BROKEN BONES, BROKEN LIVES:
A roadmap to solve the fragility fracture crisis in Germany
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 Germany’s population ages, the incidence and contribution of fragility fractures to the overall healthcare spend continue to increase. In 2017, 765,000 fractures occurred in Germany with an associated healthcare cost of €11.3 billion. This annual expenditure is predicted to increase by nearly 23.2% (to €13.9 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 Germany, explores the clinical, societal, and cost burdens associated with fragility fractures in Germany. The findings provide evidence that, despite the availability of effective preventative therapies and management approaches for fragility fractures, only 40% of German women aged 50 or above receive preventative treatment in the year following an initial osteoporotic fracture.

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 policy recommendations that can assist policymakers in offering the best possible care for German citizens in order to reduce the number of fractures and their impact on patients and Germany’s healthcare system.

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.

The development of this report has been supported by UCB. Full publication of the data included in this report is currently in development.
This report provides an overview of the burden and management of fragility fractures in Germany and compares the national reality to that of the EU6 nations (France, Germany, Italy, Spain, Sweden, and the UK). The report not only aims to highlight the burden and challenges posed by fragility fractures, but also to signpost opportunities for increased efficiencies in fragility fracture management and to realize improvements in patient care.

As Germany’s population ages, the challenge of preserving the independence and active lifestyle of the aging population has become a multifaceted challenge that technology, social initiatives, and healthcare policy can help tackle. With approximately 765,000 new broken bones occurring in Germany in 2017, fragility fractures are a major obstacle to healthy aging; affecting the independence and quality of life for more than 5 million women and men living with osteoporosis in Germany.

Fragility fractures can be prevented, but their prevention and management have long been neglected despite the massive associated costs on the German healthcare system (€11.3 billion in 2017) and these are set to increase to €13.9 billion by 2030. The burden of fragility fractures in Germany exceeds that associated with other major chronic diseases, such as dementia, stroke, and chronic obstructive pulmonary disease (COPD), and compares to that of lung cancer.

After a fragility fracture, individuals are five times more likely to experience a second fracture within the next 2 years. Despite this, an estimated 60% of German women aged 50 and above remain untreated within a year of an osteoporotic fracture. Not unique to Germany, this massive treatment gap is observed consistently across Europe, reflecting the low importance that has been given to fragility fractures to date and the current urgency to prioritize post-fracture care in our aging societies before costs get out of control.

With life expectancy continuing to increase, fragility fracture incidence in Germany is predicted to increase by almost 18.5% 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. Coordinated care models, such as integrated care contracts, have proven effective: reducing further fractures and lessening the resultant burden on both individuals and the healthcare system.

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 between countries – should also be considered.

In recognition of the growing fragility fracture burden, the national roadmap for Germany calls for policy efforts to be focused on: increasing patient and political awareness of fragility fractures and opportunities to minimize the associated impact on individuals and society; greater multidisciplinary working to develop and deliver robust, integrated care models and improve consistency of care and long-term follow-up of high-risk patients.
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.

One in five men and one in three women aged 50 and above will experience a fragility fracture in their remaining lifetime.

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.

It is not only important to treat the existing fragility fracture but also to prevent subsequent ones, i.e. secondary fracture prevention.

“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).

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

Edmund, Germany

Prevalence of osteoporosis in Germany

Approximately...

4.2 million

1.1 million

...5.3 million people in Germany have osteoporosis.

Prevalence of osteoporosis in Germany (22.5% for women; 6.7% for men) over the age of 50 years is comparable to that of France, Italy, Spain, Sweden, and the UK, which together with Germany are hereafter referred to as the EU6 nations.
Lifetime risk of fragility fractures

At the age of 50 years, the remaining lifetime risk of a major osteoporotic fracture for German citizens is slightly higher than that of the collective EU6 population. The lifetime risk of sustaining a fragility fracture varies for women and men and by fracture site.

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

Fragility fracture incidence

An estimated 765,000 fragility fractures occurred in Germany in 2017. The total number for fractures reflects the totals for hip fractures, vertebral (clinical spine) fractures, other MOFs, and ‘other’ osteoporotic fractures in both men and women. MOFs include hip, vertebral (clinical spine), forearm, and humerus fractures. For this analysis, ‘other’ osteoporotic, or non-MOF, fractures include fractures of the pelvis, rib, tibia, fibula, clavicle, scapula, sternum, and other femoral fractures.

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

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.

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

Estimated number of fragility fractures in Germany and the EU6 in 2017, by fracture category

- **Germany:**
  - Hip: 16%
  - Vertebral: 19%
  - Other: 65%
  - Total fragility fractures in 2017: 0.77 million, of which 51% were MOFs

- **EU6:**
  - Hip: 15%
  - Vertebral: 20%
  - Other: 65%
  - Total fragility fractures in 2017: 2.68 million, of which 51% were MOFs

MOF, major osteoporotic fracture (hip, spine, humerus, or forearm fractures)
Fragility fractures incur substantial healthcare costs

Fragility fractures are associated with significant healthcare costs

In 2017, fracture-related costs totaled approximately €11.3 billion in Germany. Hospital admission and length of stay in secondary care following a fracture are important drivers of fracture-related costs.

Estimated annual fracture-related costs in Germany in 2017

Fracture-related costs mostly occur in the first year following a fracture.

Fracture-related costs differ between fracture sites and, to some extent, reflect the severity of fracture.

Fracture-related costs tend to be highest with hip fractures, as this is the most severe fracture site.

Total annual loss of QALYs across the EU6 nations in 2017

Fragility fractures place a high burden on patients and healthcare systems

The burden of fragility fractures on individuals can be demonstrated in terms of 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.

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.

The total health burden in 2017 due to fragility fractures in Germany is estimated to be 307,909 QALYs, 65% of which is attributable to fractures occurring among women.

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**Fragility fractures can significantly impact the working population**

Although fragility fractures mostly affect people in later life, an estimated 20% of fractures occur at pre-retirement age. In 2017, a total of 1.38 million sick days were taken in Germany among individuals of pre-retirement age affected by fragility fractures.27

An average number of 28 sick days are taken per 1,000 people following a fragility fracture in Germany, which is among the highest of all the EU6 nations.6

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**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.24

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.25

Several European studies have demonstrated the physical, emotional, and financial strains that long-term loss of independence and mobility can put on patients, their relatives, and friends, potentially leading to the need for institutional care, particularly in older age groups.24

Across Europe, the proportion of patients that move into long-term care (LTC) within a year of sustaining a hip fracture increases with age, from 2.1% at age 50–60 years to 35.3% above 90 years.6

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**Average sick days taken after fragility fracture per 1,000 people, by EU6 country**

- Germany: 35 sick days
- France: 25 sick days
- Italy: 20 sick days
- Spain: 15 sick days
- Sweden: 10 sick days
- UK: 5 sick days

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*International Costs and Utilities Related to Osteoporotic Fractures Study (ICUROS) Europe: Austria, Estonia, Spain, France, Italy, and Sweden*
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. The more serious the fracture, the more support is needed.

Vertebral
263 hours care per 1,000 individuals

Hip
370 hours care per 1,000 individuals

Other
130 hours care per 1,000 individuals

Fragility fractures represent a health risk for individuals aged 50, or above. In Germany, the lifetime risk of suffering a MOF at age 50 years (35% for women; 20% for men) is higher compared to the lifetime risk of a stroke for both women (20%) and men (14%) in Europe.

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An ever-growing public health challenge is emerging: an estimated 765,000 fragility fractures occurred in Germany in 2017 and the annual incidence is projected to increase to almost 1 million (907,000) by 2030.6

The predicted increase in fracture incidence in Germany (18.5%) is marked, although slightly lower than predictions for the EU6 average over the same period (23.3%).6

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 2.6 million DALYs (a measure of the impact of a disease or injury in terms of healthy years lost)23 annually, more than for hypertensive heart disease or rheumatoid arthritis.7

In Germany, an estimated 24 DALYs are lost per 1,000 individuals aged over 50 years due to fragility fractures. The German burden is higher than the national burden associated with other major chronic diseases of aging, such as stroke.23

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.32

Fragility fractures are a growing challenge in the public health landscape

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

FRAGILITY FRACTURES ARE A GROWING CHALLENGE IN THE PUBLIC HEALTH LANDSCAPE

DALYs per 1,000 people (aged over 50 years) by disease in Germany and the EU6

 Estimated number of fragility fractures by fracture category for Germany in 2017 and 2030
Fracture-related costs are set to rise

With life expectancy in Germany increasing, so too is the fragility fracture incidence and related use of healthcare services. Fracture-related costs in Germany are projected to increase by almost one-quarter (23.2%) between 2017 and 2030, comparable to the overall rate for the EU6 nations (27.7%).

Estimated annual fracture-related costs in 2017 and 2030, and percentage change for Germany

Fracture-related patient burden is set to increase

Based on population projections, the QALY losses associated with fragility fractures will increase between 2017 and 2030, with Germany facing an increase of 22.4% over the period; slightly lower than the EU6 average of 25.6%.

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

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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.11

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.11 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,21,22 but between-country comparisons are limited by data availability.

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

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

The DVO Guidelines recommend that all patients should receive treatment after suffering a fragility fracture10 – unfortunately this is not the case. The post-fracture treatment gap is large for all EU6 countries; in the year following an initial fracture, only 40% of women in Germany appear to receive treatment for subsequent fracture prevention.6

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

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. 200933
Multidisciplinary models for secondary fracture prevention can contribute to closing the treatment gap

Post-fracture coordinated care models, such as integrated care contracts and Fracture Liaison Services (FLSs), 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 intention of reducing risk of subsequent fractures. In the FLS model, care is usually coordinated by a dedicated, specialist nurse who helps patients navigate their way through the various departments of relevance (e.g. orthopedic surgery, radiology, and primary care).

Post-fracture coordinated care models, like integrated care contracts, can reduce the risk of re-fracture and mortality by increasing the number of patients being treated and by improving treatment adherence.\(^1\)\(^2\)\(^-\)\(^4\)\(^3\)

Data from the FLS in Munich, Bavaria, reported good diagnostic and treatment outcomes: 40% of orthogeriatric patients were diagnosed with osteoporosis for the first time at the clinic and 65% were discharged with an osteoporosis therapy.\(^4\)

At global level, a recently published systematic literature review and meta-analysis based on 159 scientific publications highlighted the benefits of post-fracture care models.\(^4\)

<table>
<thead>
<tr>
<th>Outcome measure(^4)</th>
<th>Effect of FLS (absolute change)</th>
<th>95% CI</th>
<th>Duration of follow-up (months)</th>
<th>Number of studies included</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMD testing</td>
<td>+24%</td>
<td>0.18 to 0.29</td>
<td>3–26</td>
<td>37</td>
</tr>
<tr>
<td>Treatment initiation</td>
<td>+20%</td>
<td>0.16 to 0.25</td>
<td>3–72</td>
<td>46</td>
</tr>
<tr>
<td>Treatment adherence</td>
<td>+22%</td>
<td>0.13 to 0.31</td>
<td>3–48</td>
<td>9</td>
</tr>
<tr>
<td>Re-fracture rate</td>
<td>−5%</td>
<td>−0.08 to −0.03</td>
<td>6–72</td>
<td>11</td>
</tr>
<tr>
<td>Mortality</td>
<td>−3%</td>
<td>−0.05 to −0.01</td>
<td>6–72</td>
<td>15</td>
</tr>
</tbody>
</table>

BMD, Bone Mineral Density

However, post-fracture care models tend to vary in terms of the services they offer between and even within countries. Some post-fracture care models focus on identifying and informing patients without taking further action, while others take a more comprehensive approach to investigating, treating, and also monitoring patients. This variation in structure affects the level of impact on health outcomes.\(^4\)

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.\(^4\)

The analyses by both Ganda et al. and Wu et al. showed dramatic increases in BMD testing and osteoporosis treatment initiation, which further supports the value of post-fracture care coordination to prevent fragility fractures and reduce the overall cost of care for these patients.\(^4\)\(^4\) In Germany, there are a number of coordinated care models available that have the potential to change the landscape of post-fracture care.

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 guidelines 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 (GP) referrals. In contrast, in the UK, the National Osteoporosis Society estimated that 55% of the UK population has access to an FLS.
Effective management can improve outcomes and reduce costs A roadmap to solve the fragility fracture crisis in Germany

Coordinated care models are a cost-effective option for patient management

Several studies have shown coordinated care models to be a cost-effective healthcare delivery form in European countries. Although not specifically evaluated for Germany, in Sweden and the UK the cost of improving patient outcomes through a coordinated care model has been estimated to be €46,747.\(^{47}\)

Cost implications of extending a coordinated care model to all individuals over 50 years in Germany

Based on a survey sent to number of coordinated care units in the EU6 enrolled in the IOF’s CTF® network, it is estimated that 10–25% of Germany hospitals and 1–10% of GPs report having a referral system for fracture patients. A recent health economic analysis suggested that the introduction of coordinated care models for all individuals aged over 50 could prevent an estimated 5,423 subsequent fragility fractures in Germany every year. Extension of coordinated care models in this way across Germany would result in an increase in annual care costs (€8.2 million), but also a gain of 2,335 QALYs.\(^6\)

The World Health Organization\(^48\) 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.

With the German GDP estimated to be €46,747,\(^{47}\) coordinated care models not only offer clear cost-effectiveness, but also the possibility of improved care for the German population.

A ROADMAP TO SOLVE THE FRAGILITY FRACTURE CRISIS IN GERMANY

As the Germany population ages and the number of elderly adults increases, so too is the expected burden of osteoporosis and associated fragility fractures. Despite this, osteoporosis prevention and treatment is not receiving the priority it deserves by the Government and relevant health policy officials. A joint stakeholder effort (involving physicians, health politicians, health insurances, patient organizations, and social welfare associations) is required to reduce the impact of fragility fractures for patients and the society. Only through joint working can the necessary structural changes in patient care delivery be implemented.

A number of improvements to osteoporosis care and healthcare policy in Germany must be implemented to realize a reduction in the threatened fragility fracture burden:

- Leaders in civil society, politics, and business must recognize the social and economic burden of fragility fractures, as highlighted in this report
- Consistent implementation of the DVO Medical Guidelines by all physicians treating patients with fragility fractures, e.g. orthopedic surgeons, rheumatologists, endocrinologists, osteologists, GPs, radiologists, internists, and geriatricians
- Include the dual X-ray absorptiometry bone density measurement for all high-risk patients within the statutory health insurance service catalog to ensure its proper reimbursement (as is the case in other European countries, such as Austria and France). High-risk patients can be defined as patients who are at risk of having another fracture in the next 1–2 years after a first fragility fracture
- Overcome the existing sectoral split between hospital and outpatient care through consistent use of coordinated care models, such as certified high-quality Integrated Doctor’s Networks (IDNs). There are 66 IDNs in Germany that combine healthcare professional expertise, with professional management, information technology platforms, communication to patients, and outcome evaluation. They are funded through incentive-based contracts by sick funds and by regional associations of sick fund-accredited physicians
- Consistent implementation of the newly established discharge management model within the daily treatment pathway to improve patients’ access to effective treatment. The new discharge management extends hospitals’ responsibilities to guide patient care following discharge from hospital. Through discharge letter recommendations, the new discharge management framework will help GPs identify appropriate follow-up osteoporosis screening and treatment for patients who have experienced a fragility fracture
- A disease management program focusing on osteoporosis (a structured treatment program) could foster a multidisciplinary approach to care, improve the quality of medical care for patients and close the current treatment gap
- Interdisciplinary collaboration is required to develop optimum treatment strategies as bone health transcends many medical disciplines (e.g. GPs, internists, endocrinologists, orthopedists, surgeons, radiologists, gynecologists, geriatriats, pediatricians, rheumatologists, psychologists, and laboratory physicians). The right framework conditions must be created to help foster such interdisciplinary working
• Innovative new treatment options should be listed among the special practice conditions after the Arzneimittelmarkt-Neuordnungsgesetz health technology appraisal process, so that access to innovative and effective therapeutics is not limited via ‘pharmaceutical budgets’ and restrictions on doctors’ ability to prescribe drugs.

• Education, information, and active involvement of patients through media and web-based communication platforms.

• Strengthen citizens’ bone awareness: citizens must be more ‘bone-conscious’ and be prepared to pay attention to, and actively participate in, their bone health.

• Actively support ‘functional training’ tailored to the needs of patients with osteoporosis and ensure availability of reimbursement through statutory health insurances.

• Active support of civil society organizations working within the field of osteoporosis, such as the patient organization BFO and social associations like Sozialverband.

• Establish more academic chairs with an osteological focus to help shape and inform the appropriate training of bone experts.

ACKNOWLEDGMENTS

IOF Steering Committee

Professor John Kanis, Emeritus Professor in Human Metabolism and the Director of the WHO Collaborating Centre for Metabolic Bone Diseases, University of Sheffield, UK

Professor Eugene McCloskey, Professor in Adult Bone Diseases, Department of Oncology and Metabolism, University of Sheffield, UK

Professor Nicholas Harvey, Professor of Rheumatology and Clinical Epidemiology, MRC Lifecourse Epidemiology Unit, University of Southampton, UK

Dr. Kassim Javaid, Associate Professor in Metabolic Bone Disease, Nuffield Department of Orthopaedics, Rheumatology and Musculoskeletal Sciences, University of Oxford, UK

Fredrik Borgström (PhD), Associate Researcher, Medical Management Centre, Department of Learning, Informatics, Management and Ethics, Karolinska Institutet, Sweden and Partner at Quantify Research, Sweden

IOF Consultation Panel

France

Professor Bernard Cortet (GRIO), Professor in Rheumatology, University Hospital Lille, France

Professor Thierry Thomas (SFR), Professor of Medicine and Head of the Rheumatology Department, University Hospital St. Etienne, France

Professor Laurent Grange (AFLAR), Professor in Rheumatology, University Hospital Grenoble, France

Germany

Professor Claus Glüer (DGO), Professor of Medical Physics, Department of Radiology and Neuroradiology, University Medical Center Schleswig-Holstein, Kiel University, Germany

Professor Andreas Kurth (DVO), Chief Orthopedic Specialist, Department of Traumatology, Orthopedics and Hand Surgery, Community Hospital Mittelrhein gGmbH, Germany

Professor Peyman Hadji (DVO), Head of the Department of Bone Oncology, Endocrinology and Reproductive Medicine, Krankenhaus Nordwest, Germany

Thorsten Freikamp (BfO), Managing Director, Federal Self-help Association for Osteoporosis (BfO), Germany

Italy

Professor Maria Luisa Brandi (FIRMO), Professor of Endocrinology and Metabolic Diseases and Director of the Operative Unit of Diseases of Mineral and Bone Metabolism, Medical School, University of Florence, Italy

Professor Stefano Gonnelli (SIOMMMS), Associate Professor of Internal Medicine and Director of the School of Specialization in Emergency Medicine and Urgency, University of Siena, Italy

Professor Giuseppe Sessa (SIOT), Professor of Orthopedics and Traumatology and Director of the Orthopedic Clinic of the Vittorio Emanuele Polyclinic, University of Catania, Italy
Spain
Dr. Josep Blanch Rubio (SEIOMM), Clinical Director of the Institut Blanch de Reumatologia, Spain
Professor Adolfo Diez-Perez (SEIOMM), Head Emeritus of Internal Medicine at the Hospital del Mar, Autonomous University of Barcelona, Barcelona, Spain
Rosario Martin Laguna, President of AECOSAR, Spain
Dr. Santiago Palacios (FHOEMO), Director of Instituto Palacios, Salud y Medicina de la Mujer, Spain

Sweden
Professor Mattias Lorentzon (SVOS), Professor in Geriatric Medicine, Institute of Medicine, University of Gothenburg, and Chief Physician, Osteoporosis Clinic at the Sahlgrenska University Hospital, Sweden
Lisa Keisu Lennerlöf (Osteoporosförbundet), Chair of Osteoporosförbundet, Swedish Osteoporosis Association, Sweden
Fredrik Borgström, MSc, PhD, Partner of Quantify, Stockholm Sweden

UK
Professor Cyrus Cooper, Professor of Rheumatology and Director of the MRC LifeCourse Epidemiology Unit, University of Southampton, UK and Professor of Musculoskeletal Science at the NIHR Musculoskeletal Biomedical Research Unit, University of Oxford, UK
Fizz Thompson (NOS), Clinical and Operations Director at National Osteoporosis Society, UK
Dr. Celia L Gregson, Consultant Senior Lecturer and Arthritis Research UK Clinician Scientist, Musculoskeletal Research Unit, Bristol Medical School, University of Bristol, UK

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