The economic burden of dementia in China, 1990–2030: implications for health policy
Junfang Xu,a Jian Wang,a Anders Wimo,b Laura Fratiglioni,b & Chengxuan Qiu4

Objective To quantify and predict the economic burden of dementia in China for the periods 1990–2010 and 2020–2030, respectively, and discuss the potential implications for national public health policy.

Methods Using a societal, prevalence-based, gross cost-of-illness approach and data from multiple sources, we estimated or predicted total annual economic costs of dementia in China. We included direct medical costs in outpatient and inpatient settings, direct non-medical costs – e.g. the costs of transportation – and indirect costs due to loss of productivity. We excluded comorbidity-related costs.

Findings The estimated total annual costs of dementia in China increased from 0.9 billion United States dollars (US$) in 1990 to US$47.2 billion in 2010 and were predicted to reach US$69.0 billion in 2020 and US$114.2 billion in 2030. The costs of informal care accounted for 94.4%, 92.9% and 81.3% of the total estimated costs in 1990, 2000 and 2010, respectively. In China, population ageing and the increasing prevalence of dementia were the main drivers for the increasing predicted costs of dementia between 2010 and 2020, and population ageing was the major factor contributing to the growth of dementia costs between 2020 and 2030.

Conclusion In China, demographic and epidemiological transitions have driven the growth observed in the economic costs of dementia since the 1990s. If the future costs of dementia are to be reduced, China needs a nationwide dementia action plan to develop an integrated health and social care system and to promote primary and secondary prevention.

Introduction

According to the 2013 Alzheimer’s Disease International report, about 44.4 million people were living with dementia in 2013 and this number is expected to reach an estimated 75.6 million by 2030. In China, which has the largest population of people with dementia, the prevalence of dementia appears to have increased steadily between 1990 and 2010. However, this trend might be partly attributed to temporal variations in the methods used to estimate such prevalence. The results of a national survey in 2008–2009 indicated that dementia was more common in rural areas than in urban settings. Given the rapid growth of the elderly population in China, dementia is expected to pose tremendous challenges to the national health-care system and to the sustainable development of the national economy.

Most cost-of-illness studies for dementia have been carried out in high-income countries such as Sweden, the United Kingdom of Great Britain and Northern Ireland and the United States of America. The economic costs of dementia in China – which have yet to be investigated in detail – are likely to differ, both in magnitude and type, from those in such distant high-income countries.

In this study, we sought to estimate and predict the costs of dementia in China for the periods 1990–2010 and 2020–2030, respectively. It was hoped that, by quantifying the economic costs of dementia, Chinese policy-makers would be motivated to develop a nationwide action plan, prioritize policies on dementia-related care and research and reduce the economic and societal burdens of dementia in China.

Methods

In this cost-of-illness study, we used a prevalence-based, bottom-up approach to quantify or predict the costs of dementia in China between 1990 and 2030, from a societal perspective. We categorized all the costs into three classes: (i) direct medical costs, that is goods and service costs related to the diagnosis and treatment of inpatients and outpatients with dementia; (ii) direct non-medical costs, that is transport costs and costs related to formal care in nursing homes or informal care at home; and (iii) indirect costs resulting from dementia-attributable loss of productivity.

Data sources

We used multiple data sources for all estimates. We used age-specific prevalence of dementia in China, for the period 1990–2010, derived from a comprehensive systematic review. From the electronic health records of the facilities, we collected cost data for patients with diagnosed dementia who were admitted either to the Shandong Centre for Mental Health – the only provincial psychiatric hospital in the eastern province of Shandong – between 1 January 2005 and 31 March 2014 or to the Daizhuang Psychiatric Hospital – one of the oldest psychiatric hospitals in China and also in Shandong province – between 1 January 2012 and 30 September 2014. The routine electronic health records include sociodemographic data and data on clinical diagnosis and disease classification, itemized costs, e.g. for drugs, examinations and beds. In each of the two study facilities, dementia was diagnosed and defined according to the International statistical classification of diseases and related health problems, 10th revision. We...
excluded 26 patients with dementia who were diagnosed as having other chronic conditions that needed treatment, e.g. anxiety, diabetes or hypertension, leaving data from the records of 146 patients with dementia in our analysis. We also searched the China National Knowledge Infrastructure, PubMed and Wanfang bibliographic databases for studies on the use of health resource by people with dementia in China, published between 1 January 1990 and 31 July 2015. The search terms included “Alzheimer’s disease,” “China,” “cost burden,” “dementia,” “economic burden,” “formal care” and “informal care”. We obtained costs for outpatient visits and transportation from a published study. 15 Data on demographics and wages came from the China Statistical Yearbook 2015. 16 The United Nations population projections for China17 and predictions of the prevalence of dementia based on data from a systematic review3 were used to estimate the total numbers of people in China who would have dementia in 2020 and 2030.

Cost estimates

For our estimates we included costs for hospitalization, formal care, informal care, loss of productivity, outpatient care and transportation. Our estimates of hospitalization costs, which included the costs of all medicines, clinical examinations, specialist consultations and bed care, were based on the mean values of the costs recorded in the electronic health records of the two study facilities and the values given in a published

### Table 1. Estimated numbers of people with dementia, China, 1990, 2000 and 2010

| Variable | Thousands of people with dementiaa | 1990 | 2000 | 2010 |
|----------|------------------------------------|------|------|------|
|          | n = 2479.7                          |      |      |      |
| Age in years |                                    |      |      |      |
| 60–64     | 314.3                              | 454.6| 792.0|      |
| 65–69     | 462.0                              | 726.9|1060.7|      |
| 70–74     | 654.7                              | 989.7|1569.5|      |
| 75–79     | 726.1                              |1099.1|2027.4|      |
| 80–84     | 655.0                              | 948.3|1566.5|      |
| 85–89     | 435.7                              | 598.3|1369.7|      |
| ≥ 90      | 231.9                              | 331.6| 839.7|      |

| Sex       |                                    |      |      |      |
|-----------|------------------------------------|------|      |      |
| Male      | 1313.1                             |1942.8|3628.5|      |
| Female    | 2166.6                             |3205.6|5987.1|      |

| Residence |                                    |      |      |      |
|-----------|------------------------------------|------|      |      |
| Urban     | 2109.8                             |3121.5|5829.9|      |
| Rural     | 1370.0                             |2026.9|3785.7|      |

**NOTE:** Inconsistencies arise in some values due to rounding.  
* Estimates based on a systematic review of the prevalence of dementia in China.3

### Table 2. Predicted age-specific prevalence of dementia and numbers of people with dementia, China, 2020 and 2030

| Age in years | 2020 | 2030 |
|--------------|------|------|
| Prevalence (%) | Thousands of cases | Prevalence (%) | Thousands of cases |
| 60–64        | 1.5  |1 121.1| 1.7 |1 879.0 |
| 65–69        | 3.0  |2 117.3| 3.4 |2 966.8 |
| 70–74        | 5.3  |2 340.7| 6.0 |3 661.7 |
| 75–79        | 9.7  |2 593.2|11.0 |5 477.5 |
| 80–84        | 16.6 |2 717.8|18.8 |4 547.9 |
| 85–89        | 27.8 |2 096.8|31.5 |2 997.0 |
| ≥ 90         | 47.4 |1 082.1|53.9 |1 760.8 |
| ≥ 60a        | 5.8  |14 069.0|6.7 |23 290.7 |

* The values shown cover all of the expected dementia cases aged at least 60 years.

### Table 3. Estimated costs of dementia, China, 1990, 2000 and 2010

| Cost item | Year | 1990 | 2000 | 2010 |
|-----------|------|------|------|------|
| Direct medical costs | | | | |
| Hospitalization cost | 37.1 | 370.0 | 1 004.0 |
| Outpatient care cost | 0.5 | 5.0 | 148.8 |
| Direct non-medical costs | | | | |
| Nursing home care | 47.4 | 222.4 | 4 468.1 |
| Transportation | 0.5 | 4.9 | 143.8 |
| Informal care | 271.5 |1184.0 | 4 635.4 |
| Indirect costs | | | | |
| Cost due to DALYs lost | 4.8 | 22.9 | 87.6 |
| Total for cases living at home | 314.4 | 1 586.8 | 6 019.6 |
| Total for cases living in nursing homes | 90.3 | 625.2 | 5 852.3 |
| National costs (US$ millions) | | | | |
| Direct medical costs | | | | |
| Hospitalization cost | 6.3 | 93.3 | 473.0 |
| Outpatient care cost | 1.8 | 26.1 | 1 431.0 |
| Direct non-medical costs | | | | |
| Nursing home care | 23.1 |160.3 | 6 014.9 |
| Transportation | 0.1 | 1.2 | 67.8 |
| Informal care | 812.4 |5 242.3 | 38 332.0 |
| Indirect costs | | | | |
| Cost due to DALYs lost | 16.7 | 118.1 | 842.3 |
| Total for all cases | 860.4 | 5 641.4 | 47 161.0 |
| Sex of case | | | | |
| Men | 324.7 | 2 128.6 | 17 796.5 |
| Women | 535.7 | 3 512.2 | 29 364.2 |
| Residence of case | | | | |
| Urban | 514.6 | 3 375.0 | 28 578.9 |
| Rural | 345.8 | 2 266.4 | 18 582.1 |

DALYs: disability-adjusted life-years; US$: United States dollars.

Note: All the estimated costs were converted to United States dollar (US$) values in January 2015, when $US 1 was equivalent to about 6.2 Chinese yuan.
article— all weighted according to the sample sizes. Our estimates of the costs of formal care were similarly weighted mean values based on published data. Informal care costs were estimated assuming that a carer, who might otherwise be earning the national mean salary, spent a mean of 6.3 hours per day giving care to each dementia case in informal care at home. We assumed that, during the observational periods, 86% of Chinese dementia cases were receiving informal care at home and that 4.9% of such cases would seek formal care. We estimated the numbers of disability-adjusted life-years (DALYs) lost because of dementia using each case's dementia severity score, assessed using the Global Deterioration Scale, and different weights for each of seven levels of severity. Costs of the productivity lost because of dementia-related disability were then estimated. For these estimations, we assumed that each person aged at least 60 years had a mean productivity weight of 0.1 and we used an annual discount rate of 3.5% to adjust the costs to 2015 values. Outpatient care costs included the costs of treatments and specialist consultations received in clinics or at home. Transportation costs comprised the costs travelling to and from medical centres.

All the estimated costs were converted to United States dollar (US$) values in January 2015, when US$ 1 was equivalent to about 6.2 Chinese yuan.

Statistical analysis

We estimated the numbers of people with dementia in China in 1990, 2000 and 2010 by multiplying the age-specific prevalence of dementia by the corresponding numbers of people in each age group in the population. For our predictions for 2020 and 2030, we used age-specific prevalence derived using a regression model and the relevant data from a comprehensive review. We estimated the total annual costs of dementia by multiplying the mean costs per patient by the total number of patients with dementia. Total annual costs for 2020 and 2030 were projected using a dynamic general disequilibrium model and assuming that the use of health resources by a dementia case was constant while the elderly population grew and the age-specific prevalence of dementia varied over time. We employed the Laspeyres decomposition method to estimate the relative contributions made by the ageing population and changes in the age-specific prevalence of dementia to the predicted future costs of dementia. When the relevant data on medical costs for particular years were missing, we assumed that those costs would have increased by the same amount as the per-capita gross domestic product (GDP).

We conducted multiple sensitivity analyses to assess the impact of variations in the key input parameters on our primary estimates. Specifically, we estimated the total costs of dementia by (i) using prevalence data derived from a different systematic review that yielded more conservative estimates of the prevalence of dementia than those that we used for our primary estimates; (ii) assuming that medical costs would increase 5% every year; (iii) using the minimum and maximum values — instead of the overall mean — for the hours spent on informal care; (iv) using the means of the minimum and maximum values recorded, in China's 22 provinces, five autonomous regions and four municipalities, for an informal carer's wages — instead of the overall national mean value; (v) assuming that dementia cases aged at least 60 years had a mean productivity weight of 0.5 instead of 0.1; (vi) assuming that 70% or 99% of people with dementia — instead of 86% — would live at home; and (vii) assuming that 60.4% or 0.4% of dementia patients — instead of 4.9% — would seek professional care.

Results

The total number of people with dementia in China was estimated to be about 3.5 million in 1990, 5.1 million in 2000 and 9.6 million in 2010 (Table 1). The overall prevalence of dementia among people aged at least 60 years was projected to increase from 5.8% in 2020 to 6.7% in 2030 (Table 2). The total number of people with dementia in China was projected to reach 14.1 million by 2020 and 23.3 million by 2030.

Between 1990 and 2010, the mean annual costs of formal and informal care for each dementia case increased more than 60-fold and more than 18-fold, respectively (Table 3). Over the same period, the national total annual costs of dementia increased more than 50-fold, from about US$ 0.9 billion in 1990 to approximately US$ 47.2 billion, or about 0.7% of China's GDP in 2010.

The total costs of dementia were projected to reach US$ 69.0 billion in 2020 and US$ 114.2 billion in 2030 (Fig. 1). The ageing population and increases in dementia prevalence appeared to be the major driving factors for the high costs of dementia in 2010–2020 and the ageing population also appeared to be the dominant force behind the growth of dementia costs between 2020 and 2030 (Fig. 2).
According to our estimates, the costs of informal care for dementia accounted for 94.4%, the total costs of dementia care in China in 1990, decreasing to 92.9% in 2000 and 81.3% in 2010 (Fig. 3). In contrast, the costs of formal care accounted for just 2.7% of the total costs in 1990, increasing to 2.8% in 2000 and 12.8% in 2010. Hospitalization costs accounted for only about 1% of total costs in each year between 1990 and 2010.

The results of our sensitivity analyses indicated that variations in informal care hours, prevalence of dementia and productivity weighting had a substantial impact on estimates of the total costs of dementia, whereas changes in medical prices, wages and the proportions of patients living at home or seeking professional care had relatively little impact on such estimates (Table 4).

Discussion

Increasing costs of dementia

In China, from an age of 60 years, the prevalence of dementia almost doubles every five years and, as elsewhere,28,29 about half of those who have survived to an age of at least 90 years are affected by dementia. According to our estimates, the economic burden of dementia in China will increase substantially over the next few decades and this increase will be driven primarily by population ageing and the increasing prevalence of dementia. Our estimates of the total costs of dementia in China for 2010 and 2030 represent about 7.8% of the estimated US$ 604 billion global cost in 2010 and 10% of the forecasted US$ 1110 billion global cost in 2030.1,7 Our primary estimates of dementia costs are probably underestimates as they ignore the effects, on the costs of care, of home visits by professional careers, the predicted increases in the prevalence of diabetes, hypertension and other risk factors for dementia30 and the predicted increases in the use of medical services and devices.

Our analyses indicated that, in China, informal care accounted for more than 80% of the total dementia costs in 2010. This proportion is consistent with the global trend revealed by a systematic review31 but higher than the proportion, of about 60%, reported for low- and middle-income countries by the World Health Organization.32 In China, the care of an elderly family member is traditionally perceived as an act of filial piety and dementia cases are therefore generally kept out of nursing homes.15,33 In rural areas there is also a lack of facilities and professional carers for dementia cases.34 There is no consensus on how to estimate the costs of informal care – with regard to care hours, costs per hour or types of caregiver – or the potential indirect costs, e.g. of lost productivity, incurred by informal caregivers.7,13,20 As in previous estimates of the global costs of dementia,7,13 we assumed that informal caregivers would be earning the national mean wage if they were not caring for dementia cases. Our estimates of the costs for hospitalization due to dementia indicated that such costs increased more slowly between 2000 and 2010 than between 1990 and 2000. It seems likely that hospitalization costs became more stable in 2003, when the Chinese government launched a programme of health-care reform designed to make medical treatment more accessible.35 Our data also revealed a substantial increase in the proportion of the total costs of dementia care attributed to formal care between 2000 and 2010. In countries with rapid economic growth, the responsiveness of the quantity demanded for a service to a change in the income of the people demanding that service, that is, the...
income elasticity of demand, usually increases the use of formal care. Given the Chinese tradition of home care and the debate over whether formal care can ever meet all of the emotional and psychological needs of dementia cases,\(^{36,37}\) it remains to be seen whether increasing wealth in China will have much effect on the uptake of formal care for dementia cases.\(^{38,39}\)

**Implications for health policy**

In China, public health policy needs to be tailored to address the economic burden posed by dementia. There needs to be greater focus on developing an integrated health and social-care system, including improvements in the efficiency of dementia care and improved health education and financial and social support for dementia cases and their caregivers. Dementia care might be integrated with the national programme for critical illness insurance. Informal caregivers could be taught knowledge and skills relevant to dementia care.\(^{40}\) Central or local governments could adopt preferential tax policies or offer other financial incentives to encourage nongovernmental organizations to participate more in dementia-related care services and education.

Policy-makers also need to establish a strategic action plan designed to promote the primary and secondary prevention of dementia. In the past few decades, epidemiological studies have identified several modifiable risk factors for dementia, e.g. cardiovascular disease, that can be targeted for primary prevention.\(^{41}\) Current intervention strategies against cardiovascular disease are likely to be effective in delaying dementia onset. The declining incidence of dementia in some high-income countries may be attributable to improvements in the control of other risk factors such as diabetes, hypertension and smoking.\(^{42–45}\)

In addition, in settings where effective medical and social-care interventions are available, screening for the early detection of dementia may be cost-effective.\(^{46,47}\) Geriatricians in clinical settings should be alert to the first symptoms and signs of the dementia syndrome. Early interventions for dementia may delay entry into nursing homes and reduce the overall costs of care.\(^{48}\)

**Strengths and limitations**

Our estimates were based on data from multiple sources. The cost data on the use of health resources by dementia cases were from itemized routine hospital records, prevalence data were from a comprehensive systematic review\(^4\) and United Nations population projections and data from the National Bureau of Statistics of China represented the most authoritative sources for demographic and income data. Our study had several limitations. First, given the considerable variations in economy, cultures, health-care systems, social welfare and traditions across China, cost data from two health facilities in Shandong province are unlikely to be nationally representative. We partly addressed this concern by weighting our estimates and performing multiple sensitivity analyses. The values for income per capita, health expenditure and hospital costs for Shandong province are similar to the mean national values.\(^49\) Second, the growth rate of medical prices is generally faster than that of the GDP values we used to fill gaps in the data on dementia costs. Given the increasing awareness and use of health services for dementia, it also seems likely that the costs of medical services will increase more rapidly in the coming decades than by 5% annually, that is, by the rate we used in our sensitivity analysis. Third, as people with dementia often suffer from other chronic health conditions,\(^50,51\) comorbidities might reduce the accuracy of our estimates of dementia costs. Fourth, data on the proportion of patients with...
dementia seeking professional care were very limited. Finally, while we used a dynamic model in our projection to account for the ageing population and changes in prevalence of dementia over time, alterations in other factors – e.g. use of medical devices, prevalence of risk factors for dementia and the hiring of professional caregivers – may have reduced the accuracy of our predictions. If, in the future, additional data become available, alternative approaches such as micro-simulation may provide better cost estimates.52,53

In conclusion, demographic and epidemiological transitions in the past two decades have driven substantial growth in the economic costs of dementia in China. This trend is likely to continue over the next two decades. Given the huge economic burden of dementia, policy-makers in China are advised to make dementia a national health priority and to develop a strategic nationwide action plan. Failure to take appropriate action now will allow the economic burden of dementia to grow even further and could, in the long-term, cause dysfunction throughout China’s entire health-care system. ■

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Malnex

The economic burden of the dementia in China in the past and future years.

The overall economic burden of dementia has increased significantly from 1990 to 2030. In 1990, the annual economic burden was approximately 1.94 billion US dollars. By 2030, this figure is projected to reach 31.42 billion US dollars. This increase is due to the aging population and the rising prevalence of dementia in China.

The main contributors to the economic burden of dementia are medical costs, informal care costs, and productivity loss. Medical costs include direct medical costs and indirect costs such as transportation costs and lost productivity. Informal care costs are borne by families and can be substantial. Productivity loss refers to the loss of economic activity due to the illness of the person with dementia.

To address the increasing economic burden of dementia in China, policymakers and healthcare providers will need to develop and implement strategies to reduce the cost of care, improve the efficiency of the healthcare system, and promote preventative measures to reduce the incidence of dementia.

In conclusion, understanding and addressing the economic burden of dementia is crucial for maintaining a healthy and productive population. It is important for policymakers and healthcare providers to work together to develop strategies that can help to reduce the economic burden of dementia in China.
Resumen

La carga económica de la demencia en China, 1990–2030: implicaciones para la política sanitaria

**Objetivo**

Cuantificar y predecir la carga económica de la demencia en China durante los periodos comprendidos entre 1990 y 2010 y entre 2020 y 2030, respectivamente, y analizar las posibles implicaciones para la política sanitaria pública del país.

**Métodos**

Utilizando un enfoque social, basado en la prevalencia y coste bruto de la enfermedad, así como información de varias fuentes, se estimó o se predijo el total de costes económicos anuales de la demencia en China. Se incluyeron los costes médicos directos en entornos ambulatorios y hospitalarios, los costes no médicos directos (por ejemplo, los costes de transporte) y los costes indirectos derivados de la pérdida de productividad. No se incluyeron los costes relacionados con la comorbilidad.

**Resultados**

El total de costes anuales estimados de la demencia en China aumentó de 900 millones de dólares estadounidenses (USD) en 1990 a 47 200 millones de USD en 2010, y se prevé que aumentarán hasta los 69 000 millones de USD en 2020 y los 114 200 millones de USD en 2030. Los costes de la atención informal sumaban un 94,4%, un 92,9% y un 81,3% del total de costes estimados en 1990, 2000 y 2010, respectivamente. En China, el envejecimiento demográfico y la creciente prevalencia de la demencia fueron los principales impulsores del aumento de los costes de la demencia previstos entre 2010 y 2020, y el envejecimiento demográfico fue el principal factor que contribuyó al crecimiento de los costes de la demencia entre 2020 y 2030.

**Conclusión**

En China, las transiciones demográficas y epidemiológicas han impulsado el crecimiento observado en los costes económicos de la demencia desde la década de los 90. Si el objetivo es reducir los futuros costes de la demencia, China necesita un plan de acción nacional contra la demencia para desarrollar un sistema de atención sanitaria y social integrado y fomentar la prevención primaria y secundaria.
Research

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12. Olesen J, Gustavsson A, Svensson M, Wittenhu J, Jonsson B. CDBE2010 study group; European Brain Council. The economic cost of brain disorders in Europe. 2012:2177:56.

13. World Alzheimer Report 2010: the global economic impact of dementia. London: Alzheimer’s Disease International; 2010. Available from: http://www.alz.co.uk/research/files/WorldAlzheimerReport2010.pdf [cited 2015 Apr 21].

14. The international statistical classification of diseases and related health problem, tenth revision. Geneva: World Health Organization; 1992. Available from: http://www.who.int/classifications/icd/en/ [cited 2015 Apr 21].

15. Wang G, Cheng Q, Zhang S, Bai L, Zeng J, Cui P, et al. Economic impact of dementia in developing countries: an evaluation of Alzheimer-type dementia in Shanghai, China. J Alzheimers Dis. 2008 Sep;15(1):99–105. PMID: 18780971

16. China statistical yearbook 2015. Beijing: National Bureau of Statistics of China. 2015. Available from: http://www.stats.gov.cn/tjjs/ndsj/2015/index.htmlx [cited 2015 Apr 21].

17. United Nations Population Information Network [Internet]. New York: United Nations; 2015. Available from: www.un.org/popsin [cited 2015 Apr 21].

18. Chen LJ, Zhao GM, Tang JK, Fang H. A study on the economic burden of people with senile dementia in nursing homes. Chin Health Econ. 2009;28(19):1–19. Chinese.

19. Hu WS, Tang MN, Zheng HB, Ma C, Hu HY. Study on economic burden of senile dementia in community, nursing institution and psychiatric hospital. J Pract Med. 2008;24(10):1821–3. Chinese.

20. Wang H, Gao TF, Wima A, Xu Y. Caregiver time and cost of home care for Alzheimer’s disease: a clinic-based observational study in Beijing. Ageing Int. 2010;35(2):153–65. doi: http://dx.doi.org/10.1080/17413d87.0906156. PMID: 19524780

21. Phillips MR, Zhang J, Shi Q, Stanford, WE, Zold DS, Blacker D, et al. Clinical features associated with costs in early AD: baseline data from the Early Onset Alzheimer Disease (EURCOGNITION) study group; EURCOGNITION study group; EURCOGNITION study group; EURCOGNITION study group; EURCOGNITION study group. Am J Geriatr Psychiatry. 2015 Feb(30):192. PMID: 25358236

22. Qiu C, Fratiglioni L. A major role for cardiovascular burden in age-related cognitive decline. Nat Rev Cardiol. 2015 May;12(5):267–77. doi: http://dx.doi.org/10.1038/nrcardio.2014.223 PMID: 25586619

23. Qiu C, von Strauss E, Blackman L, Winblad B, Fratiglioni L. Twenty-year changes in dementia occurrence suggest decreasing incidence in central Stockholm, Sweden. Neurology. 2013 May 14;80(20):1888–94. doi: http://dx.doi.org/10.1212/WNL.0b013e3182e92ca9 PMID: 23596063

24. Matthews FE, Stephens BC, Robinson L, Jagger C, Barnes LE, Arthur A, et al.; Cognitive Function and Ageing Studies (CFAS) Collaboration. A two-decade dementia incidence comparison from the Cognitive Function and Ageing Studies I and II. Nat Commun. 2016;7:11398. doi: http://dx.doi.org/10.1038/ncomms11398 PMID: 27092707

25. Sztaszal CL, Beiser AS, Chourakis V, Chene G, Dufouil C, Seshadri S. Incidence of dementia over three decades in the Framingham Heart Study. N Engl J Med. 2016;374(16):1545–52. doi: http://dx.doi.org/10.1056/NEJMoa1504327 PMID: 26863354

26. Winblad B, Amouyel P, Andreasen N, Ballard C, Brayne C, Brodaty H, et al. Defeating Alzheimer’s disease and other dementias: a priority for European science and society. Lancet Neurol. 2016 Apr;15(5):455–532. PMID: 26987701

27. Dixon J, Ferdinand M, D’Amico F, Knapp M. Exploring the cost-effectiveness of a one-off screen for dementia (for people aged 75 years in England and Wales). Int J Geriatr Psychiatry. 2015 May;30(5):446–52. doi: http://dx.doi.org/10.1002/gps.4208 PMID: 25354132

28. Bux J, Wang J, Wima A, Qiu C. The economic burden of mental disorders in China, 2005–2013: implications for health policy. BMC Psychiatry. 2016;16(1):137. doi: http://dx.doi.org/10.1186/s12888-016-0839-0 PMID: 27169936

29. Bunn F, Burn AM, Goodman C, Rag I, Norton S, Robinson L, et al. Comorbidity and dementia: a scoping review of the literature. BMC Med. 2014;12:192. PMID: 25358236

30. Poblador-Plou M, Calderón-Larralaga A, Marta-Moreno J, Hanco-Caaveda J, Sicas-Masara A, Soljak M, et al. Comorbidity of dementia: a cross-sectional study of primary care older patients. BMC Psychiatry. 2014;14(1):84. doi: http://dx.doi.org/10.1186/1471-244X-14-84 PMID: 2464576

31. Brookmeyer R, Evans DA, Hebert, L. Kanga LM, Henryring SG, Plassman BL, et al. National estimates of the prevalence of Alzheimer’s disease in the United States. Alzheimers Dement. 2011 Jan;7(1):61–73. doi: http://dx.doi.org/10.1016/j.jalz.2010.11.007 PMID: 21255744

32. Norton S, Matthews FE, Brayne C. A commentary on studies presenting projections of the future prevalence of dementia. BMC Public Health. 2013;13(1):1. PMID: 23280303