

CHINA

COUNTRY OVERVIEW

The Chinese National Committee on Ageing declared in 2013 that the number of people aged older than 60 years had reached 200 million, in China¹. According to the US Census Bureau (2013) the Chinese population totals 1.35 billion and life expectancy is 75 years, which has increased by 3.4 years since 2000. Osteoporosis risk increases in men and women aged over 50 years and in 2013, 26% (357 million) of the Chinese fell into this age range. Looking ahead, in just over 10 years to 2025, the population is predicted to grow to 1.39 billion, with those aged over 50 years exceeding 518 million. Thus 37% of the country's population will be in the age group most at risk for osteoporosis. By 2050, the Chinese population is projected to decrease slightly to 1.3 billion, but those aged over 50 years will reach almost half (49%) of the total population at 636 million. In addition, those aged 70 years or above are projected to rise from 81 million in 2013 to 132 million in 2025, reaching 263 million by 2050 (Figure 1). These figures clearly indicate that osteoporosis is an increasingly important public health problem. Not surprisingly, the rate of hip fractures is already rising very rapidly in China².

State of osteoporosis/osteopenia

There have not been many studies on the prevalence of osteoporosis in China, and results vary based on region, sample size, and diagnostic methods. Considering this, Y. Wang and colleagues consolidated available Chinese studies and estimated that approximately 13% of Mainland Chinese adults have osteoporosis. As expected, osteoporosis is more prevalent in those aged over 50 years with 40.1% of women and 22.5% of men being affected³. A smaller study in 10 of China's cities estimated slightly lower osteoporosis prevalence of 31.2% in women and 10.4% in men aged over 50⁴. Looking back at data from 2006, there were 350 million people aged older than 50 years in Mainland China. Of these, it was estimated that 69.4 million people, or 19%, had bone mineral density (BMD) T scores lower than -2.5, and 213.9 million (60%) had BMD in the osteopenic range (-1 to -2.5)⁵. According to

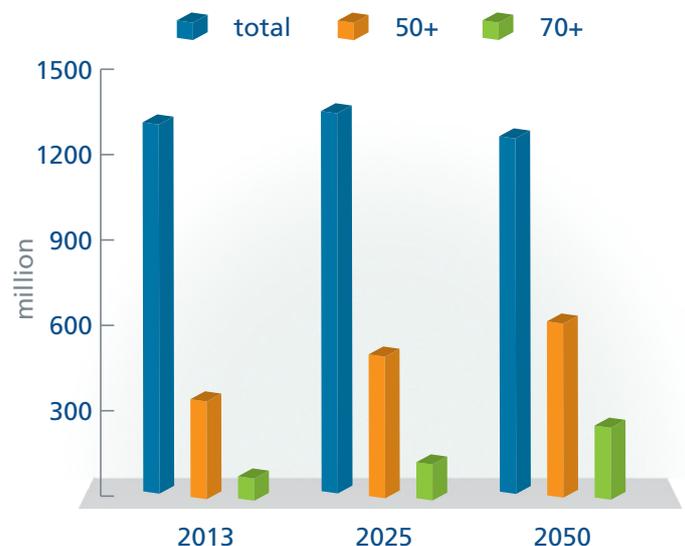
CURRENT

Population **1.35 billion**
Aged over 50 years **26%**
Life expectancy **75 years**
Hip fracture incidence per year **229/100,000** (women)
Cost per hip fracture **3,600–5,000 USD**
Number of DXA per million population **0.46**
Fracture liaison services **1–10% of hospitals**
National health priority status **since 2011**

PROJECTED 2050

Population **1.3 billion** ↓
Aged over 50 years **49%** ↑
Life expectancy **81 years** ↑

FIGURE 1 Population projection for China

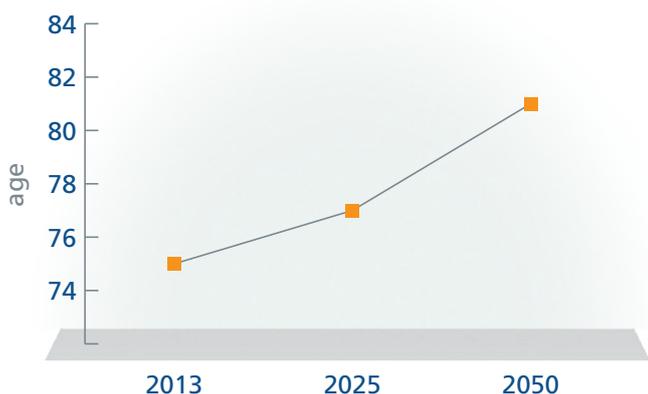


several studies, osteoporosis in China is still lower than in Caucasian countries, and the prevalence does not appear to differ between rural and urban populations^{3,6}. However, the incidence of osteoporosis is increasing³. Hip fracture rates are on the rise too, as demonstrated in one study where rates rose 10% per year between 2002–2006, in Chinese aged over 70 years⁷.

Lifestyle

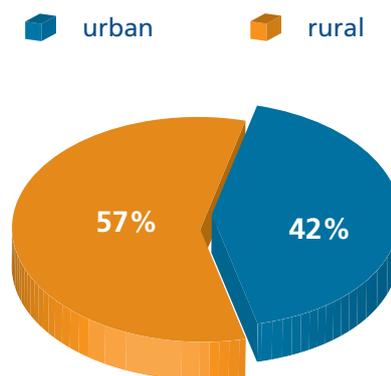
The ageing population and lifestyle changes are likely contributing to the increasing incidence of osteoporosis in China. Life expectancy has increased by 1 year since the previous IOF Audit was published in 2009, going from 74 years in 2009 to 75 years in 2013, and is projected to increase to 77 years and 81 years in 2025 and 2050, respectively (Figure 2). Improvements in medical care have resulted in longer survival of the elderly who are at increased risk of falling and breaking a bone³. Additionally, China is becoming more urbanized (urban living increased from 33% in 2000 to 42% in 2013⁴) (Figure 3). This population shift could result in an increased risk of osteoporosis given the decreased exposure to sunlight and reduced physical activity. For example, individuals are leaving more active outdoor occupations such as farming to work in an urban office setting, which results in less exposure to sunlight and increases the risk of vitamin D deficiency³. It has been found that vitamin D deficiency (<25 nmol/L) and insufficiency (>25 nmol/L and <50 nmol/L) is highly prevalent in the Chinese population in almost all age groups and areas. Studies indicate vitamin D deficiency in 40–90% of Chinese children (where rickets is also common) and in an even greater

FIGURE 2 Life expectancy in China



percentage of adults. Deficiency in Beijing and Shanghai was found in as many as 70–90% of the elderly⁴.

FIGURE 3 Urban versus rural population in China



Physical inactivity is another risk factor for osteoporosis and may also contribute to the increased incidence, as people are turning to cars and buses for transportation instead of walking. In fact, the number of adults owning cars increased from 4 per 100 adults in 1992 to 18 per 100 adults in 2004⁷. Additionally, as more Chinese are living in Western style apartments – with increased use of couches, chairs and western toilets – they are squatting less. Only 20-years ago many Chinese used to squat, rather than sit, as part of daily life. The benefit was strengthened leg muscles and improved balance, resulting in fewer falls⁷. Now, Chinese people are losing this protective benefit.

Level of awareness

According to a study from the First Affiliated Hospital of Nanjing Medical University and the Peking Union Medical College, increased education is needed to increase the awareness of China’s people about osteoporosis, starting with health-care providers⁹. In the study, which investigated awareness and prevention of osteoporosis, female nursing students responded correctly to just half of the questions in a test about osteoporosis. Basic facts such as bone loss after menopause, greater prevalence in women than men, race differences, drug therapies etc. were not common knowledge to the nursing students. After an osteoporosis educational programme was implemented, the knowledge of the nursing students improved

dramatically and they showed increased concern about osteoporosis for themselves, their sisters, mothers and grandmothers. With nurses being in a prime position to educate and treat people with osteoporosis, this study pointed out the critical need for continuing education on osteoporosis for Chinese health care providers, before they go on to work in clinical centres⁹.

Furthermore, an awareness assessment of osteoporosis was conducted among physicians in China and found that 33% did not know that published guidelines existed for BMD testing¹⁰.

FRACTURE RATES

Hip fracture

Hip fracture rates are increasing throughout urban Asia. A landmark study from Beijing 2002–2006 indicates the hip fracture incidence in those aged over 50 years to be 229/100,000 per year in women and 129/100,000 per year in men⁷. This study found the rates of age-specific hip fractures in those aged over 50 years increased by 58% in women and by 49% in men. The same study also compared hip fractures that occurred from 2002–2006 with those that had occurred previously from 1990–1992, and it was found that the adjusted age-specific rates of hip fracture over age 50 years increased 2.76-fold in women and 1.61-fold in men (*Figure 4*)⁷.

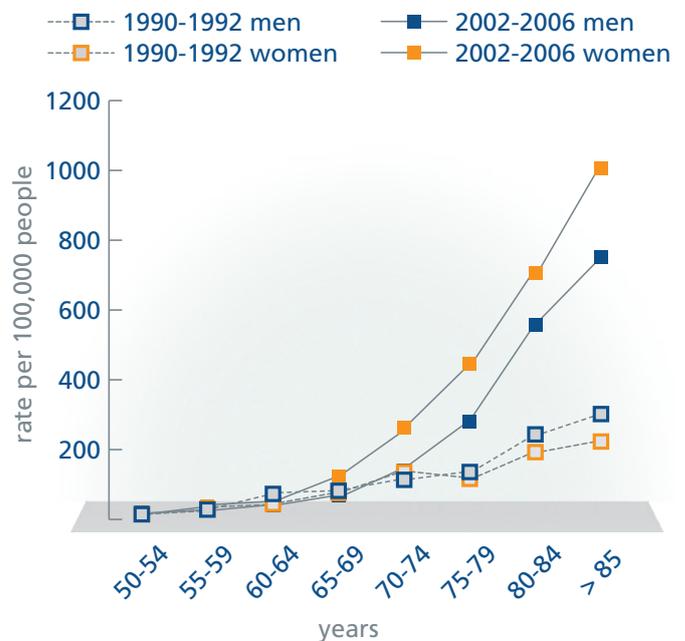
The increasing rate of hip fractures is serious since they are associated with increased mortality. The Singapore Chinese Health Study (SCHS) found that within the Chinese population, those having suffered a hip fracture were at greater risk of dying from other diseases within the following five years, than are Chinese who had not suffered a hip fracture¹¹.

According to the national societies in China more information is available for urban areas when compared to rural ones. Just looking at the cities alone, approximately 90% of hip fractures are managed surgically, and the average waiting time for surgery is 1–2 days.

Other fragility fractures

More data and studies are needed on fragility fracture in China. Of those conducted to date, a large nationwide study in Mainland China reported a prevalence of all fractures of 26.6%, and a local study conducted in Chongqing City reported a prevalence of 14%³.

FIGURE 4 Change in age-specific incidence of hip fracture in Beijing, China from 1990–1992 to 2002–2006⁷



SOURCE Reproduced from Xia, W-B. et al. Rapidly Increasing Rates of Hip Fracture in Beijing, China.

Vertebral fractures

In Mainland China, 1.8 million new osteoporotic vertebral fractures occurred in 2006. Since the number of people aged older than 60 years is expected to approach 438 million by 2050, it can be projected that the number of Chinese in this age group with osteoporotic vertebral fractures could reach 36.7 million and 48.5 million in 2020 and 2050, respectively⁵ (*Table 1*). Looking at specific studies, according to data pulled from the Chinese Database of Trauma from 2001–2007, of the 82 720 Mainland Chinese of all ages identified with spinal trauma (caused by auto accidents, major falls, minor falls and non-traumatic specific events), 20% (16 544) of the fractures occurred in people aged over 60 years. In the

TABLE 1 Vertebral fracture incidence and projections in China⁵

60+ WITH VERTEBRAL FRACTURES	
2006	1.8 million
2020	36.7 million
2025	48.5 million

age group 60 years and above, most of the fractures were lumbar, thoracic and non-traumatic and were determined to be age-related osteoporotic fractures⁵. The Osteoporosis in China' study found the prevalence of vertebral fracture in 2005, in those aged over 50 years as determined by patient questionnaire and lateral spine X-ray, to range from 13.3–16.2%³.

COST OF FRACTURE

It is projected that by 2050, 50% of hip fractures will occur in Asia, with the majority occurring in China⁶. IOF's survey of the national osteoporosis societies in China reported that hospital costs for treating hip fractures range between 3,600 and 5,000 USD with an average of 15–20 hospital bed days (Table 2). This is supported by various studies estimating that each hip fracture in China may cost approximately 1,200 to 4,000 USD. These figures are based on local data, which varied between urban and rural areas, across regions, and increased over time³.

TABLE 2 Hip fracture in China

HOSPITAL COSTS PER HIP FRACTURE (USD)	AVERAGE HOSPITAL BED DAYS	SURGICALLY TREATED
\$3600–5000	15–20	90% (urban areas only)

FRACTURE REGISTRIES

In general, China does not have fracture registries, however according to the Osteoporosis Committee of China Gerontological Society (OCCGS) and the Chinese Journal of Osteoporosis (CHO), a fracture registry does exist at the local level in the northern area of Beijing City. Here, the major hospitals serve 2 million residents and have been collecting fracture data for 10 years on both men and women aged over 50 years, including data on hip, spine, wrist and other fractures (Table 3).

FRACTURE LIAISON SERVICES

It is reported by OCCGS and CHO that only approximately 1–10% of hospitals in China have implemented a coordinator-based, post-fracture system of care, otherwise known as a fracture liaison service.

TABLE 3 Fracture registry data of hospitals in North Beijing (Hospital Information System Data, 2012)

FRACTURES PER YEAR	
Hip	241
Spine	217
Wrist	173
All	1489

SOURCE Hospital health information system from China Medical University Aviation General Hospital, and the Hospital of Chinese People's Liberation Army. Data supplied by OCCGS & CHO.

SPECIALISTS RESPONSIBLE FOR OSTEOPOROSIS

Osteoporosis is still not taught as a separate interdisciplinary subject in China. Prior to 2009, there were not many registered doctors who were aware of the osteoporosis crisis and few were dedicated to its diagnosis and treatment. The IOF survey of the Chinese national osteoporosis societies found that osteoporosis care is not primarily managed by the general practitioners (i.e. family doctors, primary care physicians), but rather, in addition to the general practitioners, by a variety of specialities that have specific medical training for osteoporosis and also look after most cases. These include: rheumatology, orthopaedic surgery, gynaecology, endocrinology, geriatrics, rehabilitation medicine and internal medicine.

Things are beginning to change at the local hospital level, however, and some hospitals have arranged for osteoporosis and metabolic bone disease to be an isolated medical department with specialists dedicated solely to osteoporosis treatment. A complete list in Chinese can be found at <http://haopinghaodf.com/keshi/DE4r0u-lSI6BTj99T-5VQfj38SlxeGa/keshi.htm>.

GOVERNMENT POLICIES

Osteoporosis as a documented national health priority

Mandated by the Ministry of Health, China recently documented osteoporosis as a national health priority (NHP) on May 9, 2011 (<http://www.moh.gov.cn/mohbgt/s10329/201105/51580.shtml>).

Action plans linked to the NHP can be found in the China Health Knowledge Sharing Plan (Osteoporosis 2011/ 中国健康知识传播激励计划 (骨质疏松.2011)). Public health programmes associated with the action plan cover:

- Education/information
- Nutrition (Vit D, Ca)
- Risk factors
- Exercise
- Prevention
- Diagnostics

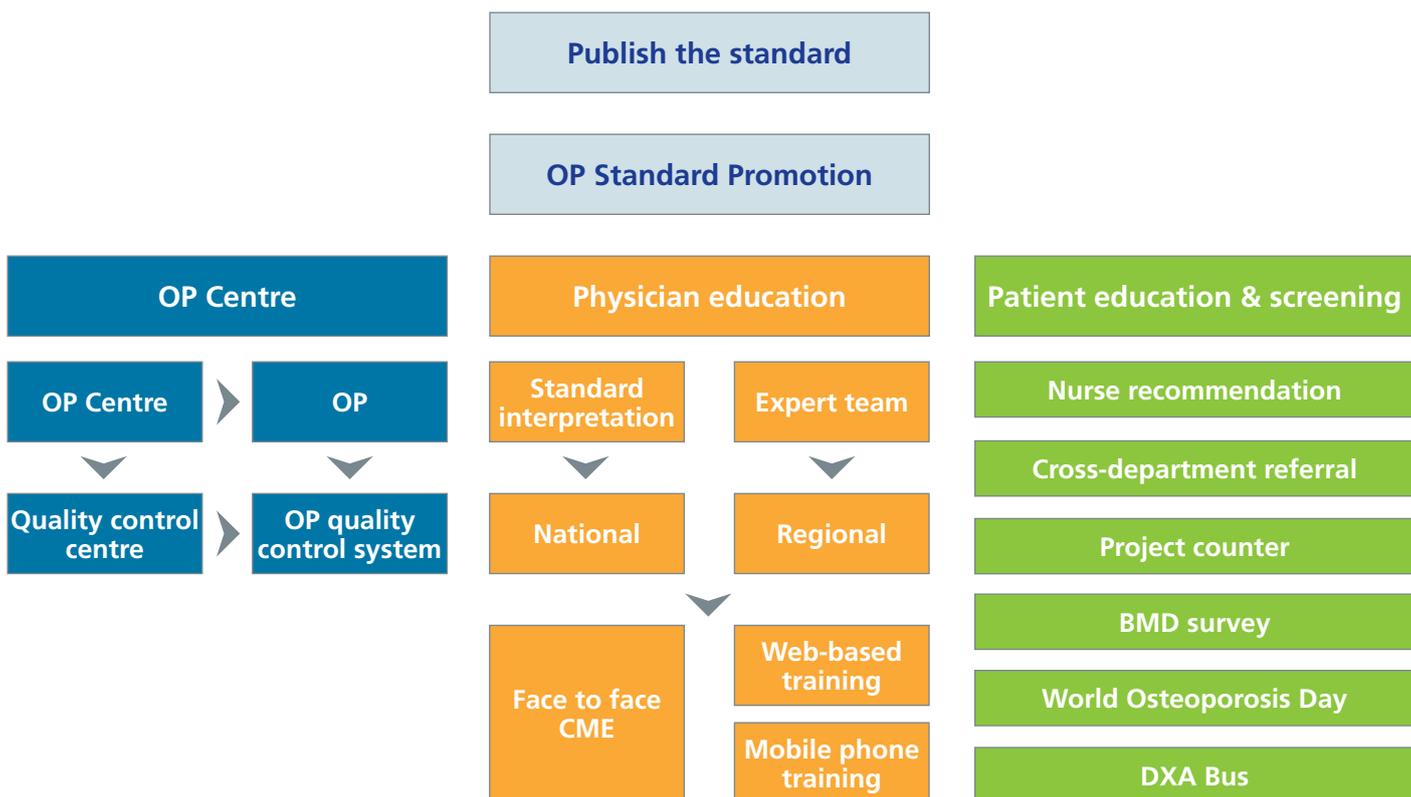
Additionally, China has many national societies which are actively involved with osteoporosis awareness, these include: the OCCGS in conjunction with CHO, and the Chinese Medical Association (CMA) in conjunction with the: 1) Chinese Society of Osteoporosis and Bone Mineral Research (CSOBMR), 2) osteoporosis division in Chinese society of orthopaedics, and 3) osteoporosis division in the Chinese society of endocrinology. There are also more than 20 local osteoporosis societies in province and city levels.

Guidelines

China currently has several guidelines for osteoporosis diagnosis and management including:

- ‘*The Standard of Diagnosis, Treatment and Quality Control on Osteoporosis*’ (Figure 5) was published in 2013 by CSOBMR/CMA in collaboration with the Department of Medical Administration of the Ministry of Health. The goal was to standardize clinical outcomes and improve the osteoporosis diagnosis and treatment quality indicators nationwide in China.
- ‘*Guidelines on Diagnosis and Treatment of Primary Osteoporosis*.’ Published in 2011 by CSOBMR/CMA.
- ‘*Guideline on Diagnosis and Treatment of Osteoporosis and Bone Mineral Disease*’ published in 2006 by CSOBMR and CMA.

FIGURE 5 The standard of diagnosis, treatment and quality control on osteoporosis in China



OP osteoporosis; CME continuing medical education; BMD bone mineral density; DXA BUS dual energy x-ray absorptiometry.

- The *Chinese Journal of Osteoporosis* published three editions of ‘Guidelines for Osteoporosis,’ in 1999, 2009 and recently in 2013 (<http://yunpan.cn/QX3JYpTKPiDuZ>).
- The CMA published the ‘Osteoporosis Treatment Guidelines’ in 2006, with an update published in 2011 (http://www.haodf.com/zhuanjiaguandian/liaodefa_583581080.htm).

In general, the guidelines above address criteria for osteoporosis assessment and treatment including population screening; osteoporosis risk assessments, such as the IOF One-Minute Osteoporosis Risk Test and the Osteoporosis Self-assessment Tool for Asians (OSTA); fracture risk assessments, including FRAX; and specific risk factors (e.g. age, BMD, prior fracture, and falls risk). According to the national societies in China, the osteoporosis guidelines for assessment and treatment are compatible with existing reimbursement guidelines.

Audit and quality indicator systems

In China, the audit and quality indicator system for tracking the quality of care for osteoporosis is provided at the national level. The document due to be published in late 2013 is called the ‘Standard of Diagnosis, Treatment and Quality Control on Osteoporosis.’

TREATMENT

Treatment for osteoporosis is reimbursed in part by the national health system and in part by private health insurance. In general, osteoporosis treatments are reimbursed 70–90% for inpatient care and approximately 30–50% for outpatient care in most cities, depending on the diagnosis and different insurance policies. Traditional Chinese medicine is often used for osteoporosis treatment and is reimbursed at 80% (Table 4).

DIAGNOSTICS

BMD measurement techniques in China include dual-energy X-ray absorptiometry (DXA), quantitative ultrasound (QUS), and single photon absorptiometry (SPA)⁶. In China, however, not everyone at risk can get a BMD measurement. A study carried out by Yongsheng Zhao and colleagues found that few, especially elderly women in rural areas, are willing to go to the hospital for a DXA, due to cost and other personal reasons.

TABLE 4 Osteoporosis treatments and respective reimbursement in China

	YES	NO	IF YES, % REIMBURSED
Risedronate	variable		80%
Alendronate	x*		90%
Ibandronate		x	
Zoledronic acid	x*		80%, only for inpatient
Clodronate		x	
Pamidronate	variable		
Raloxifene	x*		90%
Bazedoxifene		x	
Denosumab		x**	
Strontium Ranelate		x	
Teriparatide		x	
PTH (1-84)	variable		
Vitamin D/Ca supplements	x*		90–100%
Calcitonin	variable*		
Hormone Replacement Therapy	x*		90–100%
Testosterone	variable		
Alfacalcidol	x*		90–100%
Calcitriol	x*		90%

* first-line treatment, **not available

This results in osteoporosis not being confirmed in these women until fractures occur and the optimum time for therapy has been missed¹².

According to the national osteoporosis societies in China, there are approximately 0.46 DXA machines per million of the general population in the urban areas of China and often none in the rural areas. In the cities where DXA and ultrasound are available there is little or no wait time, and the cost is approximately 27 USD for DXA and 8–20 USD for ultrasound (Table 5). Patients can receive reimbursement for both DXA and ultrasound, although the level of reimbursement for DXA can be inadequate, sometimes presenting a barrier to treatment.

TABLE 5 Diagnostics access and cost in China

	DXA	ULTRASOUND
Waiting time (d)	immediately	immediately
Cost (USD)	27	8-10
Is it reimbursed?	in part	in part
Is reimbursement a barrier to access to treatment?	yes	yes

RECOMMENDATIONS

The Chinese Department of Medical Administration of the Ministry of Health has provided an overview of programmes that are taking place in China now aimed at the overall improvement of osteoporosis care. A summary of their activities is given below.

In 2009, the China Ministry of Health implemented the national project, “Win Over Osteoporosis (WOO)” and launched the project nationwide to the China Medical Doctors Association (CMDA). Beginning in 2009, physician education and patient screening were carried out in the 431 newly established osteoporosis centres. Since then, the scientific influence was cascaded down from the WOO advisory board to the centre leaders, specialists and physicians. By the end of 2012, the number of dedicated osteoporosis specialists had rapidly expanded to 1,659 – who then reached 3.8 million patients through multichannel avenues including nurse recommendations, cross-department referrals, educational seminars, public relationship programmes, etc. Project WOO has an official website at, <http://www.op-woo.com>, and an iPhone application for public and clinician education.

REFERENCES

1. 我国老年人口明年突破两亿. 2013, <http://news.xinhuanet.com/local/2012-10/19/c_113422369.htm?prolongation=1>.
2. *United States Census Bureau 2013*, Census.Gov, viewed 01 September 2013, <<http://www.census.gov/population/international/data/idb/informationGateway.php>>.
3. Wang, Y, Tao, Y, Hyman, M.E., Li, J & Chen, Y 2009, ‘Osteoporosis in China’, *Osteoporos Int*, vol. 20, pp. 1651–1662.
4. Zhang, W, Stoecklin, E & Eggersdorfer, M 2013, ‘A glimpse of vitamin D status in Mainland China’, *Nutrition*, [Epub ahead of print].
5. Liu, P, Yao, Y, Liu, MY, Fan, Wl, Chao, R, Wang, ZG, Liu, YC, Zhou, JH & Zhao, JH 2012, ‘Spinal Trauma in Mainland China From 2001 to 2007: An Epidemiological Study Based on a Nationwide Database’, *SPINE*, vol. 37, no. 15, pp. 1310–1315.
6. Bow, CH, Tsang, SWY, Loong, CHN, Soong, CSS, Yeung, SC & Kung, AWC 2011, ‘Bone mineral density enhances use of clinical risk factors in predicting ten-year risk of osteoporotic fractures in Chinese men: the Hong Kong Osteoporosis Study’, *Osteoporos Int*, vol. 22, pp. 2799–2807.
7. Xia, WB, He, SL, Xu, L, Liu, AM, Jiang, Y, Li, M, Wang, O, Xing, XP, Sun, Y & Cummings, SR 2012, ‘Rapidly Increasing Rates of Hip Fracture in Beijing, China’, *J Bone Miner Res*, vol. 27, no. 1, pp. 125–129.
8. *Rural Population (% Of Total Population) In China 2013*, Trading Economics, viewed 01 September 2013, <<http://www.tradingeconomics.com/china/rural-population-percent-of-total-population-wb-data.html>>.
9. Zhang, YP, Li, XM, Wang, DL, Guo, XY & Guo, X 2012, ‘Evaluation of educational program on osteoporosis awareness and prevention among nurse students in China’, *Nursing and Health Sciences*, vol. 14, pp. 74–80.
10. Ford, MA, Bass, M, Zhao, Y, Bai, JB & Zhao, Y 2011, ‘Osteoporosis Knowledge, Self-Efficacy, and Beliefs among College Students in the USA and China’, *J Osteoporos*, pp. 1-8.
11. Koh, GCH, Tai, BC, Ang, LW, Heng, D, Yuan, JM. & Koh, WP 2013, ‘All-cause and cause-specific mortality after hip fracture among Chinese women and men’, *Osteoporos Int*, vol. 24, pp. 1981–1989.
12. Zhao, Y, Liu, Y & Zheng, Y 2013, ‘Osteoporosis and related factors in older females with skeletal pain or numbness: A retrospective study in East China’, *J Int Med Res*, vol. 41, no. 3, pp. 859–866.