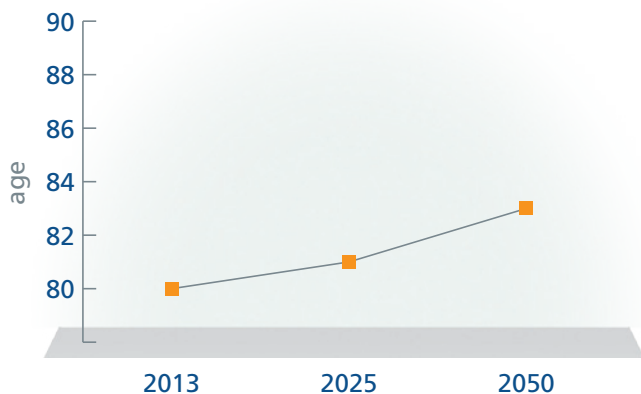


CHINESE TAIPEI

COUNTRY OVERVIEW

Thirty-two per cent (32%) of Chinese Taipei's men and women were aged over 50 years in 2013; equivalent to 7.5 million (of the 23.3 million total population) who are most at risk for osteoporosis. The average life expectancy of 80 years in 2013, is predicted to increase to 81 years and 83 years in 2025 and 2050 respectively (Figure 1). Projections show that while the total population will decrease by approximately 10% by the year 2050 to 20.8 million, the proportion of men and women aged over 50 years will increase drastically by 31% in 2025 and 59% in 2050 (Figure 2). This means that 42% of the Chinese Taipei population will be aged over 50 years in 2025, and over half (57%) will be aged over 50 years in 2050¹.

FIGURE 1 Life expectancy in Chinese Taipei



The population aged over 70 years is expected to increase by 189% by 2050, growing from 1.92 million in 2013 to 5.5 million in 2050. Combined with the fact that one in three women and one in five men over age 50 years are predicted to experience a fragility fracture in their remaining lifetime, the burden of osteoporosis will continue to grow in Chinese Taipei².



Chinese Taipei

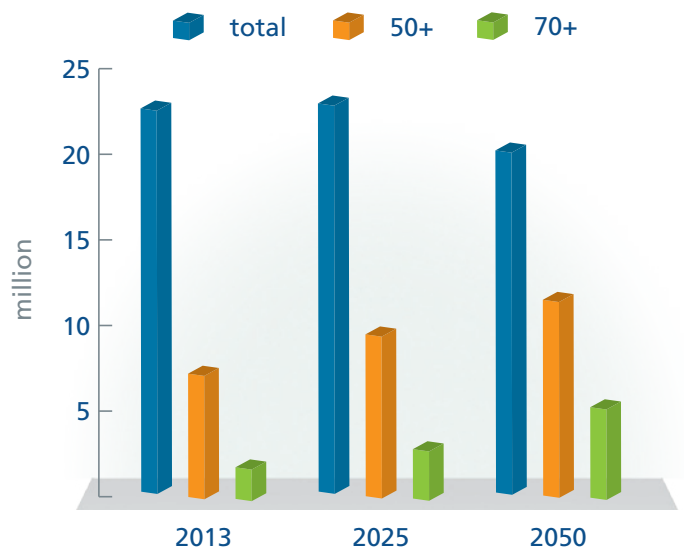
CURRENT

Population **23.3 million**
 Aged over 50 years **32%**
 Life expectancy **80 years**
 Hip fracture incidence per year **392/100,000** (women)
 Cost per hip fracture **3,242 USD**
 Number of DXA per million population **8.7**
 Fracture liaison services **10-25% of hospitals**
 National health priority status **since 2005**

PROJECTED 2050

Population **20.8 million** ↓
 Aged over 50 years **57%** ↑
 Life expectancy **83 years** ↑

FIGURE 2 Population projection for Chinese Taipei



State of osteoporosis/osteopenia

The Taiwanese Osteoporosis Association states that approximately 1.6 million people in Chinese Taipei, including 950,000 postmenopausal women, suffer from osteoporosis. Many studies have been conducted and their findings support this estimated prevalence. The latest study using bone mineral density (BMD) was conducted by the 2004-2008 National Nutrition and Health Survey in Chinese Taipei (NAHSIT) and reported that 41.2% of women and 22.6% of men older than 50 years of age have osteoporosis⁵. Unfortunately, most patients with osteoporosis, including those presenting with fragility fractures, were not diagnosed, evaluated or treated, and the prevalence appears to be rising since the year 2000^{2,8}. One study of community-dwelling women aged over 50 years indicated that the prevalence of osteoporosis was 12% in 2001 and 14% in 2006^{3,4}. Another study estimated mild to severe osteoporosis (T-score of < -2.5) in 54% of the population aged over 50 years, and another study reported low BMD (T-score of -1.0 to -2.5) in 47% of women and in 57.1% of men in this age group⁶. These figures would translate into increased hip fracture risk, in which Chinese Taipei ranks as one of the highest in Asia and may be higher than the world average⁷.

Lifestyle

Similar to Mainland China and Hong Kong, Chinese Taipei has been experiencing urbanization over recent decades and with it comes lifestyle changes such as lower physical activity and less exposure to sunlight, both of which are contributors to osteoporosis risk⁴ (Figure 3). One study of middle-aged Taipei City women found that

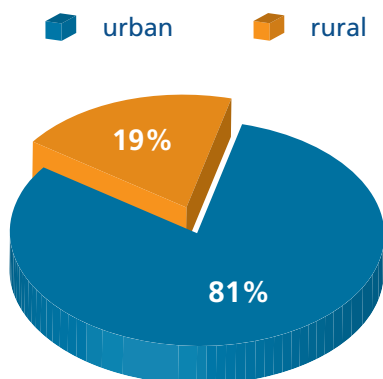
about 50% had low vitamin D levels and low bone density levels, and the data from the NAHSIT found vitamin D levels below 20ng/mL in 61.1% of men and in 71.3% of women aged older than 19 years^{7,14}. Another study found that the average daily calcium intake was just 622 mg and 628 mg for older men and women respectively, which is lower than the daily recommended intake of 1,000 mg⁴. Additionally, the Chinese Taipei population may have low rates of adherence to anti-osteoporosis drugs. One study found that men and women from Chinese Taipei were less likely to comply with bisphosphonate prescriptions due to the inconvenience of taking the medication (remaining upright and avoiding food for 30 minutes)². This is another lifestyle aspect that may be contributing to the increase in osteoporosis and fractures in Chinese Taipei.

Level of awareness

Health care in Chinese Taipei is improving, partially due to the introduction of the National Health Insurance (NHI) system, and patients are experiencing an increase in life expectancy. The transition into an ageing society has caught the attention of policy makers who are now interested in diseases that affect the elderly⁷. These include osteoporosis, which was officially documented as a national health priority in 2005 in conjunction with the Health Promotion Administration's osteoporosis prevention and public awareness campaigns.

Having the government on board is a step in the right direction, but awareness of osteoporosis still has a long way to go to reach individuals at the community level. The Taiwanese Osteoporosis Association recently released a report saying that as many as 74% of the public is unaware that a loss of body height is a likely sign of osteoporosis in women⁹. Another study found that that 58% of participants believed that osteoporosis is a serious condition, 60% believed they were at risk and 50% believed they would benefit from preventive osteoporosis behaviour, but 60% indicated that they had difficulty taking action³. Finally, a study on drug compliance concluded that many patients and doctors are not aware of the importance of taking osteoporosis medications to reduce fracture risk. This study pointed out that bisphosphonate therapy has been available in Chinese Taipei since the early 1990s; however, the cumulative re-fracture rates were increased among those not adhering to medications². The awareness of osteoporosis management among patients and physicians clearly needs to be improved⁹.

FIGURE 3 Urban versus rural population in Chinese Taipei⁸



FRACTURE RATES

Hip fracture

A recent systematic review indicated that the annual hip fracture rate (392/100,000 for women and 196/100,000 for men, standardized for the world population in 2010) in Chinese Taipei was among the highest worldwide and the highest among Asian nations, especially for men^{7,10}. With low bone mass in 47.5% of women and 57.1% of men aged over 50 years, the incidence of hip fracture is similar to, if not higher than, rates in Western countries, especially in elderly men⁶. One study showed increases in hip fracture incidence in those aged over 65 years from 49.6 per 100,000/year to 64.4 per 100,000/year from 1996–2002². From this, it was estimated that the annual number of hip fractures in 2009 was approximately 16,000, with women over 70 years having a 10% risk of fracturing at least one hip⁷. Furthermore, 15% of women and 22% of men in Chinese Taipei die within the first year after hip fracture from infections related to being bedridden⁹. There is some good news; in patients followed through 2009, consistent with trends over the last decade from other countries it was found that the age-related hip fracture incidence in Chinese Taipei declined in men and women aged over 60 years¹¹. However, this decline in incidence over time will be offset by an increase in absolute number of fractures due to an ageing population.

In Chinese Taipei, approximately 90% of hip fractures are managed surgically, and the average waiting time for hip surgery after fracture is 1–2 days. After 2010, Diagnosis Related Group (DRG) payments were introduced for orthopaedic procedures, and as a result some evidence suggested length of stay decreased by about 10%. Detailed analyses of the NHI database are in progress.

Other fragility fractures

In Chinese Taipei, approximately one in three women and one in five men over age 50 are expected to experience an osteoporotic fracture in their remaining lifetimes². It has been found that the prevalence of osteoporosis and related fractures in Chinese Taipei is similar to that of the United States⁷. Access to treatment could be partially to blame for these high numbers. According to the 2006–2007 Chinese Taipei NHI hip fracture data, only 27% of hip fracture patients received bone density examinations, and 34% received drug

treatment for osteoporosis, showing that many patients were not given the opportunity to have appropriate testing to diagnose osteoporosis and are therefore not being treated⁹.

Vertebral fractures

A study measuring osteoporosis through BMD scanning reported vertebral fractures in 31% of postmenopausal women aged 45–64 years, 53% of those aged 65–74 years, and 69% of those aged older than 75 years¹².

COST OF FRACTURE

The direct hospital costs of treating hip fractures in Chinese Taipei were approximately 3,242 USD with an average of 13 hospital bed days¹³. Additionally there were a significant amount of family and social resources that go into the care for a hip fracture patient⁹ (*Table 1*).

TABLE 1 Hip fracture in Chinese Taipei

HOSPITAL COSTS PER HIP FRACTURE (USD)	AVERAGE HOSPITAL BED DAYS	SURGICALLY TREATED
\$3,242 USD	13	95%

FRACTURE REGISTRIES

A fracture registry in Chinese Taipei can be derived from the inpatient healthcare utilization and reimbursement database collected by the Chinese Taipei NHI administration. This enables fracture specific information to be sorted out and collected through analysis of the NHI's database. Also, Chinese Taipei's Ministry of Health and Welfare has published an annual report of the NHI healthcare resource utilization sorted by ICD9-CM codes since 1997 with free access at <http://www.mohw.gov.tw/CHT/Ministry/Index.aspx>.

In 2010, the NHI annual report collected inpatient fracture data that showed:

- 21,337 hip fractures in those aged over 40 years (assuming hospitalization admission = hip fracture number, utilizing ICD9-CM code 820).

- 44,787 other fractures (assuming hospitalization admission = fracture number utilizing ICD9-CM code 820 (hip), 806 (vertebral), 812 (humerus) and 813 (wrist). Given that only a minority of vertebral, wrist and humerus fractures would be hospitalized the total fracture numbers are significantly underestimated.

FRACTURE LIAISON SERVICES

Formal fracture liaison services (FLS) in Chinese Taipei are rare and approximately just 10–25% of hospitals have implemented an FLS. However, at the individual physician level, many orthopaedic surgeons do hire private assistants to serve as a coordinator to collect patient information, arrange for treatment and manage osteoporosis patients so that secondary fractures can be prevented. And recently in 2013, the Taiwanese Osteoporosis Association began offering courses designed specifically for the training of nurses as osteoporosis care managers.

SPECIALISTS RESPONSIBLE FOR OSTEOPOROSIS

In Chinese Taipei, osteoporosis care is not primarily devolved to primary care physicians, mainly because the NHI does not require primary care gatekeeping for specialty referral. This results in multiple specialities managing osteoporosis. Mainly, it is the orthopaedic surgeons who look after most cases. Other specialists that also care for osteoporosis patients include: family doctors, rheumatologists, gynaecologists, endocrinologists, geriatricians, rehabilitation medicine physicians and internal medicine specialists.

For those listed specialists, osteoporosis is a recognized component of their speciality medical training. Additionally, osteoporosis as a recognized medical speciality in itself is gaining traction in Chinese Taipei. Since 2010 the Taiwanese Osteoporosis Association has been issuing certificates to osteoporosis specialists, and as of May 2013, there were 148 osteoporosis specialists



in Chinese Taipei. This is a huge step in the right direction, and the next step is to bring Chinese Taipei's Ministry of Health and Welfare on board towards recognizing osteoporosis as an independent medical speciality as well.

GOVERNMENT POLICIES

Osteoporosis as a documented national health priority

Osteoporosis is an officially documented national health priority in Chinese Taipei. The Health Promotion Administration in the Ministry of Health and Welfare made it official in 2005, along with prioritizing osteoporosis prevention and public awareness. In fact, several important osteoporosis education materials for nurses, menopausal women, and the general public were published in recent years and are available online at <http://health99.doh.gov.tw/default.aspx>

Action plans linked to the Health Promotion Authority focus on four main areas, including:

- Designing osteoporosis educational material for health care professionals and the general public
- Establishing national osteoporosis practice guidelines
- Hosting community and mass media campaigns to increase awareness and disseminate knowledge
- Subsidizing osteoporosis research or educational projects initiated by domestic organizations such as the Taiwanese Osteoporosis Association, or other experts in the field

Every year the Health Promotion Administration in collaboration with the Taiwanese Osteoporosis Association hosts public health programmes focusing on osteoporosis and nutrition, exercise and prevention, and offers these to the public through health symposiums and patient educational campaigns. For example, during key annual events such as Mother's day or World Osteoporosis Day, press conferences and media exposure about osteoporosis-related topics are always organized by both parties. Also, the Health-99 website operated by the Health Promotion Administration always posts updated information on osteoporosis for public access at <http://health99.doh.gov.tw/default.aspx>

Guidelines

The 'Taiwan Osteoporosis Practice Guidelines' were published in Chinese in 2011 and in English in 2012. Collaboration between the Health Promotion Administration, National Health Research Institute and the Taiwanese Osteoporosis Association, these guidelines were then accepted for publication in 2013, and became the first guidelines from Chinese Taipei to be published in the National Guideline Clearing house⁷.

To disseminate them to health care professionals, 10 nationwide educational courses were offered in 2012 to 2028 physicians, nurses, and pharmacists. The courses significantly improved their knowledge and skills about caring for osteoporosis patients. In 2013, another 11 courses were extended to other health care professionals including dietitians, radiation technologists, and physical therapists – with three of the courses designed specifically for the training of nurses as osteoporosis care managers.

Additionally, the Taiwanese Osteoporosis Association published a summary version of the 2007 practice guidelines as a quick reference for health care professionals. The Chinese version was updated in 2011 and the English version was updated in 2012¹⁵.

The guidelines include the following elements: population-based screening (women aged over 65 years and men aged over 75 years should have dual-energy X-ray absorptiometry (DXA) testing for BMD status), suggested use of FRAX, prior fracture, age, BMD, and the Osteoporosis Self-assessment Tool for Asians (OSTA). These elements are broader than the reimbursement policies offered. For example, whereas the guidelines recommend that all women aged over 65 years and men aged over 70 years receive BMD testing, the NHI only reimburses BMD if there is prior history of a low-trauma fracture. Additionally, the guidelines recommend that a high-risk FRAX score in itself is a reason to start treatment for osteoporosis; however the NHI places many more requirements for reimbursement for osteoporosis treatment - such as evidence of prior hip or vertebral fracture plus T- score of bone mineral density by DXA ≤ -2.5 .

Audit and quality indicator systems

Chinese Taipei quality indicators for the treatment of osteoporosis include the *Taiwan Quality Indicator Project*.

This is initiated by Chinese Taipei's Joint Commission on Hospital Accreditation and covers topics such as inpatient falls, falls associated injuries, and severity of injury. The quality indicator is reported quarterly.

TREATMENT

Generally, treatment for osteoporosis in Chinese Taipei does not require a prior authorization and is reimbursed in full by the NHI; however conditions for reimbursement are extensive. Private insurance is available and will cover costs that are not covered by NHI (Table 2).

The conditions on which reimbursement is based include: prior fracture, age, BMD, secondary prevention,

first-line treatment, second-line treatment. These conditions do interfere with what physicians would normally recommend to patients, for example:

- First-line medications are only reimbursed for secondary prevention (one fracture plus $T \leq -2.5$ or 2 fractures plus $T \leq -1$)
- Second-line medications (Teriparatide) have very strict reimbursement regulations since 2011 ($T \leq -3 + \geq 2$ fractures + use first line agents for more than 1 year)
- Patients have to pay out-of-pocket for primary prevention (e.g.: $T < -2.5$, no fracture) or having one fracture but $T > -2.5$
- Male patients have restriction on treatments: first-line agents are alendronate and zoledronic acid. Second line agent is teriparatide

TABLE 2 Treatments available in Chinese Taipei and reimbursement levels

	YES	NO	IF YES, % REIMBURSED
Risedronate		x	
Alendronate	x*		100%
Ibandronate	x*		100%
Zoledronic acid	x*		100%
Clodronate		x	
Pamidronate		x	
Raloxifene	x*		100%
Bazedoxifene	x*		100%
Denosumab	x*		100%
Strontium Ranelate		x	
Teriparatide	x*		100%
PTH (1-84)		x	
Vitamin D/Ca supplements**		x*	10%
Calcitonin	x*		100%
Hormone Replacement Therapy	x		100%
Testosterone	x		100%
Alfacalcidol	x		100%
Calcitriol		x	

* first line treatment

** Only certain brands of calcium and active vitamin D3 were covered by the NHI.

DIAGNOSTICS

Along with FRAX, DXA is used for diagnosing osteoporosis in Chinese Taipei. There are approximately 8.7 DXA machines per one million in general population¹⁶, and scans cost approximately 40 USD with a general waiting time of less than 2 weeks (Table 3). Reimbursement for DXA is limited and does pose a barrier to access. For example, the NHI has placed limits on reimbursement for BMD testing. Reimbursement occurs only if:

- The health status of the patient is associated with certain endocrine diseases
- There has been a non-traumatic fracture

TABLE 3 Diagnostics access and cost in Chinese Taipei

	DXA	ULTRASOUND
Waiting time (d)	< 2 weeks	not used
Cost (USD)	40	
Is it reimbursed?	limited if conditions are met	
Is reimbursement a barrier to access to treatment?	yes	

- The patient is a man with prostate cancer before and after androgen deprivation therapy
- The patient is a postmenopausal woman undergoing osteoporosis treatment

Further, only three BMD examinations can be performed within the lifetime of a patient, and the interval between these examinations must exceed one year³.

Ultrasound is not considered a standardized diagnostic tool for osteoporosis in Chinese Taipei. It is only used for patient education campaigns as a means to attract more participants. All costs are paid by the sponsoring organizations for the campaigns.

RECOMMENDATIONS

Establishing population specific FRAX intervention cut-points is essential in Chinese Taipei since the current FRAX calculator used, although launched in 2010, is still using the American cut-points for fracture risk because of lack of domestic, cost-effective analysis and data. As in other countries, data on hip fractures were mostly available; but epidemiological data on incidence, healthcare resource utilization, quality of life (utility) and mortality for other osteoporotic fractures are still scarce and limit the ability to perform cost-effective analysis. More nationwide data are needed to address this issue.

Additionally, since 2011, the new NHI reimbursement policy for osteoporosis medications required BMD data. The availability of DXA machines in the rural areas as well as the costs for the tests (only limited reimbursement) became an issue for acquiring needed medications. Medication cost drops of roughly 15% were noted with reimbursement policy changes. A suggestion by the Taiwanese Osteoporosis Association is to move toward a new cut off points-based reimbursement scheme when more data are available.

REFERENCES

1. United States Census Bureau 2013, Census.Gov, viewed 01 September 2013, <<http://www.census.gov/population/international/data/idb/informationGateway.php>>.
2. Soong, YK, Tsai, KS, Huang, HY, Yang, RS, Chen, JF, Wu, PCH & Huang, KE 2013, 'Risk of refracture associated with compliance and persistence with bisphosphonate therapy in Taiwan', *Osteoporos Int*, vol. 24, pp. 511–521.
3. Chang, SF, Hong, CM & Yang, RS 2011, 'Global computer-assisted appraisal of osteoporosis risk in Asian women: an innovative study', *J Clin Nursing*, vol. 20, pp. 1357–1364.
4. Lan, TY, Hou, SM, Chen, CY, Chang, WC, Lin, J, Lin, CC, Liu, WJ, Shih, TF & Tai, TY 2010, 'Risk factors for hip fracture in older adults: a case-control study in Taiwan', *Osteoporos Int*, vol. 21, pp. 773–784.
5. Lin, YC & Pan, WH 2011, 'Preliminary Analysis of Bone Mineral Density among Taiwanese Adults from 2007-2008.'
6. Kruger, M, Todd, J, Schollum, L, Kuhn-Sherlock, B, McLean, D & Wylie, K 2012, 'Bone health comparison in seven Asian countries using calcaneal ultrasound', *BMC Musculoskeletal Disord*, vol. 14, p. 81.
7. Bureau of health Promotion, Department of Health, 2011, 'Taiwan Osteoporosis Practice Guidelines', viewed 20 November 2013 <<http://cebm.tmu.edu.tw/web/archive.php?class=101>>.
8. Taiwan 2013, Encyclopædia Britannica, viewed 01 September 2013, <<http://www.britannica.com/EBchecked/topic/580902/Taiwan>>.
9. The Taiwanese Osteoporosis Association, 2011-2013, 'Taiwanese Guidelines for the Prevention and Treatment of Osteoporosis'.
10. Kanis, JA, Oden, A, McCloskey, EV, Johansson, H, Wahl, DA & Cooper, C 2012, 'A systematic review of hip fracture incidence and probability of fracture worldwide', *Osteoporos Int*, vol. 23, no. 9, pp. 2239-2256.
11. Wang, CB, Lin, CFJ, Liang, WM, Cheng, CF, Chang, YJ, Wu, HC, Wu, TN & Leu, TH 2013, 'Excess mortality after hip fracture among the elderly in Taiwan: 3 A nationwide population-based cohort study', Epub ahead of print.
12. Kung, A, Fan, T, Xu, L, Xia, WB, Park, IH, Kim, HS, Chan, SP, Lee, JK, Koh, L, Soong, YK, Soontrapa, S, Songpatanasilp, T, Turajane, T, Yates, M & Sen, S 2012, 'Factors influencing diagnosis and treatment of osteoporosis after a fragility fracture among postmenopausal women in Asian countries: a retrospective study', *BMC Women's Health*, vol. 13, p.7.
13. Wong, CW & et al. 2008, 'Epidemiology and Medical Costs of Patients with Hip Fracture at a Medical Center in Central Taiwan', *J Emerg Med*, Taiwan, vol. 10, no. 3, pp. 81-86.
14. Lee, MS & et al. 2011, 'Preliminary Analysis of Taiwanese Vitamin D Status: From (NAHSIT) 1993-1996 to 2005-2008'.
15. International Osteoporosis Foundation 2012, 'Taiwanese Guidelines for the prevention and treatment of Osteoporosis', viewed 14 November 2013, <http://www.iofbonehealth.org/sites/default/files/PDFs/National%20Guidelines/Taiwanese_guidelines_prevention_treatment_osteoporosis.pdf>.
16. Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, World Population Prospects: The 2008 Revision, viewed March 28, 2011, <<http://esa.un.org/unpp>>.