

Population ageing and residential care resources in Beijing: spatial distribution of the elderly population and residential care facilities

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ABSTRACT

Background. Beijing faces enormous challenges in caring for its elderly population because of demographic ageing and socio-economic transformations. Residential care has become an alternative for the care of the elderly.

Methods. Various indicators have been developed to understand the demographics of the elderly population and the development of residential care industry. Using these indicators, the spatial distribution of the elderly population and residential care facilities (RCFs) was mapped.

Results. The oldest-old (≥ 80 years) females were more vulnerable than other elderly groups in terms of health and socio-economic status. The spatial distribution of the elderly population and residential care resources was uneven and mismatched.

Conclusion. The oldest-old females should receive most care resources. In some central districts of Beijing, resources do not meet the potential demand for RCFs, whereas in suburban and ex-urban areas, resources are under-utilised. The findings provide scientific evidence for future planning of residential care services in Beijing.

Key words: Demography; Population dynamics; Residential facilities

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INTRODUCTION

Elderly populations in China are fast-growing, as a result of the decline in fertility and the increase in life expectancy. By 2005, the elderly population in China was 144 million or 11.03% of the total population.¹ In Beijing, the elderly population was 2 million in 2006 or 16.9% of its total population and is expected to reach 30% in 2025.^{2,3} This population of elderly needs more care resources than any other age-group.

Traditionally, Chinese people live in multi-generational families, and the elderly receive care from their adult children and extended families.⁴ The combination of socio-demographic changes

(rapid population ageing, the increased geographical distances of adult children from their parents, increased proportion of women in the workforce) decreases the availability of family members to provide day-to-day care for the elderly.^{5,6} Thus, in the absence or shortage of community or home care, residential care becomes a viable alternative.

Understanding the geography of ageing and health care enables assessment of the spatial distribution of the elderly population and residential care resources.⁷ Statistics, mapping, and geographic information system have been used to provide information on service locations and availability, and explore the spatial match between service needs and

resources.⁸⁻¹² In China, residential care is new for the elderly; studies have usually focused on social welfare system reform,^{13,14} options and challenges of elderly care,^{6,13,15,16} characteristics of residents in RCFs,⁵ and the development of residential care.^{17,18} From a geographic perspective, demographic changes in the ageing population and regional differences have also been studied in China.¹⁹ Residential care in Shanghai, Tianjin, and Nanjing has also been studied.^{17,20-22}

This paper aimed to understand the demographics of the elderly population and development of the residential care industry in Beijing, and to visualise the spatial distribution of the elderly population and residential care resources. Challenges of accessing residential care resources and the distribution pattern in terms of potential needs and supplies are also discussed.

METHODS

Policy documents on the development of residential care and the social welfare system were reviewed, as were population data of the elderly (≥ 60 years), the oldest-old (≥ 80 years), and elderly families (a family with all of its members aged ≥ 60 years living alone, as a couple, or with parents or elderly relatives).²³

Beijing municipality consists of 16 districts and 2 counties. The 11th Five-Year Plan on function area development of its municipality divides Beijing into 4 functional areas: Capital Core Functional Area (Dongcheng, Xicheng, Chongwen, and Xuanwu districts), Urban Functional Extension Area (Chaoyang, Fengtai, Shijingshan, and Haidian districts), Urban New Developing Area (Fangshan, Tongzhou, Shunyi, Changping, and Daxing districts), and Ecological Protection Area (Mentougou, Huairou, Pinggu districts, and Miyun and Yanqing counties).^{3,24} The spatial distribution of the elderly population was analysed using 3 indicators: percentage of the elderly population (≥ 60 years) to the total population, percentage of the oldest-old (≥ 80 years) to the total population, and percentage of elderly families to the elderly population.

Data related to self-rated health status, income sources, marital status, and education,²³ as well as the ownership, bed numbers, occupied bed numbers, and the standard charge of each RCF²⁵ were reviewed. Occupancy rates and the number

of beds per thousand elderly persons were used to indicate the availability and spatial distribution of residential care resources. The ArcMap 9.2 software was used for mapping.

RESULTS

By the end of 2006, the registered population in Beijing was 11.98 million, and the elderly population was 2.02 million, which was 16.9% of the total population. Regarding the oldest-old, there were 258 000 (2.2% of the population). Both the number and proportion of elderly people has rapidly increased during the past 2 decades and will continue to increase in the next few decades, and is expected to become 4 150 000 by 2025, which will be 30% of the population.^{2,3}

Health status was better among men than women and among those aged ≥ 60 years than the oldest-old. Gender and age differences were important factors in considering the demand for elderly care (**TABLE 1**). The gender difference was more obvious among the oldest-old than the overall elderly population. Two thirds of the oldest-old who self-reported having no ability to self-care or work were females. The oldest-old were generally in poorer health and more likely to need elderly care resources than the young-old (age 60-79 years).²³

A higher proportion of the young-old than the oldest-old received income from work, which implies that elderly people may take on a second job after retirement.²⁶ In China, the retirement age is 60 for male workers, 55 for female cadres, and 50 for female workers. A lower proportion of the oldest-old received income from work and pensions compared to the overall elderly population. Thus, financial dependence on family members among the oldest-old was higher. Elderly men were more likely to receive pensions and less likely to depend on family members than elderly women.

The elderly were more likely to live without a spouse; elderly women were less likely to live with a spouse than elderly men. Among the oldest-old, males were almost twice as likely as the females to live with a spouse, partly because females live longer than males and tend to marry men older than themselves. With regard to education level, the young-old were more likely to be better educated

TABLE 1
Demographics of Beijing elderly inhabitants in 2005²³

Demographics	% of elderly					
	≥60 years			≥80 years		
	Total	Male	Female	Total	Male	Female
Self-rated health						
Healthy	61.65	31.18	30.47	28.91	15.60	13.31
With ability to self-care/work	23.67	10.53	13.14	31.46	16.91	14.55
Without ability to self-care/work	13.95	5.64	8.31	37.66	12.99	24.67
Not clear	0.73	0.28	0.45	1.97	0.68	1.29
Income sources						
Income from work	4.74	4.00	0.74	0.17	0.15	0.02
Retirement income	69.39	36.88	32.51	56.54	36.58	19.96
Social welfare income	1.20	0.57	0.63	2.44	0.76	1.68
Enterprise transfer	0.03	0.02	0.01	0	0	0
Support from family	23.37	5.61	17.77	39.42	8.23	31.19
Other sources	1.27	0.55	0.71	1.43	0.46	0.97
Marital status						
With spouse	76.90	40.95	35.95	42.58	27.58	15.00
Without spouse	23.10	6.68	16.42	57.42	18.60	38.82
Education						
Without formal education	19.31	3.47	15.84	30.38	6.49	23.89
Less than high school	50.31	25.85	24.46	48.97	29.43	19.54
Graduated from high school	13.68	7.46	6.22	12.65	3.93	8.72
Above college education	16.70	10.85	5.85	8.00	6.33	1.67

than the oldest-old, and elderly males were more likely to be better educated than elderly females.²³

The young-old were in a better position than the oldest-old in terms of health, finance, marital status, and education level. Elderly males were more likely to be healthier, more financially independent, have a spouse, and be better educated than elderly females. Both age and gender differences among elderly people enhanced the vulnerability of the oldest-old females, which implies that they are also the most likely group needing elderly care resources among the elderly population.

Private sector organisations and non-profit corporations were allowed to invest in the residential care industry since the 1990s. A guide for development of elderly care was put forward, based on home care and community care with the support of residential care. This was to fulfil the Chinese tradition of filial piety and in accord with the level of socio-economic development.²⁷ By the end of 2008 in Beijing, there

were 336 RCFs with 41 583 beds in total, and 61% of the beds were occupied. About 1.26% of the elderly population lived in RCFs and there were 20 beds for per 1000 elderly persons in Beijing.²⁵

Ownership of RCFs in Beijing is divided between government-operated RCFs, community RCFs, private RCFs, and publicly owned and privately run RCFs. Government-operated RCFs are usually managed by the civil administration department in urban areas and funded by local and central governments. Community RCFs include those operated by city neighbourhood and village committees, and are funded by the community, local and central governments. RCFs operated by individuals, companies, enterprises, and organisations are categorised as private RCFs. Publicly owned and privately run RCFs are a new type of ownership developed in recent years. They are set up and funded by government, but managed by the private sector with the aim of reducing costs and to take advantage of the private sector's expertise

in management. The private sector does not own the properties or need to pay rent, but assumes sole responsibility for the profits or losses. Private RCFs offer almost half of the beds (49.49%), community RCFs offer 36.44% of the beds, and government operated RCFs and publicly owned and privately run RCFs offer 7.93% and 6.14% of the beds, respectively. Only government operated and community RCFs accept subjects with 'Three-No' (no living children or relatives, little or no income, and no physical ability to work in urban areas) and provide 'Five Guarantees' for free (basic needs of food, clothes, shelter, health care, and funerals for the childless elderly and the disabled in rural areas) with funding from the local governments. All other elderly residents are charged residential and service fees. The average charge of RCFs is between 1000 to 2000 Yuan per month. Standard charges in Beijing vary from 117 to 7100 Yuan per month. There was no significant difference in standard charges among the 4 types of ownership. Within each type of RCF, however, there was a wide range of standard charges.

The average income of the elderly in Beijing was 1338 Yuan per month in 2006. For those in urban areas, their average income was 1643 Yuan per month, but was only 316 Yuan per month in rural areas.²⁸ Elderly people with rural household registration

mainly depended on their families for living and health care expenses, and residential care was an expensive option for such elderly. The development of the residential care industry provides a choice for family caregivers to reduce their care burden, whereas social welfare reform has shifted more of the financial burden onto individual families.

The spatial distribution of the elderly population is important for an understanding of the demand for elderly care resources. Xuanwu (20.3%) and Chongwen (19.6%) districts in the Capital Core Functional Area and Chaoyang district (19.4%) in the Urban Functional Extension Area are the areas with the highest proportions of elderly persons (FIGURE 1).³ The indicators of the percentage of the oldest-old to the total population and the percentage of elderly families to the elderly population show the distribution of the elderly population most likely to need elderly care resources. Chongwen (3.9%), Xuanwu (3.6%), and Xicheng (3.5%) in the Capital Core Functional Area are districts with the highest proportions of the oldest-old (TABLE 2). Both the proportion of the elderly population and the oldest-old are higher in the Ecological Protection Area than in the Urban New Developing Area. One possible reason is that a part of the middle-aged population (the main source of the labour) has migrated from

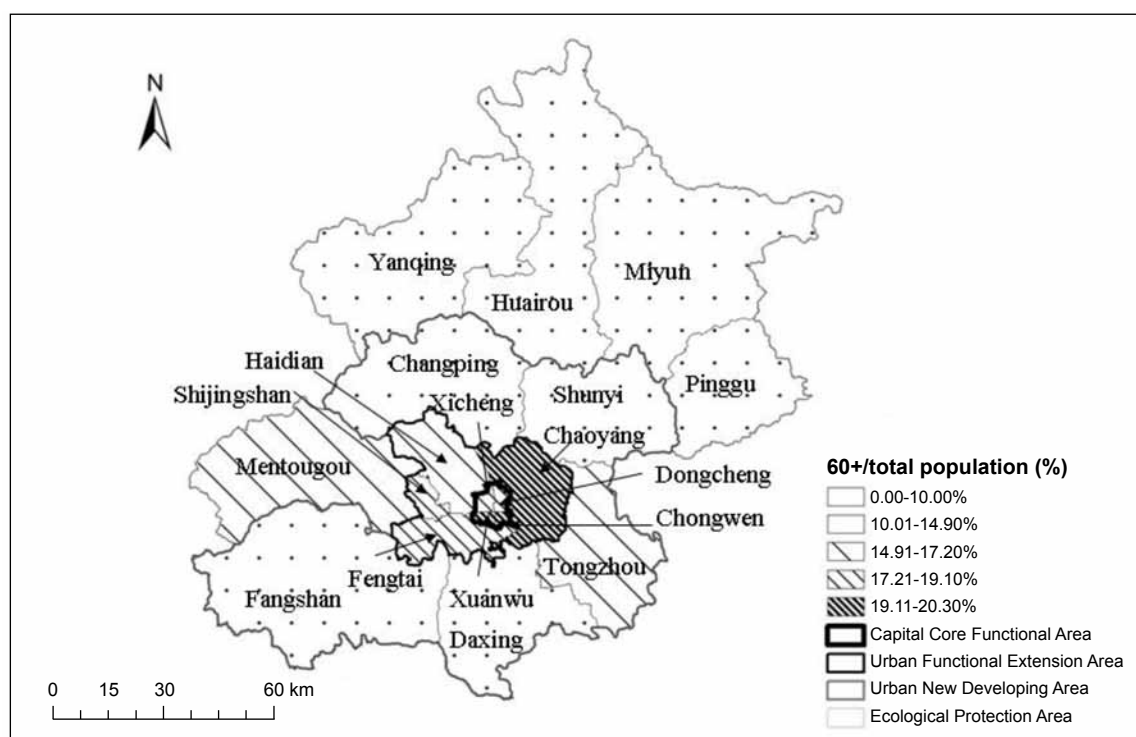


FIGURE 1. The spatial distribution of population aged ≥ 60 years in Beijing in 2006.³

TABLE 2
Spatial distribution of the elderly and residential care facilities (RCFs) in Beijing^{3,25}

Area	Population 60+ (10 000)	60+/total population (%)	Population 80+ (10 000)	80+/total population (%)	Elderly family (10 000)	Elderly family/ 60+ (%)	No. of RCFs	No. of beds (by July 09)	Beds / 1000 60+	Occupancy rate (%)
Beijing	202.4	16.9	25.8	2.2	33.1	16.4	336	40384	19.95	60.72
Capital Core Functional Area	43.2	19.3	8	3.6	4.7	10.9	32	2062	4.77	89.72
Dongcheng	11.3	18.4	2.1	3.4	1.4	12.4	7	350	3.1	89.43
Xicheng	14.6	19.1	2.7	3.5	1.6	11.3	14	574	3.93	93.03
Chongwen	6.6	19.6	1.3	3.9	0.4	6.4	3	420	6.36	93.81
Xuanwu	10.7	20.3	1.9	3.6	1.3	11.7	8	718	6.71	84.82
Urban Functional Extension Area	90.8	17.8	10.2	2	15.9	17.5	85	15309	16.86	68.85
Chaoyang	34.1	19.4	3.8	2.2	6	17.7	28	5049	14.81	73.12
Fengtai	19.2	19.1	2.2	2.2	3	15.7	23	3221	16.78	61.35
Haidian	31	15.7	3.5	1.8	5.2	16.6	25	5379	17.35	67.41
Shijingshan	6.5	18.6	0.7	2	1.7	26.8	9	1660	25.54	75.06
Urban New Developing Area	44	14.5	4.8	1.6	6	13.7	131	15807	35.93	51.99
Fangshan	10.5	13.8	0.9	1.2	0.8	8.1	36	2021	19.25	28.90
Shunyi	8.4	14.9	1	1.8	1.1	13.5	17	1822	21.69	60.04
Tongzhou	9.9	15.5	1.2	1.9	1.5	15.3	19	2209	22.31	75.65
Daxing	8	14	0.9	1.6	1.3	15.8	23	3268	40.85	63.37
Changping	7.2	14.6	0.8	1.6	1.3	17.5	36	6487	90.10	43.13
Ecological Protection Area	24.4	15.1	2.8	1.7	6.5	26.6	88	7206	29.53	54.29
Mentougou	4.1	17.2	0.5	2.1	1.4	33.4	13	998	24.34	59.32
Miyun	6.3	14.7	0.7	1.6	1.7	27.6	21	1565	24.84	67.67
Huairou	4	14.6	0.4	1.5	1	25.3	17	1091	27.28	39.69
Pinggu	5.9	14.9	0.7	1.8	1.2	19.9	20	1852	31.39	52.21
Yanqing	4.1	14.7	0.5	1.8	1.2	28.9	17	1700	41.46	50.65

the ex-urban areas to central and suburban areas for better pay, leaving the elderly back at home. The distribution pattern of the oldest-old does not match the distribution of the elderly population. For example, Chaoyang has a relatively low proportion of the oldest-old but a relatively high proportion of the elderly, which indicates that Chaoyang may become the area with highest proportion of the oldest-old if the pattern does not change in the next 2 decades.³

By the end of 2006, the number of the elderly in elderly families was 331 000, which was 16.4% of the total elderly population in Beijing. Elderly people in elderly families are more likely to lack caregiving resources than those who live with their adult

children or relatives. Mentougou, Yanqing, and Miyun have the highest proportion of elderly families. The proportion of elderly families is higher in suburban and ex-urban areas than in central districts, which supports the idea that the influence of labour force migration from ex-urban areas to suburban and central districts affects these population measures. In the central districts of Beijing, a high percentage of elderly people still live with their children or relatives, even though the more general trend is for them to become more and more financially independent and live by themselves or with their spouses instead with their children.¹⁸

Changping in the Urban New Development Area has relatively abundant residential care resources (36

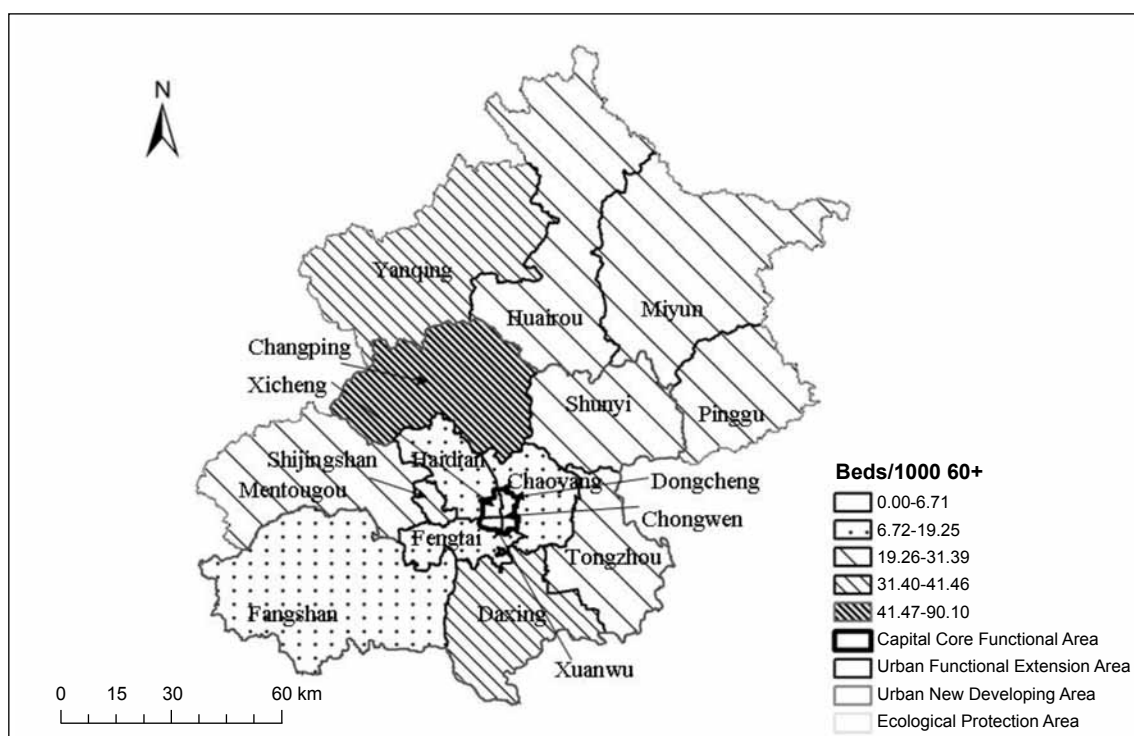


FIGURE 2. The spatial distribution of residential care resources in Beijing in 2008.²⁵

RCFs with 90.1 beds/1000 elders) and Dongcheng in the Capital Core Functional Area has relatively few resources (7 RCFs with 3.1 beds/1000 elders) [FIGURE 2]. With respect to ownerships, private, publicly owned and privately run, and government-operated RCFs all favour locations in the central districts and suburban districts, whereas most of the RCFs in ex-urban districts are traditional community RCFs. Those in central districts are generally more expensive than those in suburban and ex-urban districts.²⁵

The occupancy rate of RCFs is used to show the utilisation and availability of residential care resources. The districts with less residential care resources are more likely to have high occupancy rates. For example, among the 7 RCFs located in Dongcheng, 1 government-operated RCF and 5 community RCFs are fully occupied (100%), with only 1 private RCF 38% occupied. The occupancy rate of RCFs in districts with the most abundant resources, such as Fangshan (40.25%) and Changping (43.13%), is relatively low (TABLE 2).

The distribution pattern of the elderly population and residential care resource are geographically uneven and mismatched (FIGURES 1 and 2). The

Capital Core Functional Area and Urban Functional Extension Area have the highest proportion of elderly people, but relatively few residential care resources and a high occupancy rates (e.g., Xicheng District has 13 out of 15 RCFs fully occupied except for 2 RCFs under construction). By contrast, 57% of the residential care resources are located in the Urban New Developing Area and Ecological Protection Area, where the occupancy rates are lower than 50%.^{3,25}

The distribution pattern of the elderly population indicates a higher proportion of the elderly are concentrated in the central districts, whereas a higher proportion of elderly families are located in the ex-urban areas. The large number and distribution patterns of the elderly implies that Beijing is already facing pressure from population ageing and the demand for elderly care, especially in the central and ex-urban districts. The situation in Beijing will become more serious as the number and proportion of elderly inhabitants constantly and rapidly increase. Central districts have a high proportion of the elderly population with relatively limited residential care resources, whereas ex-urban areas have relatively abundant residential care resources but with low utilisation.

DISCUSSION

Understanding demographic characteristics of the elderly population helps identify the potential demand for elderly care. The oldest-old females are the most vulnerable with regard to health and socio-economic status and demands for elderly care resources owing to their age and gender. Lack of financial security of elderly people limits their access to residential care, especially for those in rural areas. The spatial distribution of the elderly population and care resources shows the geographic mismatch between potential demand and care resources in Beijing. Policies have facilitated the development of residential care over the past 2 decades, but the utilisation of current residential care resources is inefficient. The resources in some central districts are unable to meet the potential demand, whereas some resources in suburban and ex-urban areas are under-utilised.

The city-district (county)-street (village) multi-level residential care system that Beijing municipal government plans to create policies to meet the challenges owing to the uneven distribution of care demands and care resources and satisfy various levels of demands.²⁹ Considering the limited availability of land in central districts, one option is to improve and enlarge existing RCFs and transform under-used public facilities into RCFs. For instance, some community kindergartens and primary schools now attract fewer students than before because of recent demographic changes. Already, the local government and communities have converted some of these facilities into RCFs to meet the increasing demand for residential care, and might consider converting more facilities in the future. In view of the availability of land and the pleasant physical environment in suburban areas, more new RCFs are planned for these areas. However, many RCFs have already been built in suburban areas where the average occupancy rate is <60%. An over-supply of RCFs can also result in wastage of resources and reduce market competition. In ex-urban areas, most of the RCFs are traditional community-operated facilities for elderly people without children. In theory the residential care resources in these areas could satisfy the needs of the elderly population, but the condition of these facilities and quality of care services need to be improved.

Various factors affect access and utilisation of residential care, apart from geographic factors. Financial affordability, socio-cultural factors such as the quality of services provided by RCFs and traditional cultural conceptions on RCFs, are also crucial. In addition, the high proportion of elderly families in ex-urban areas because of labour force migration from ex-urban areas to suburban and central districts also reinforces the pressure for elderly care.

This paper contributes to a general understanding of the geographical distribution of potential care needs and resources, which provides a reference for the future planning of residential care resources in Beijing. If more detailed data become available, future research directions should focus on: (1) the spatial distribution of potential care needs considering the health and socio-economic status of the elderly population, (2) the spatial distribution of various types of residential care resources in order to improve the allocation of resources to meet demand, and (3) the link between demand for care and residential care resources for better planning of the multi-level residential care system.

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REFERENCES

1. National Bureau of Statistics of China. *One percent population sample survey in 2005* [In Chinese]. National Bureau of Statistics of China 2006. Available from <http://www.stats.gov.cn/tjsj/ndsj/renkou/2005/renkou.htm>. Accessed 25 September 2010.
2. Beijing Municipal Bureau of Statistics. *The future 50 years of Beijing municipality* [in Chinese]. Beijing: Electronics press; 2000.
3. Committee on Aging of Beijing. *Report on elderly population information and development of elder care of Beijing in 2006* [in Chinese]. Beijing; 2007. Available from <http://zhengwu.beijing.gov.cn/tjxx/tjgb/P020071019536380228806.doc>. Accessed 25 September 2010.
4. Chen SY. *Social policy of the economic state and community care in Chinese culture: Aging, family, urban change, and the socialist welfare pluralism*. Brookfield: Avebury; 1996.
5. Gu D, Dupre ME, Liu G. Characteristics of the institutionalized and community-residing oldest-old in China. *Soc Sci Med* 2007;64:871-83.
6. Zhan HJ. Chinese caregiving burden and the future burden of elder care in life-course perspective. *Int J Aging Hum Dev* 2002;54:267-90.

7. Andrews GJ, Phillips DR. Changing local geographies of private residential care for older people 1983-1999: lessons for social policy in England and Wales. *Soc Sci Med* 2002;55:63-78.
8. Andrews GJ. Residential homes: from distributions in spaces to the elements of place. In: Andrews GJ, Phillips DR, editors. *Ageing and place*. New York: Routledge; 2005:61-78.
9. Gatrell A, Loytonen M, editors. *GIS and health*. London: Taylor & Francis; 1998.
10. Joseph AE, Cloutier DS. A framework for modeling the consumption of health services by the rural elderly. *Soc Sci Med* 1990;30:45-52.
11. Joseph AE, Cloutier DS. Elderly migration and its implications for service provision in rural communities: an Ontario perspective. *J Rural Stud* 1991;7:433-44.
12. Morrison D, Alexander D, Fisk J, Maguire J. Improving delivery of health and community services to welfare recipients, Columbia, South Carolina, 1997. *J Public Health Manag Pract* 1999;5:49-50.
13. Bartlett H, Phillips DR. Ageing and aged care in the People's Republic of China: national and local issues and perspectives. *Health Place* 1997;3:149-59.
14. Huang J. Economic restructuring, social safety net, and old-age pension reform in China. *Am Asian Rev* 2003;21:171-89.
15. Joseph AE, Phillips DR. Ageing in rural China: impacts of increasing diversity in family and community resources. *J Cross Cult Gerontol* 1999;14:153-68.
16. Zhang Y, Goza FW. Who will care for the elderly in China? A review of the problems caused by China's one-child policy and their potential solutions. *J Aging Stud* 2006;20:151-64.
17. Zhan HJ, Liu G, Bai H. Recent developments in Chinese elder homes: a reconciliation of traditional culture. *Aging Int* 2005;30:167-87.
18. Zhan HJ, Liu G, Guan X. Willingness and availability: explaining new attitude towards institutional elder care among Chinese elderly parents and their adult children. *J Aging Stud* 2006;20:279-90.
19. Wang W, Zhang L, Li HR, Li RB, Yang LS, Liao Y. Spatial-temporal changes and trends of aging in China. *Chin Geogr Sci* 2005;15:200-5.
20. Di J, Rosenbaum E. Caregiving system in transition: an illustration from Shanghai, China. *Res Policy Rev* 1994;13:101-12.
21. Zhan HJ, Feng X, Luo B. Placing elderly parents in institutions in urban China: a reinterpretation of filial piety. *Res Aging* 2008;30:543-71.
22. Zhan HJ, Liu G, Guan X, Bai HG. Recent developments in institutional elder care in China: changing concepts and attitudes. *J Aging Soc Policy* 2006;18:85-108.
23. Beijing Municipal Bureau of Statistics. *One percent population sample survey of Beijing municipality (2005)* [in Chinese]. Beijing: Statistics of China; 2007.
24. Beijing Municipal Commission of Development and Reform. *11th five-year plan on function area development of Beijing municipality 2006* [in Chinese]. Available from <http://www.chinaenvironment.com/view/ViewNews.aspx?k=20061207103952477>. Accessed 25 September 2010.
25. Beijing Municipal Bureau of Civil Affairs. *Social welfare facilities* [in Chinese]. Social Welfare Information of Beijing 2009. Available from <http://bjfl.bjmzj.gov.cn/index.do?websitesId=900&netTypeId=2>. Accessed 25 September 2010.
26. Arnsberger P, Fox P, Zhang X, Gui S. Population aging and the need for long term care: a comparison of the United States and the People's Republic of China. *J Cross Cult Gerontol* 2000;15:207-27.
27. The Central Government and State Council of China. *The decision on improving elder care 2000* [in Chinese]. Available from <http://law.lawtime.cn/d446022451116.html>. Accessed 25 September 2010.
28. Li C. Survey on elderly population in rural and urban areas of Beijing [in Chinese]. *Sci Times* 2007.
29. State Council of China, Ministry of Civil Affairs of China. *Suggestions on accelerating social welfare socialization 2000* [in Chinese]. Available from <http://www.people.com.cn/zcx/2000/04/040101.html>. Accessed 25 September 2010.