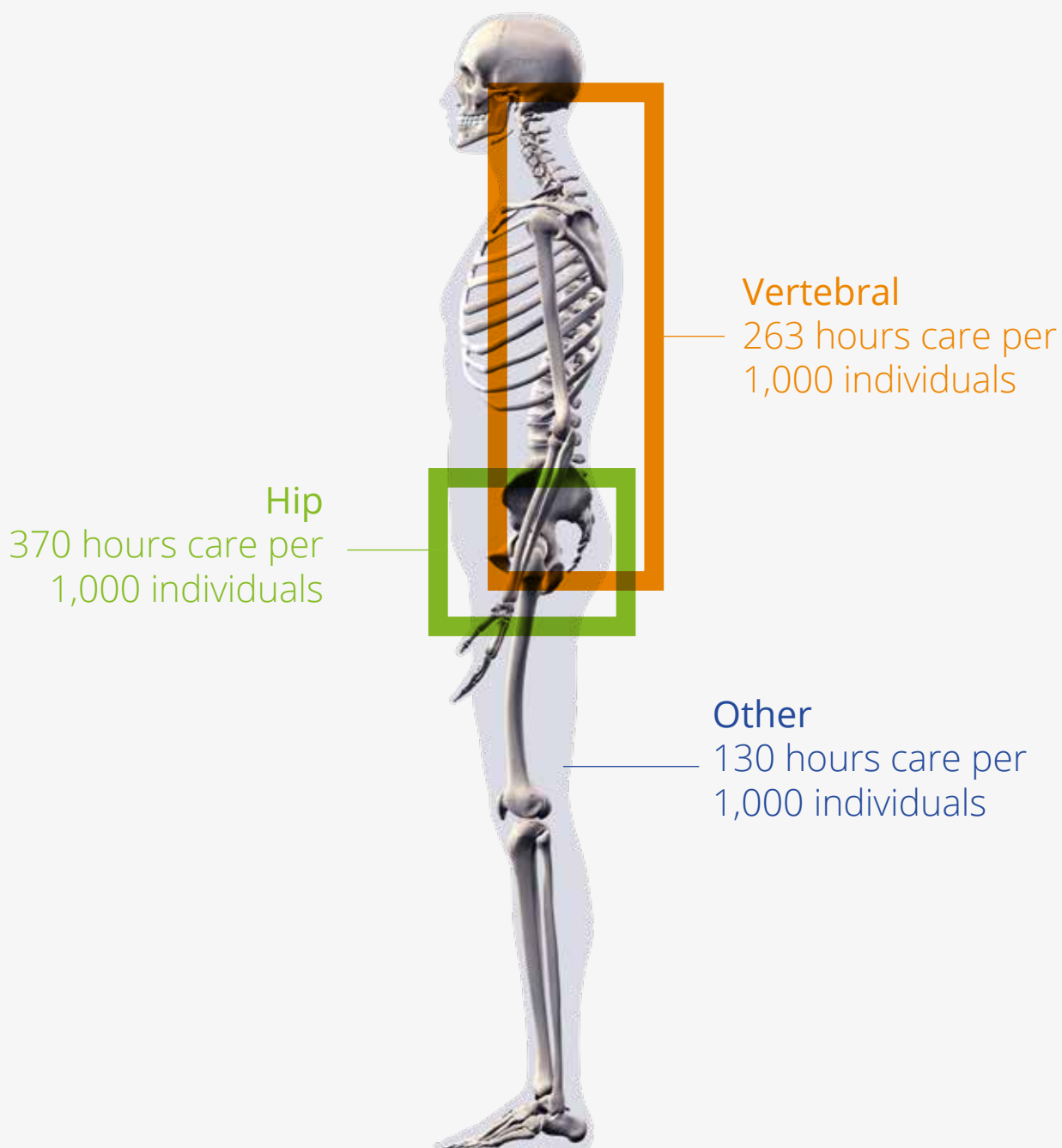
Number of sick days taken after a fragility fracture, by country



## Patients suffering fragility fractures depend on care from family and friends

As a result of reduced mobility and ability to complete activities of daily living, individuals who have suffered a fragility fracture may rely on informal caregivers, such as family members or friends.

During the first year after a fracture, the hours of care provided by relatives vary greatly by fracture type and country.\*<sup>11</sup> **The more serious the fracture, the more support is needed.**

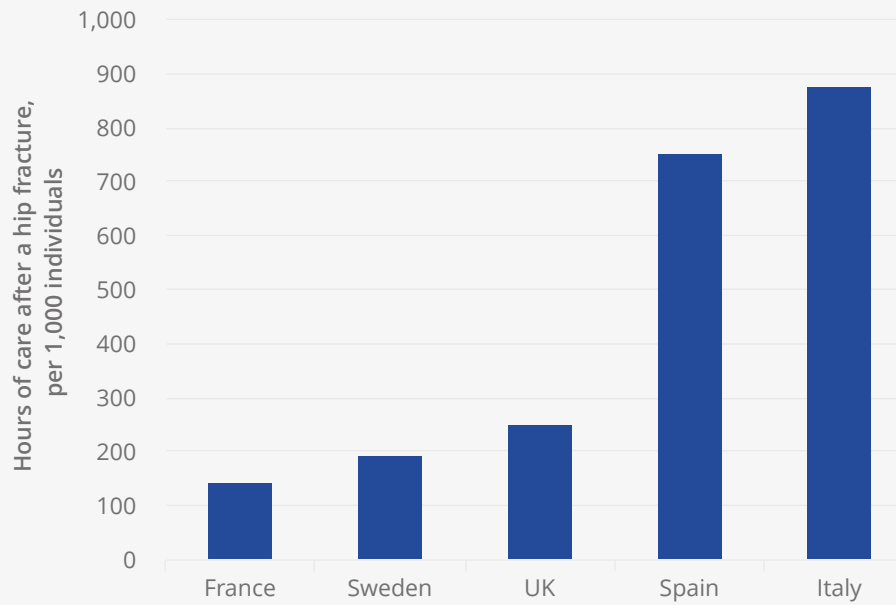


\*To measure the average burden placed on informal caregivers per year, survey responses from ICUROS<sup>22-24</sup> were also used to determine the caregiver burden due to osteoporotic fracture. It was measured in terms of hours of care per year provided by relatives in ICUROS Europe (a substitute measure for the EU6), as well as selected countries.



In countries where cross-generational support is more established, the impact of fragility fractures on caregivers is generally higher.<sup>25</sup>

Relative care hours related to hip fractures per 1,000 people, by country



# FRAGILITY FRACTURES IN THE CONTEXT OF PUBLIC HEALTH PRIORITIES



The latest fracture, which is my third, occurred when I had flu and coughed.

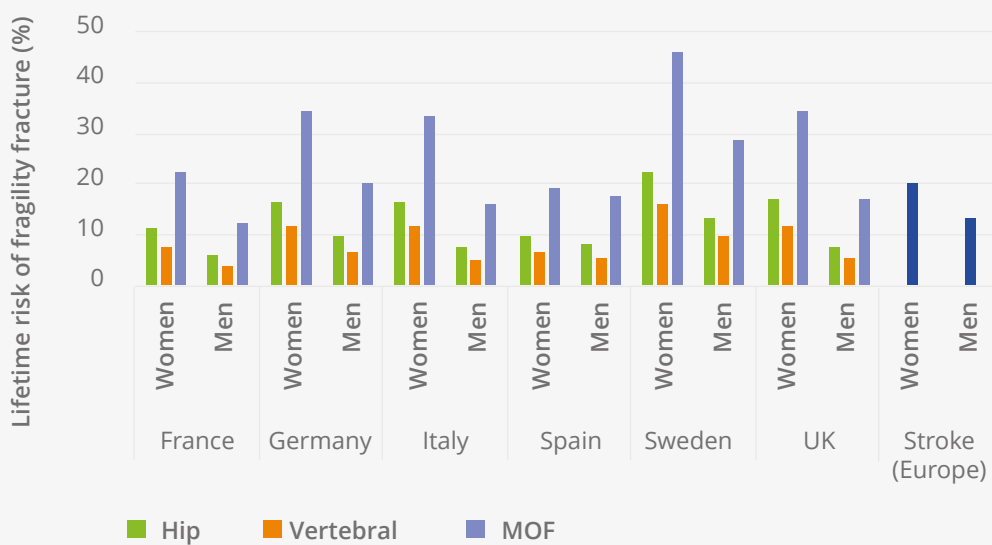
*Anita, Sweden*



Fragility fractures represent a health risk for individuals aged 50 or above, who **have similar chances of being affected by osteoporosis as they do of having high cholesterol or high blood pressure** (two major contributors to heart disease that affect 54% and 44% of people aged 50 or above, respectively).<sup>26</sup>

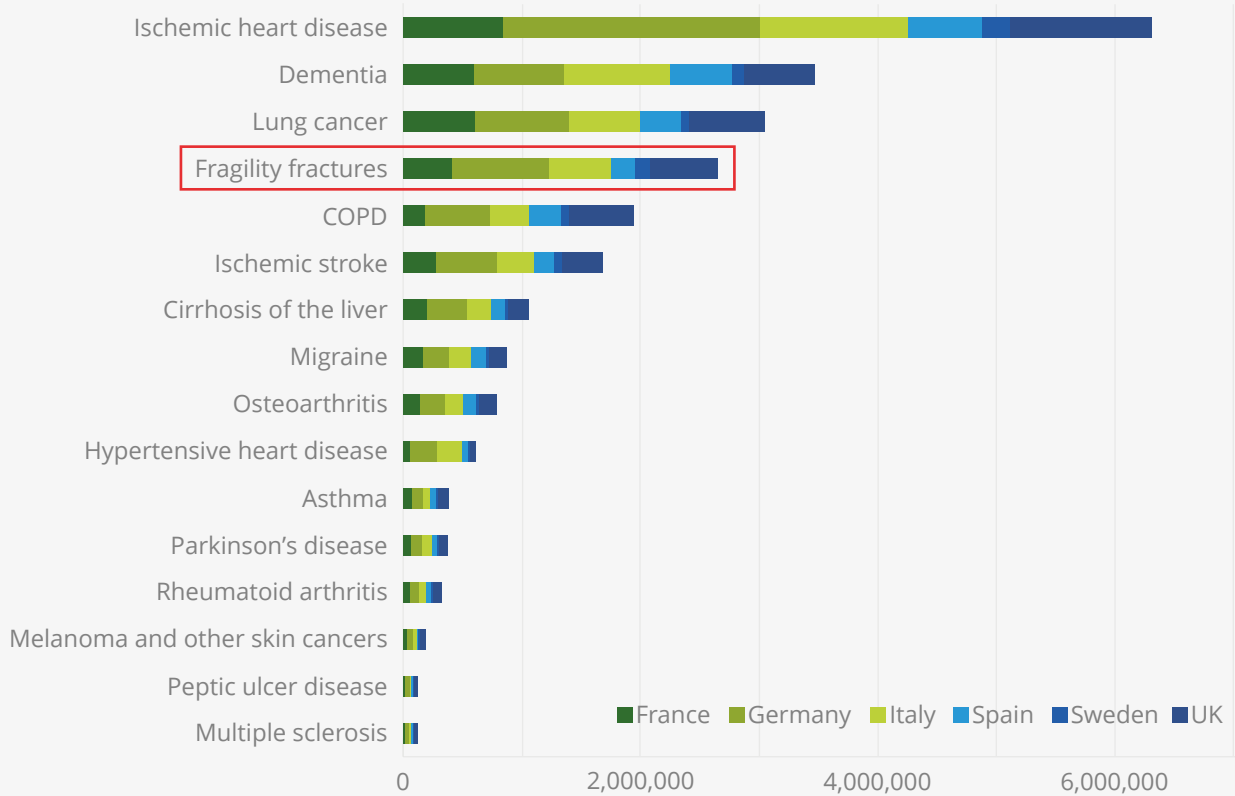
**The lifetime risk of sustaining a hip fracture is similar to the lifetime risk of a stroke in Europe** for both women (between 10% and 23% for hip fracture, and 20% for stroke) and men (between 6% and 14% for hip fracture, and 14% for stroke).

**Lifetime risk of fragility fracture from the age of 50 years, by country, and the equivalent risk of stroke in Europe**



The fragility fracture burden in the EU6 is greater than that of many other chronic diseases (including COPD). It is surpassed only by ischemic heart disease, dementia, and lung cancer.<sup>27</sup>

### Country contribution to total disability-adjusted life years (DALYs) by disease in the EU6 in 17 selected diseases

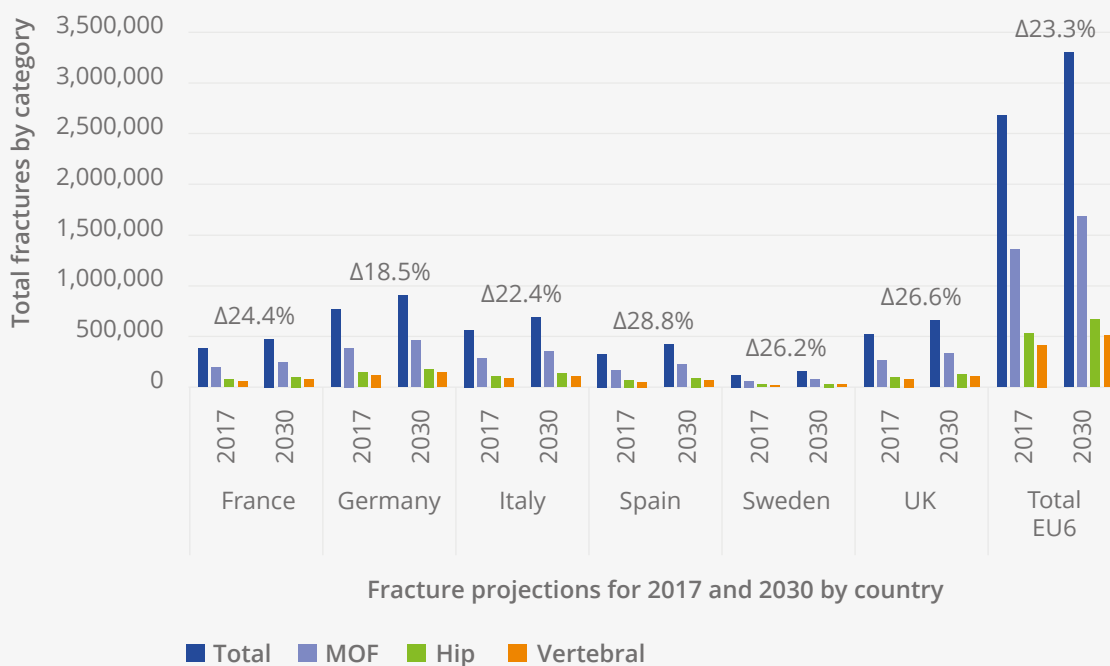


Fragility fractures are the fourth leading cause of chronic disease morbidity, rising from a ranking of sixth in 2009. Across the EU6, fragility fractures now account for more than 2.6 million DALYs (a measure of the impact of a disease or injury in terms of healthy years lost<sup>17</sup>) annually, more than for hypertensive heart disease or rheumatoid arthritis.<sup>6</sup>

# FRAGILITY FRACTURES ARE A GROWING CHALLENGE IN THE PUBLIC HEALTH LANDSCAPE

An ever-growing public health challenge is emerging: an estimated 2.7 million new fractures occurred in the EU6 during 2017, and the incidence of fragility fractures is expected to increase by 23% (by **over 3.3 million fractures annually**) between 2017 and 2030.

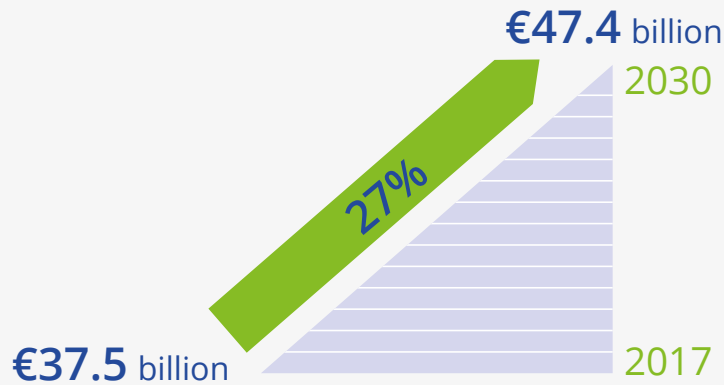
Estimated number of fragility fractures by fracture category and country in 2017 and 2030, including percentage change for all fragility fractures



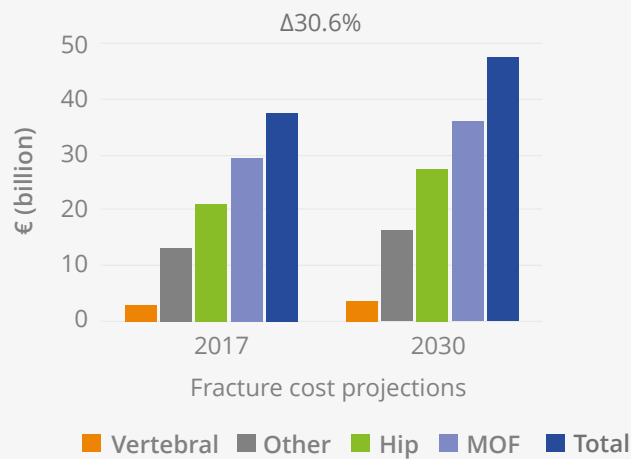
Δ percentage change for all fragility fractures

## Fracture-related costs are set to rise

Fracture-related costs are projected to increase between 2017 and 2030.<sup>11</sup>



### Estimated annual fracture-related costs in 2017 and 2030, and percentage change for the EU6



Although hip fractures make up **1/5** of total fractures, they are estimated to incur an estimated **56%** of total fracture-related costs

Across the EU6 countries, the greatest increases in costs are expected to be seen in:



Spain  
(30.6%) and



The UK  
(30.2%), with

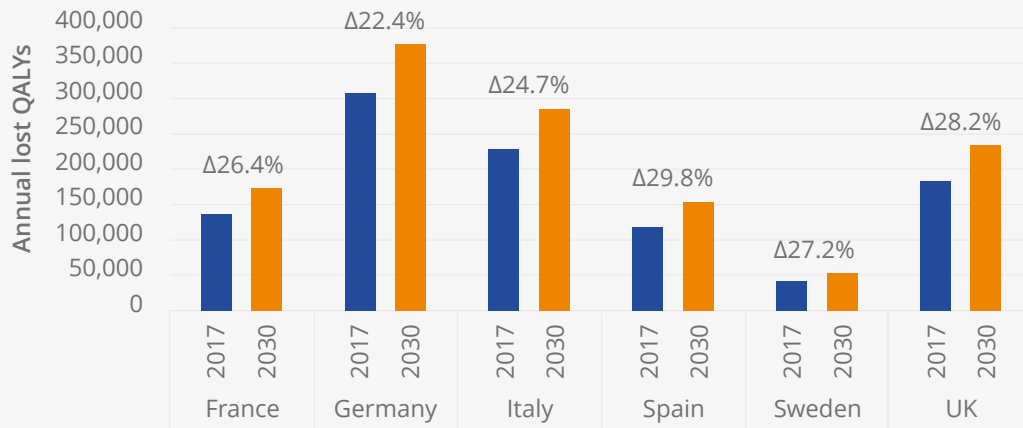


Germany expected  
to see the lowest  
increase (23.2%)

## Fracture-related patient burden is set to increase

Based on population projections, the QALY losses from 2017 up to 2030 across the EU6 have been estimated, showing an increase of approximately one-quarter over this time.<sup>11</sup>

### Total annual loss of QALYs by country in 2017 and 2030, and percentage change

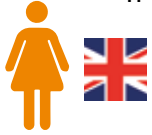


Δ percentage change for all fragility fractures





# EFFECTIVE MANAGEMENT CAN IMPROVE OUTCOMES AND REDUCE COSTS



If the fracture I suffered in my spine had been spotted earlier than it was, I would have been spared a great deal of pain and suffering.

*Christine, UK*



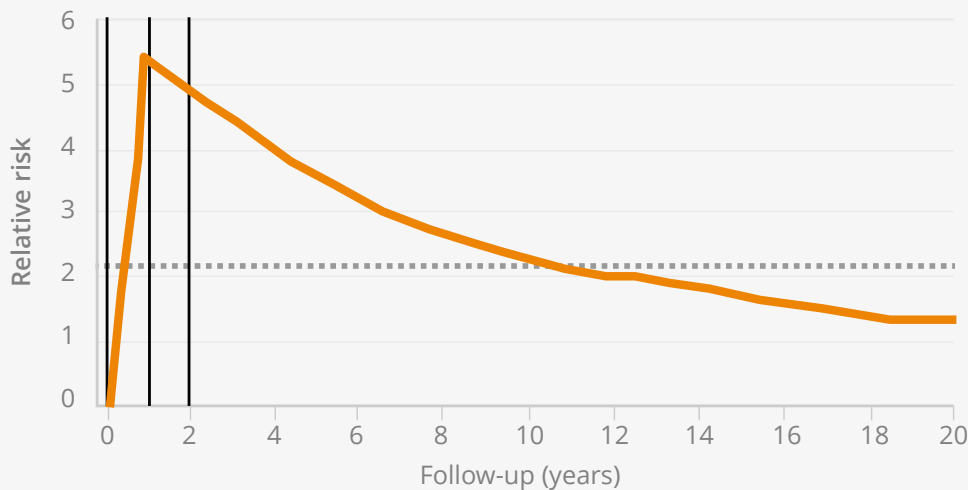
## One fragility fracture leads to another

For women aged 50 to 80, after their first fragility fracture, their risk of a subsequent fracture within the first year after a fracture is **five times greater** than women who have not had a prior fracture.<sup>28</sup>

Subsequent fracture risk is highest in the first 2 years following an initial fracture, when there is an **imminent risk** of another fracture at the same, or other, sites.<sup>29</sup> This is why it is critically important to identify patients as soon as possible after fracture to optimize fracture prevention treatments and keep the patient from having another fracture.

Similar patterns of imminent fracture risk have been observed in most countries evaluated,<sup>15,16</sup> but between-country comparisons are restricted by limited data availability.

Relative risk of all subsequent fractures calculated as a mean from the first fracture (grey line) and per separate year of follow-up (orange line)



Adapted from van Geel *et al.*<sup>28</sup>

## Most eligible patients do not receive treatment to prevent fragility fractures following their first fracture



There is indeed one thing I have learned: that an accurate diagnosis, which is relatively simple, can save women from a lot of suffering, fractures, and emotional damage.



*Carmen, Spain*

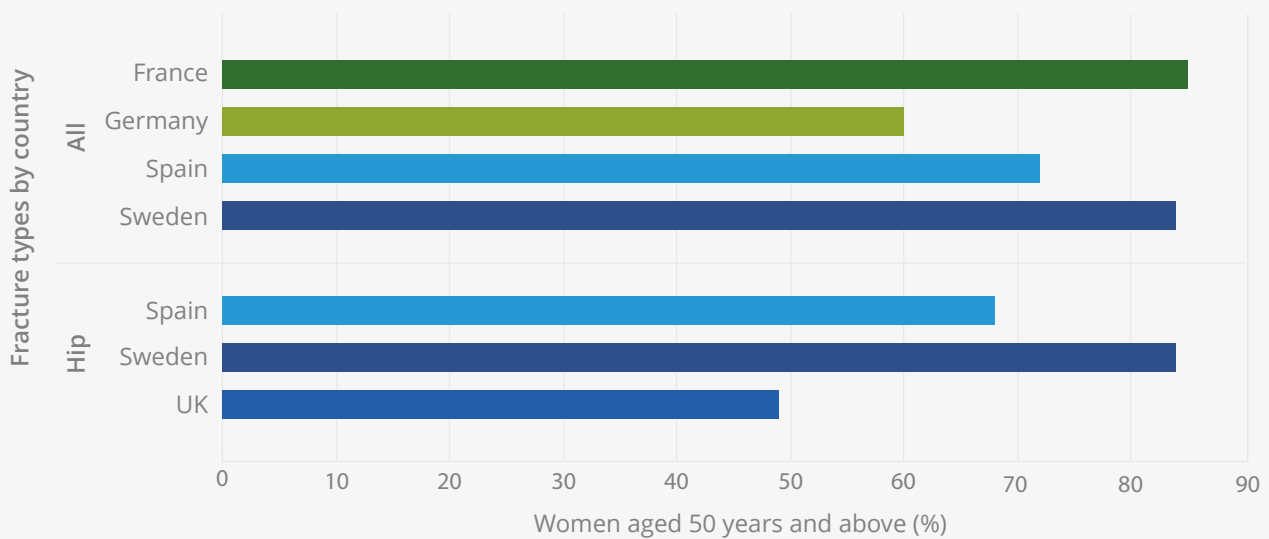


With appropriate medical treatment, many fragility fractures can be avoided.

The guidelines recommend that all patients should receive treatment after suffering a fragility fracture – unfortunately this is not always the case with **60–85% of women not receiving treatment following a fracture**.<sup>30</sup>

The proportion of women aged 50 years or more that are not treated within a year of an osteoporotic fracture varies by country.

### Proportion (%) of female patients (50 years and above) untreated within a year of osteoporotic fracture



## Multidisciplinary models for secondary fracture prevention can contribute to closing the treatment gap

Post-fracture coordinated care models, such as a Fracture Liaison Service (FLS), are multidisciplinary healthcare delivery models for secondary fracture prevention. Systematically, they aim to identify, diagnose, and treat (by referral) all eligible patients within a local population who have suffered a fragility fracture, with the aim of reducing risk of subsequent fractures. In the FLS model, care is usually coordinated by a dedicated, specialist nurse who helps patients navigate the way through the various departments of relevance (e.g. orthopedic surgery, radiology, and primary care).

Post-fracture coordinated care models, like FLSs, offer the potential for a **cost-effective care delivery model** that reduces the risk of re-fracture and mortality by increasing the number of patients being treated and improving adherence to treatment.<sup>5,31-36</sup> Data published from the FLS in Glasgow, Scotland, showed that FLSs are cost-effective for the prevention of further fractures in fragility fracture patients, resulting in fewer fractures and cost savings for healthcare systems.<sup>5,33</sup>

A recently published systematic literature review and meta-analysis based on 159 scientific publications highlighted the benefits of FLSs:<sup>37</sup>

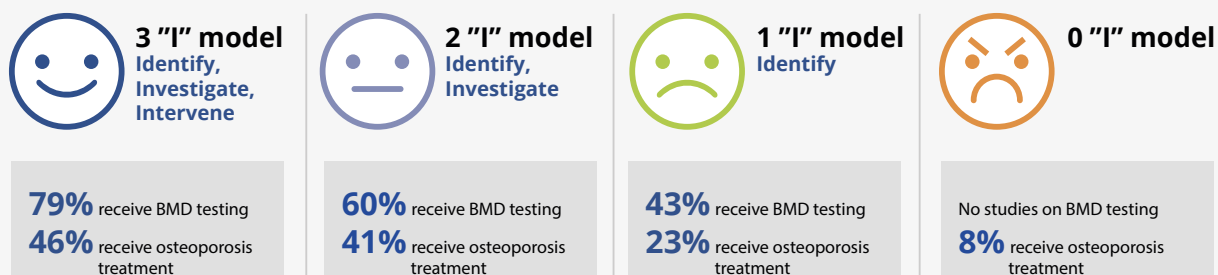
Outcome measure <sup>37</sup>	Effect of FLS (absolute change)	95% CI	Duration of follow-up (months)	Number of studies included
BMD testing	+24%	0.18 to 0.29	3-26	37
Treatment initiation	+20%	0.16 to 0.25	3-72	46
Treatment adherence	+22%	0.13 to 0.31	3-48	9
Re-fracture rate	-5%	-0.08 to -0.03	6-72	11
Mortality	-3%	-0.05 to -0.01	6-72	15

BMD, Bone Mineral Density

However, not all FLSs are the same between and within countries. FLSs vary in the services they offer, from identifying and informing patients without taking further action, to more comprehensive models that include investigating, treating, and monitoring patients. This variation in structure affects the level of impact on health outcomes.<sup>36</sup>

The effect of different models of care on osteoporosis treatment and frequency of BMD testing were evaluated in a meta-analysis by Ganda *et al.*<sup>38</sup>

A meta-analysis demonstrated that adoption of the 3 "I" model, with core priorities of Identify, Investigate and Intervene, offered greater effectiveness in patient assessment and treatment than 0-2 "I" models



Adapted from Ganda *et al.*<sup>38</sup>

The analyses by both Ganda *et al.* and Wu *et al.* showed **dramatic increases in BMD testing and osteoporosis treatment initiation**, which further support the value of post-fracture care coordination to prevent fragility fractures and reduce the overall cost of care for these patients.<sup>37,38</sup>

## Capture The Fracture® (CTF®): A global initiative of IOF

CTF® aims to 'facilitate the implementation of coordinated, multidisciplinary models of care for secondary fracture prevention'. CTF® has created a set of internationally endorsed standards and guides for best practice to bridge the gap between FLS providers and to help in the development and implementation of new FLSs. CTF® includes the largest network of individual FLS providers in the world. Providers undergo a CTF® audit to determine service quality, with a gold, silver, or bronze star awarded.

There are huge variations between and within countries in terms of the availability of coordinated care models. A CTF® survey reported that such models only existed for 2.8% of responders in Italy and up to 37.5% of responders in Sweden for hospital referrals, reducing to 1–10% for general practitioner referrals. In contrast, in the UK, the National Osteoporosis Society estimated that 55% of the UK population has access to an FLS.

## FLSs are a cost-effective option for patient management

The cost of improving patient outcomes within an FLS has been estimated to be:<sup>39,40</sup>



€14,029  
per QALY saved; ICER



€22,700–26,000  
per QALY saved;  
ICER post-hip fracture

ICER, incremental cost-effectiveness ratio (a statistic used to summarize the cost-effectiveness of a healthcare intervention)

A recent health economic analysis estimated that the comprehensive introduction of FLSs across the EU6 nations could achieve the following cost benefits:<sup>37</sup>

### Cost implications of extending an FLS to all individuals over 50 years across the EU6 nations



Based on an ICER value of €3,108 per QALY saved, the FLSs model to identify, evaluate, and treat patients with osteoporosis medications after fracture demonstrates that post-fracture care is a **significantly cost-effective interventional approach to improve overall outcomes and reduce costs**. By comparison, the ICER value for a stroke service model in post-stroke care was found to be €11,685 saved per QALY gained,<sup>41</sup> which showed that an FLS is markedly more effective than the more commonly utilized post-stroke care regimen.

The World Health Organization provides guidance on how an intervention with a benefit expressed in QALY value equivalent to 1 year's gross domestic product (GDP) per capita or less is considered to be reasonable expenditure, representing the likelihood of achieving at least 1 additional year of healthy life per capita.<sup>42</sup> With the GDP per capita in the EU6 ranging from €32,405 (Spain) to €56,935 (Sweden),<sup>43</sup> investment in FLSs is recommended as it qualifies as one of the most cost-effective interventions available to help manage the growing crisis of fragility fractures and osteoporosis.

## CLOSING REMARKS

This report, **Broken bones, broken lives: A roadmap to solve the fragility fracture crisis in Europe**, provides new evidence that the clinical, societal, and cost burden associated with fragility fractures across the EU6 nations remains a growing public health concern requiring urgent action.

All stakeholders involved in the development and implementation of initiatives to improve the prevention and management of fragility fractures have a role to play in protecting patients from further fractures. While there are isolated examples of positive initiatives by patient groups, healthcare institutions, and professionals, there is a need to up-scale our response to the silent threat of fragility fractures. Policies can accelerate this process by prioritizing care standards and funding to support the effective management of fragility fractures and avoid escalation of related costs.

In order to reflect the specificities of healthcare systems and policies, within and between-country reports have been developed to complement this EU6 summary. These country-specific reports include local data and tailored policy solutions designed to improve the prevention and management of fragility fractures, and make a difference for patients, family members, and friends.

“

I can no longer run to catch a bus. I no longer feel young.

*Maryvonne, France*



”



# ACKNOWLEDGMENTS

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Our vision is a world without fragility fractures,  
in which healthy mobility is a reality for all

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