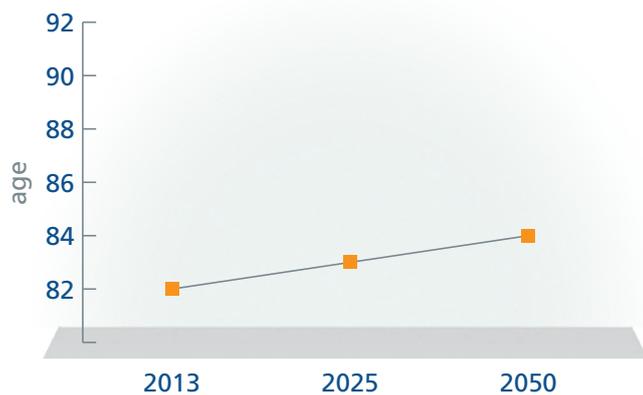


REPUBLIC OF KOREA

COUNTRY OVERVIEW

In 2013, the population of Korea was 48.9 million and an 11% decrease is expected by 2050. However, the proportion of the population in the age group most at risk for osteoporosis is expected to increase. Life expectancy will also rise from 80 years to 84 years (Figure 1). While currently 33% of the Korean population is aged over 50 years, in 2050 this will increase to 57%. Those aged over 70 years are projected to go from just 8% of the population today (4 million) to 28% in 2050 (12.2 million) – representing an increase of 200%¹ (Figure 2). Given the rate of increase seen in the elderly population in Korea is one of the highest in the world, the burden of osteoporosis is expected to escalate dramatically² (Figure 1).

FIGURE 1 Life expectancy in the Republic of Korea



State of osteoporosis/osteopenia

Korea is able to make fairly accurate determinations of disease prevalence in its population due to the national health insurance system that collects all health-care claims data into a central database, the *Health Insurance Review and Assessment Service (HIRA)*. According to the data collected in 2009, the number of people aged over 50 years being treated for osteoporosis was 6.1% for men, and 33% for women. Additionally, since 1989



CURRENT

Population **48.9 million**
 Aged over 50 years **33%**
 Life expectancy **80 years**
 Hip fracture incidence per year **207/100,000** (women)
 Cost per hip fracture **no data**
 Number of DXA per million population **24.5**
 Fracture liaison services **not implemented**

PROJECTED 2050

Population **43.4 million** ↓
 Aged over 50 years **57%** ↑
 Life expectancy **84 years** ↑

FIGURE 2 Population projection for the Republic of Korea



Korea's Ministry of Health and Welfare has been conducting – at a nationwide level – the *Korea National Health and Nutrition Examination Survey* (KNHANES) at three to four year intervals. The KNHANES is a national screening programme targeting chronic disorders in the population (aged 1 year and above). This national screening programme provides data on which to develop studies and research about various diseases, including osteoporosis, in the Korean population³.

The osteoporosis information collected from the KNHANES (2008-2009) indicated a similar prevalence of osteoporosis to that from the HIRA at 7.5% in men and 35.5% in women in those aged over 50 years (Figure 3). The KNHANES went a step further and estimated the prevalence of low bone density (according to World Health Organization (WHO) criteria) to be 47.2% and 46.7% in men and women respectively³.

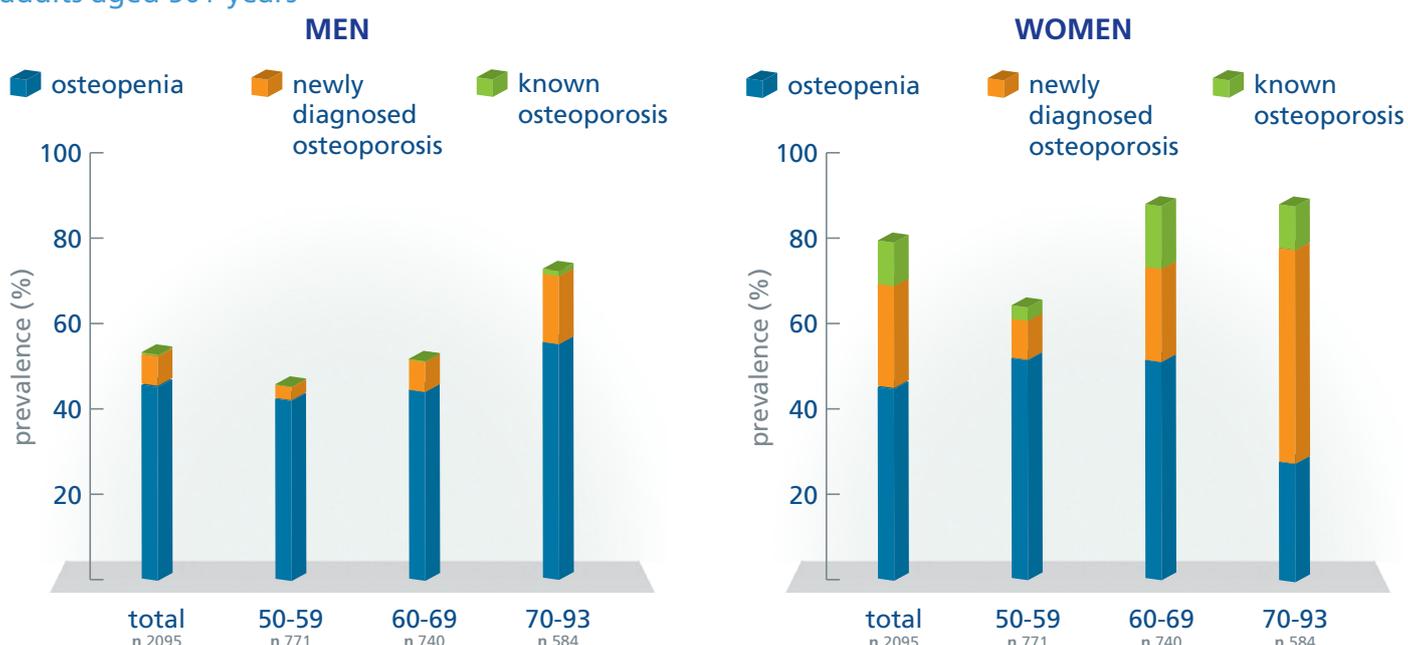
Lifestyle

Studies have found that Korean osteopenic and osteoporotic participants share common characteristics, which include: being older in age; having a lower height, weight and bone mineral density (BMD); as well as having

a lower household income and education level. In general, among women, those with osteoporosis were found to live in less affluent residential areas, had an increased prevalence of smoking, and exercised less frequently. One analysis of post hip fracture mortality rates found that Korean men had a higher rate of death one year after hip fracture than women, and all Koreans living outside of Seoul had a higher risk of dying within the first year after hip fracture than those living within the capital⁴.

Regarding vitamin D levels, it is more and more evident that deficiency is common in Korea's adolescents. This is a concern in that adolescence is an important period in life for building bone mass. One study found vitamin D insufficiency/deficiency (<30ng/mL) in 98.9% of boys and 100% of girls⁵. An expected explanation is lack of sunlight exposure, and in adolescents a hypothesis is that time engaged in outdoor activities is limited in order to study for the highly competitive entrance exams for high school and university. Another review of the 2008 KNHANES survey of men and women aged 10 years and older found that 86.8% of men and 93.3% of women were vitamin D insufficient. These studies reveal that vitamin D insufficiency or deficiency is common in the entire population of Korea⁵.

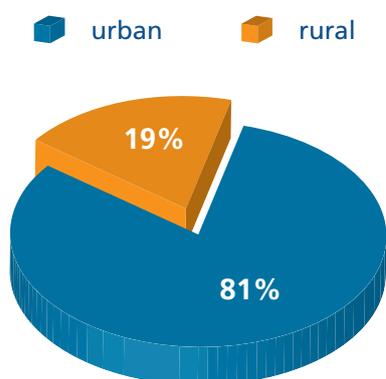
FIGURE 3 Prevalence of known and newly-diagnosed osteoporosis and osteopenia cases in Korean adults aged 50+ years³



SOURCE Figure reproduced from Choi Y.C et al. (2012 The Prevalence of Osteoporosis in Korean Adults Aged 50 Years or Older and the Higher Diagnosis Rates in Women Who Were Beneficiaries of a National Screening Program: The Korea National Health and Nutrition Examination Survey 2008–2009.

Another key consideration is the impact that urbanization will have on exacerbating risk for osteoporosis given that urban living can result in decreased exposure to sunlight, people being less physical active and eating unhealthily (Figure 4).

FIGURE 4 Urban versus rural population in the Republic of Korea⁶



Level of awareness

Awareness of osteoporosis in Korea is increasing. This is especially due to the KNHANES which, in addition to its traditional collection of data, added the collection of BMD measurements in women aged 40 and 66 years, in 2007³.

Due to the increased awareness brought about by KNHANES, the number of patients being treated for osteoporosis increased substantially – by 26.7% in women and 29.9% in men – between 2005–2008. However, osteoporosis is still under-diagnosed and under-treated. According to 2009 diagnostic and claims data from Korea’s national health insurance database (the HIRA as mentioned earlier), among women aged over 50 years with osteoporosis 30.3% were diagnosed and only 14.3% reported being treated⁷. It has been found that the osteoporosis treatment rate is similar to that of other countries. However, the treatment rate for osteoporosis within Korea was 12.8% lower than the treatment rate for other chronic diseases³.

Additionally, physicians have become more and more aware of osteoporosis and related treatments thanks to the numerous national osteoporosis-related organizations which provide education programmes for clinicians⁸.

FRACTURE RATES

Hip fracture

Reviews of Korea’s HIRA database have tracked trends in hip fracture over time for the past decade. Hospital claims data shows an increasing incidence in hip fractures in Koreans aged over 50 years. In women, hip fracture incidence rose from 146/100,000 in 2003 to 207/100,000 in 2008, and in men the increase went from 62/100,000 in 2003 to 98/100,000 in 2008^{2,4} (Table 1). However, when looking at the actual numbers of hip fractures over the five-year period, Koreans saw a 108% increase from 9,817 hip fractures in 2003 to 20,432 hip fractures in 2008, as the population of those aged over 50 years grew 24% during the same time period^{2,4} (Table 2).

The one year post-hip fracture mortality rate also increased in men and women, going from 16.6% in 2003 to 17.8% in 2007, and mortality rates after hip-fracture seem greater for Korean men than women (Table 3). Studies from 2005 to 2008 found the male mortality rate to be 1.4-times higher than that for females², and earlier studies from 2003 found the male mortality rate to be twice that of female rates⁴. Reasons suggested for this

TABLE 1 Increasing hip fracture incidence per 100,000 in Korean men and women over 50 years^{2,4}

	WOMEN	MEN
2003	146.38	61.72
2005	191.9	94.8
2008	207	97.8

TABLE 2 Number of hip fractures in Korean men and women over 50 years, during a 5-year period^{2,4}

	WOMEN	MEN	TOTAL
2003	6,892	2,925	9,817
2005	11,921	4,945	16,866
2006	12,843	5,134	17,977
2007	13,367	5,243	18,610
2008	14,538	5,894	20,432

TABLE 3 Mortality rate: deaths 1-year post hip fracture in Korean men and women over 50 years^{2,4}

	WOMEN	MEN	TOTAL	MORTALITY RATE
2003	1,065	560	1,625	16.6%
2005	2,117	1,049	3,166	18.8%
2006	2,292	1,121	3,413	19.0%
2007	2,166	1,141	3,307	17.8%

are that men have more comorbidities, higher infection rates, poorer osteoporosis management, and a higher risk of postoperative complications⁴.

Fracture incidence appears to be lower than in other Asian countries such as Chinese Taipei, Hong Kong, and Singapore, and also lower than in Western countries⁹. By contrast however, it is higher than in Malaysia and China^{2,4}. However, according to one study, hip fractures in Korea are projected to increase dramatically because, as mentioned earlier, the rate of increase of the elderly population in Korea is one of the highest in the world².

According to the Korean society for bone and mineral research, approximately 90% of hip fractures in Korea are managed surgically, and the average waiting-time for surgery is 1–2 days.

Other fragility fractures

A study of HIRA from 2005–2008 found that Koreans have a moderate residual lifetime risk for osteoporosis-related fractures, and at the age of 50 years, the probability of future fracture is 59.5% for women and 23.8% for men. Findings indicated that the incidence of osteoporosis-related fracture in women was 3 times that of men and osteoporosis-related fractures increased with advancing age (*Table 4*)¹⁰.

Vertebral fractures

A 2006–2007 community-based study of Koreans aged over 50 years living in rural areas was conducted (using vertebral morphometry) and found the standardized prevalence for vertebral fractures using the age distribution of Korean population was 8.8% in men and 12.6% in women⁹. The incidence of

TABLE 4 Incidence of fractures per 100,000 men and women Koreans over 50 years, site specific, 2008 data¹⁰

	WOMEN	MEN
Total	2,373	730
Hip	207	98
Spine	1,430	431
Distal radius	647	160
Humerus	110	47

vertebral fracture, according to the 2008 HIRA, was found to be 1,430/100,000 per year in women and 431/100,000 per year in men¹⁰.

Additionally, the KNHANES (2008–2009) study found that lumbar spine BMD T-scores tended to be lower than those of the femoral neck or hip, and the prevalence of osteoporosis was higher at the lumbar spine than the femoral neck or total hip³.

COST OF FRACTURE

Data not provided.

FRACTURE REGISTRIES

Korea does not have specific registries for the recording of fractures. However it is possible that a fracture registry could be derived from the central database of the government-mandated national health insurance system, which collects prescription medication and claims data on the entire Korean population, including data on osteoporosis care⁸.

FRACTURE LIAISON SERVICES

Korea does not have fracture liaison services implemented in its hospitals.

SPECIALISTS RESPONSIBLE FOR OSTEOPOROSIS

Osteoporosis care in Korea is managed by multiple specialities and is included as part of the medical specialty training for orthopaedic surgeons, gynaecologists, endocrinologists, internal medicine physicians and rheumatologists. In some cases, hospitals recognize osteoporosis as a medical specialty in itself. Other physicians that may also see osteoporosis patients

are the geriatric physicians, rehabilitation medicine physicians and general practitioners.

GOVERNMENT POLICIES

Osteoporosis as a documented national health priority

Osteoporosis is not documented as a national health priority in Korea.

Guidelines

While the Korean government has not produced official national guidelines on osteoporosis, the Korean Society for Bone and Mineral Research has published its own *Clinical Guidance on Management of Osteoporosis* in 2007, with updates in 2008, 2011 and 2013. The guidelines offer criteria for treatment of patients aged over 50 years, who have had a prior fracture and/or have a BMD value of -2.5 . The guidelines offered are generally compatible with reimbursement policies defined by the National Health System.

Audit and quality indicator systems

Korea does not have a system in place to measure the quality of care provided to people with osteoporosis or associated fractures.

TREATMENT (REIMBURSEMENT OF MEDICATION)

Since 1989, all Koreans are covered under the national health insurance (NHI) system. Treatments for osteoporosis are covered by the NHI for patients who are aged 50 years or older, have had a prior fracture, or have a BMD T score of ≤ -2.5 . Generally, the NHI covers 70% of the cost with the patient paying the balance of around 30%. An authorization is not required for reimbursement, and there are no specifically designated first-line treatments (*Table 5*).

DIAGNOSTICS

The Republic of Korea is well situated with dual-energy X-ray absorptiometry (DXA) equipment and has 24.5 machines per one million in population¹¹. The NHI limits reimbursement of DXA for osteoporosis screening to women aged 65 years or older, younger women with low body weight, evidence of early menopause, surgical menopause, and a past history or family history of non-

TABLE 5 Osteoporosis treatment availability and reimbursement levels in the Republic of Korea

	YES	NO	IF YES, % REIMBURSED
Risedronate	x		70%
Alendronate	x		70%
Ibandronate	x		70%
Zoledronic acid	x		70%
Clodronate		x**	
Pamidronate	x		70%
Raloxifene	x		70%
Bazedoxifene	x		70%
Denosumab		x**	
Strontium Ranelate		x**	
Teriparatide		x	
PTH (1-84)		x	
Vitamin D/Ca supplements	x		70%
Calcitonin*	x		70%
Hormone Replacement Therapy	x		70%
Testosterone		x	
Alfacalcidol	x		70%

*Elcatonin only Recently, calcitonin which extracted from salmon is out of market. Elcatonin which extracted from eel is reimbursing now.
**not available

traumatic fracture⁷. With these conditions met, DXA (which costs approximately 80 USD) is reimbursed by the NHI and access to a scan is usually immediate (*Table 6*).

For pre-screening, Korea has a FRAX model adapted for the Korean population to predict the 10-year probability of hip fracture. Additionally, a new screening model is under development called the Korean Osteoporosis Risk Assessment Model (KORAM), and when tested, 91.2% of patients with osteoporosis could be detected⁷.

RECOMMENDATIONS

- Osteoporosis is currently under-diagnosed and under-treated. Accordingly, it is critical that further effort is given to find more effective methods for

TABLE 6 Diagnostics access and cost in the Republic of Korea

	DXA	ULTRASOUND
Waiting time (d)	no wait	no wait
Cost (USD)	80	60
Is it reimbursed?	yes	yes
Is reimbursement a barrier to access to treatment?	no	no

the prevention, early detection and treatment of osteoporosis in both men and women⁷.

- Develop Korean reference BMD scores so sex-specific reference means and standard deviations for T-scores can be accurately calculated in the Korean population⁷.
- A national screening programme for osteoporosis in Korea may have contributed to an increased diagnosis rate in the sixties age group. Therefore, a large-scale screening programme for osteoporosis could help increase the diagnosis rate for osteoporosis³.
- Use the data collected regularly by the National Health and Nutrition Examination Survey (KNHANES) to develop quality indicators to measure the quality of care provided to people with osteoporosis and related fractures.
- Implement public health strategies to treat osteoporosis and to reduce fracture incidence. Measures should be implemented that target the indigenous elderly population in Korea⁴.

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