

THE LANCET

Supplementary appendix

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Appendix 1. Trends in demographic, economic and disease patterns between 2012 and 2030

Indicator	2012 (otherwise stated)	2030
% population above 65	9% ¹	20% ²
% urban population	52% ¹	65% ³
Total dependency ratio	36.0% (2010) ⁴	44.8% ⁴
GDP growth rate	7.7% (2013) ⁵	5.0% (2026-2030) ³
Household income growth rate	10.06% (2012-2015) ⁶	5.91% (2020-2030) ⁶
The number of NCD cases (myocardial infarction, stroke, COPDs, DM, and lung cancer) among people over 40	79 million (2010) ⁷	181 million (2030) ⁷
<p>Data source: ¹ The World Bank. http://data.worldbank.org/indicator/ (accessed Mar 30, 2013). ² Wang F. Racing towards the precipice. <i>China Econ Q</i> 2012; June: 17-21. ³ The World Bank, Development Research Center of the State Council of the People's Republic of China. <i>China 2030: Building a Modern, Harmonious, and Creative High-Income Society</i>. Washington, DC: The World Bank; 2012. ⁴ United Nation, Department of Economic and Social Affairs, Population Division, Population Estimates and Projections Section. <i>World Population Prospects: The 2012 Revision</i>. http://esa.un.org/unpd/wpp/Excel-Data/population.htm (accessed Mar 30, 2013). ⁵ National Bureau of Statistics of China. <i>China National Economic and Social Development report 2013</i>. http://www.stats.gov.cn/tjsj/zxfb/201402/t20140224_514970.html (accessed Mar 30, 2014). ⁶ Woetzel J, Li XL, Cheng W. <i>What's next for China?: McKinsey & Company</i>; 2012. ⁷ Wang S, Marquez P, Langenbrunner J. <i>Toward a Healthy and Harmonious Life in China: Stemming the Rising Tide of Non-Communicable Diseases: Human Development Unit, East Asia and Pacific Region, The World Bank</i>; 2011.</p>		

Appendix 2: A snapshot of medical conglomerates in China

Medical conglomerates are generally made up of financial groups, pharmaceutical companies and other industry. For instance, PKU HealthCare was established in 2003 by Peking University and the Founder Group making an acquisition of Southwest Synthetic Pharmaceutical Corp. Ltd. Following the merger, it became a medical conglomerate dealing in both the healthcare and pharmaceutical markets.¹

Another example is the China Resources Healthcare (CR Healthcare), set up in 2011 by the China Resources Company, a multi-business holding enterprise incorporating seven strategic business units including retail, pharmaceuticals, and finance. CR Healthcare mainly focuses on hospital investment and medical devices.²

Medical conglomerates develop their hospital networks either by building new hospitals or acquiring existing ones. While the Peking University International Hospital was built by PKU HealthCare and the Evergrande Group intends to set up a new hospital in Shenzhen (Guangdong Province) in cooperation with Harvard Brigham and Women's Hospital,³ issues surrounding licensing and staff recruitment make it difficult to start from scratch.^{4,5} Consequently, it is more common to expand hospital networks through acquisition. In 2013, PKU HealthCare acquired Kaide Hospital (Zhuzhou, Hunan Province) – a tertiary hospital specializing in cardiovascular diseases⁶ – and CR Healthcare holds stake in Kunming Children's Hospital, the Guangdong 999 Brain Hospital, the Xuzhou Mine Hospital and the WISCO General Hospital.⁷

Pharmaceutical companies have also been actively involved in hospital investment. In 2003, Jinling Pharmaceuticals bought a 63 percent stake in Suqian Hospital (Jiangsu Province) and successfully upgraded it from a secondary to a tertiary hospital after two years.⁸ Other involved pharmaceutical companies include Fosun, Kangmei, Gansu Duiwei, Mayinglong, Beijing Shuanglu, Jointown, Wuhan Jianmin, Harbin Sanjing, Inner Mongolia Furui, Guizhou Yibai and Chongqing Huapont.⁹

At the time of writing, many deals were still under negotiation and no rigorous evaluations existed.

Appendix 3. Review of literature on hospital competition

Reference citation	Years	Country	Study Population	Measures of competition	Impacts on efficiency	Impacts on quality
Kessler and McClellan (2000) ¹⁰	1985-1994	USA	All nonrural elderly Medicare beneficiaries hospitalized for treatment of AMI	Herfindahl-Hirschman Indexes (HHI) categorized into 4 groups: very low, low, high, very high	Comparing two extreme groups, competition led to * significantly higher <i>1-year hospital expenditure</i> before 1990 whereas significantly lower after 1990	Comparing two extreme groups, competition led to * lower rate of <i>1-year mortality</i> (only significant after 1990) * lower rate of <i>1-year AMI readmission</i> (significant for both periods) * no significant results on <i>1-year HF readmission</i>
Kessler and McClellan (2002) ¹¹	1985-1996	USA	all nonrural elderly Medicare beneficiaries hospitalized for treatment of AMI	Presence of for-profit hospital	Patients from area with above-median density of for-profit hospitals have statistically significantly lower levels of <i>1-year hospital expenditures</i> as compared to patients from areas with below-median density, of around 2.4%	No significant effect on <i>1-year mortality</i> , <i>1-year AMI readmission</i> , and <i>1-year HF readmission</i>
Gowrisankaran and Town (2003) ¹²	1989-1993	USA	both Medicare and HMO patients in Southern California	HHI following Kessler and McClellan (2000)	n/a	An increase in the degree of competition for HMO patients is associated with a decrease in <i>risk-adjusted hospital mortality rates for pneumonia and AMI</i> but it is not true for Medicare enrollees
Barro, Huckman and Kessler (2007) ¹³	1993, 1996, 1999	USA	Medicare patients with a new occurrence of cardiovascular illness (AMI, heart disease, dysrhythmia, heart failure, other heart conditions, circulatory system disorders, and cerebrovascular disorder)	1. living in the area experienced specialty hospital entry (entry HRRs), which typically for-profit firms that are at least partially owned by physicians 2. presence of a specialty hospital (1999 data only)	1. For <i>1-year hospital expenditures</i> , results differ with the choice of baseline. With the baseline they prefer, patients from entry HRRs experienced statistically significantly slower growth, whereas no significant results on intensive procedures (<i>CATH, PTCA, CABG</i>). 2. No significant result on expenditure, but specialty hospitals provided significantly more intensive procedures	1. Results differ with the choice of baseline. With the baseline they prefer, no statistically significant results on <i>365-day mortality</i> , <i>365-day CHF readmission</i> , <i>365-day AMI readmission</i> 2. Specialty hospital had significantly lower mortality rate but no significant effects on CHF/AMI readmission
Propper et al (2008) ¹⁴	1991/1992 - 1999/2000	UK	hospital trusts that have more than 10 AMI admissions in each year	The number of hospitals within 30 minutes' drive (including controls for population density)	Competition reduced <i>waiting times</i> .	The relationship between competition and <i>30-day in-hospital mortality rate for AMI</i> over 50s is negative.
Bloom et al. (2010) ¹⁵	2006	UK	All acute public sector hospitals (NHS "trusts") in England with orthopaedics or cardiology departments	The number of other public hospitals within a given "catchment area" for each hospital (30km radius as baseline)	n/a	Higher competition is positively correlated with increased management quality, and this relationship strengthens when we instrument the number of local hospitals with local political competition. Adding another rival hospital increases the index of management quality by one third of a standard deviation and leads to a 10.7% reduction in <i>heart-attack mortality rates</i> .
Cooper et al. (2012) ¹⁶	2002 to 2010	United Kingdom	Hospital admission – virtually should include every NHS consultant episode.	HHI of market concentration and hospital counts	Efficiency measure is average length of stay (two measures pre- and post- elective surgery). competition between public providers led to improvement of productivity measured by pre-surgery, overall and post-surgery length of stay	(<i>no quality – efficiency</i> continued) one standard deviation decrease in market concentration pre-reform was associated with a reduction in overall LOS of between 2% and 6% relative to the mean LOS over that period.

Cooper et al. (2011) ¹⁷	2002 to 2008	United Kingdom	Hospital admission – virtually should include every NHS consultant episode (after cleaning etc. 227 hospital sites)	HHI based on patient flow	n/a	30-day mortality rate fell 0.31 percentage points faster per year after the reforms for patients treated in more competitive markets
Gaynor et al. (2010) ¹⁸	2003 and 2007	United Kingdom	Hospital level data – for acute hospitals only	HHI based on patient flow	n/a	mortality rates both within the hospital and including deaths post-hospital discharge as indicators of quality. A 10% increase in the HHI leads to an increase of 2.91% in the AMI death rate
Palangkaraya and Yong (2013) ¹⁹	2000/1 to 2004/5.	Victoria, Australia	Using Victorian admitted episode dataset (VAED), which considers hospital admission public and private.	HHI and number of competing hospitals.	n/a	30-day mortality rates and 30-day unplanned readmission rates. hospitals facing higher competition have lower unplanned admission rates, but competition is related negatively to hospital quality when measured by mortality (effects very small and not really significant)

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