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Direct Economic Burden of Alzheimer's Disease and Parkinson's Disease Among Patients Covered by Health Insurance in GBA

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Outline

- **Background**
- **Objectives**
- **Methodology**
- **Results**
- **Conclusions**



Background

- Due to the rapidly growing aging population, **Alzheimer's disease (AD) and Parkinson's disease (PD)** are becoming a worldwide public health problem.
- **AD and PD are the first and second most common neurodegenerative disorder.**
- AD and PD imposes a significant financial burden on patients and their families, as well as on the health care systems.



Background

AD Prevalence in GBA

表 2 我国各省、自治区及直辖市 AD 及其他痴呆疾病负担数据(/10 万)*

地区	患病率	标化患病率	死亡率	标化死亡率
安徽	1 018.6	775.4	25.0	23.1
北京	865.5	717.0	22.2	20.5
重庆	1 227.7	794.4	32.1	25.3
福建	861.3	791.5	22.7	24.1
广东	801.5	845.5	19.2	22.7
广西	824.8	774.1	21.5	24.3
贵州	691.4	678.3	17.1	21.8
甘肃	777.1	767.6	18.1	24.2
海南	732.8	768.5	19.0	23.9
河南	956.6	889.3	18.0	20.7
河北	977.4	928.5	21.3	26.5
黑龙江	842.6	746.1	17.3	21.2
湖南	956.7	770.8	23.9	23.6
湖北	987.3	770.8	23.3	23.2
江苏	1 212.1	778.6	31.1	22.4
江西	611.2	624.9	16.5	20.9
吉林	1 081.4	882.4	19.3	20.5
辽宁	1 077.5	759.2	24.1	21.3
内蒙古	755.5	750.6	16.2	21.6
宁夏	589.5	776.7	13.4	24.4
青海	520.7	769.6	12.0	24.9
上海	1 137.6	799.9	34.0	24.7
山东	1 006.8	766.9	25.7	23.1
山西	690.2	707.0	18.8	24.9
四川	1 059.0	791.6	26.0	25.1
陕西	848.7	780.0	20.4	24.6
天津	902.3	803.3	25.3	27.3
新疆	510.3	736.5	12.1	24.4
西藏	383.0	761.8	8.5	21.7
云南	666.9	772.7	16.7	25.0
浙江	1 078.6	815.6	30.1	25.2
香港	1 585.2	711.8	61.1	24.2
澳门	948.7	799.0	26.6	21.2

- In 2019, China had an estimated **15.3 million cases** of dementia.
- In 2019, the prevalence of AD and other types of dementia in **Guangdong province, Hong Kong and Macao** was **(801.5/ 100,000), (1,585.2/100,000)** and **(948.7/100,000)** respectively.

[1]GBD 2019 Dementia Forecasting Collaborators. Estimation of the global prevalence of dementia in 2019 and forecasted prevalence in 2050: an analysis for the Global Burden of Disease Study 2019. *The Lancet Public health*, 2022, 7(2):e105–e125. doi:10.1016/S2468-2667(21)00249-8

[2]任汝静,殷鹏,王志会,等.中国阿尔茨海默病报告2021[J].诊断学理论与实践,2021,20(04):317-337.DOI:10.16150/j.1671-2870.2021.04.001.



Background

Economic Burden of AD

- In China, the calculated annual costs of dementia was predicted to reach **US\$114.2 billion by 2030.**
- In 2015, the annual socioeconomic costs per patient of **AD** were **US\$19,144.36** in mainland China.
- In 2017, per capita cost of **AD** was **CNY 114,343.7**, while the total cost was **CNY 27.53 billion**, accounting for 0.77% of Zhejiang Province's GDP.

[1]Wimo, A, Seeher, K, Cataldi, R, et al. The worldwide costs of dementia in 2019. *Alzheimers & Dementia*, 2023,1-9. doi:10.1002/alz.12901

[2] Xu J, Wang J, Wimo A, Fratiglioni L, Qiu C. The economic burden of dementia in China, 1990-2030: implications for health policy. *Bulletin of the World Health Organization*. 2017, 95(1):18-26. doi:10.2471/BLT.15.167726

[3] Jia J, Wei C, Chen S, et al. The cost of Alzheimer's disease in China and re-estimation of costs worldwide. *Alzheimers & Dementia*. 2018,14(4):483-491. doi:10.1016/j.jalz.2017.12.006

[4]Yu E, Liao Z, Fan W, et al. The Economic Burden of Alzheimer's Disease in Zhejiang Province. *Journal of Alzheimer's Disease*. 2021,80(2):539-553. doi:10.3233/JAD-201285



Background

Economic Burden of PD

- In China, **PD patients** will increase to **5 million** by 2030, accounting for 50% of worldwide PD patients.
- In Shanghai, the percentage of overall mean **annual cost of PD** in GDP per capita was 17.46% in 2015.
- The average direct medical costs per **PD** patient were **USD 2,577.04** per year in 2019 in Nanjing City.

Li, G.; Ma, J.; Cui, S.; He, Y.; Xiao, Q.; Liu, J.; Chen, S. Parkinson's disease in China: A forty-year growing track of bedside work. Transl. Neurodegener. 2019, 8, 22

刘涛,王遥,白倩,罗尔丹,刘卫国,卞鹰.帕金森病患者的疾病经济负担现状及影响因素研究[J].临床神经病学杂志,2022,35(03):166-170.



Health Insurance in Guangdong Province

- Two urban insurance schemes in China
 - UEBMI**: Urban **Employee** Basic Medical Insurance (launched in 1998)
 - URBMI**: Urban **Resident** Basic Medical Insurance (launched in 2007)
- In 2022, **48.6 million** urban employees **in Guangdong province** had participated in the **UEBMI**. A total of **63.0 million** urban residents participated in **URBMI**.



Objectives

- These studies aimed to evaluate the direct medical costs of **patients with AD and PD** using a large sample from an entire city and to identify the potential factors correlating with their inpatient costs in Guangzhou City, Southern China.

Study 1: Direct medical costs of dementia including AD in Guangzhou

Study 2: Direct medical costs of PD in Guangzhou

Methodology

- Data Sources: **Reimbursement claim database** cover entire enrollees of the UEBMI and URBMI scheme in Guangzhou during the period from 2008 through 2013.
- **Disease subtypes** for AD&PD

	ICD-10 code		
Dementia	Alzheimer's Disease (AD) (F03 and G30)	Vascular Dementia (VaD) (F01)	Other Types of Dementia (G20)
PD	Idiopathic Parkinson's Disease (IPD) (G20)	Secondary Parkinsonism (SP) (G21)	

- The final sample included **5,747** dementia patients, and **2,660** PD patients .



Methodology

- Theoretical framework: **Andersen's behavioral model** of health services use. The predictors of inpatient costs for **patients with AD and PD** were selected based on this theoretical framework and the results of the literature review.
- Descriptive analysis and the multivariate regression analysis based on the **Extended Estimating Equations (EEE) model** were conducted.



Dementia Results: Descriptive Statistics

Table 2. Dementia patient characteristics.

Patient Characteristics	Overall	UEBMI	URBMI
No. Patients	5747	5013	734
Gender			
Female	3288.0 (57.2)	2893.0 (57.7)	395.0 (53.8)
Male	2459.0 (42.8)	2120.0 (42.3)	339.0 (46.2)
Age (years)			
Mean \pm SD	77.4 \pm 10.0	77.6 \pm 9.7	76.1 \pm 12.0
Median (25th–75th)	79.0 (72.0–84.0)	79.0 (73.0–84.0)	76.0 (70.0–85.0)
Age group			
18 \leq age < 50	56.0 (1.0)	30.0 (0.6)	26.0 (3.5)
50 \leq age < 60	332.0 (5.8)	280.0 (5.6)	52.0 (7.1)
60 \leq age < 70	670.0 (11.7)	582.0 (11.6)	88.0 (12.0)
70 \leq age < 80	1967.0 (34.2)	1711.0 (34.1)	256.0 (34.9)
80 \leq age < 85	1391.0 (24.2)	1267.0 (25.3)	124.0 (16.9)
\geq 85	1331.0 (23.2)	1143.0 (22.8)	188.0 (25.6)
Insurance type			
UEBMI	5013.0 (87.2)	5013.0 (100.0)	0.0 (0.0)
URBMI	734.0 (12.8)	0.0 (0.0)	734.0 (100.0)
Disease type			
AD	3448.0 (60.0)	2911.0 (58.1)	537.0 (73.2)
VaD	1338.0 (23.3)	1214.0 (24.2)	124.0 (16.9)
Others	961.0 (16.7)	888.0 (17.7)	73.0 (9.9)
Comorbidities			
None	3258.0 (56.7)	2698.0 (53.8)	560.0 (76.3)
Hypertension	2238.0 (38.9)	2067.0 (41.2)	171.0 (23.3)
Diabetes	413.0 (7.2)	407.0 (8.1)	6.0 (0.8)
Coronary	779.0 (13.6)	742.0 (14.8)	37.0 (5.0)
Hospital level			
Primary	358.0 (6.2)	330.0 (6.6)	28.0 (3.8)
Secondary	2026.0 (35.3)	1803.0 (36.0)	223.0 (30.4)
Tertiary	3363.0 (58.5)	2880.0 (57.5)	483.0 (65.8)
Length of stay (days)			
Mean \pm SD	24.2 \pm 21.6	22.8 \pm 19.9	33.7 \pm 29.0
Median (25th–75th)	17.0 (12.0–30.0)	17.0 (12.0–29.0)	29.0 (11.0–34.0)
Days \leq 10	1137.0 (19.8)	972.0 (19.4)	165.0 (22.5)
10 < Days \leq 15	1314.0 (22.9)	1209.0 (24.1)	105.0 (14.3)
15 < Days \leq 30	1990.0 (34.6)	1823.0 (36.4)	167.0 (22.8)
30 < Days \leq 60	830.0 (14.4)	685.0 (13.7)	145.0 (19.8)
>60 Days	476.0 (8.3)	324.0 (6.5)	152.0 (20.7)



Dementia Results: Descriptive Statistics

- The average age of dementia patients was **77.4** years old and patients aged 70–80 accounts for 34.2%.
- Most of the dementia patients were **female** (57.2%).
- **60% of total sample were AD subtype**, **23.3%** were VaD subtype, and **16.7%** were other types of dementia.
- The average annual length of stay (LOS) was **24.2 days**, and 34.6% of the patients stayed in the hospitals for 15–30 days.



PD Results: Descriptive Statistics

Table 4. Parkinson's disease patient characteristics.

	Overall	UEBMI	URBMI
No. Patients	2660	2448	212
Gender, n(%)			
Female	1318.0 (49.5)	1178.0 (48.1)	140.0 (66.0)
Male	1342.0 (50.5)	1270.0 (51.9)	72.0 (34.0)
Age (years)			
Mean \pm SD	71.4 \pm 9.9	71.5 \pm 9.8	70.5 \pm 10.3
Median (25th–75th)	73.0 (65.0–78.0)	73.0 (66.0–78.0)	71.0 (63.0–78.0)
Age groups, n(%)			
18 \leq age < 60	335.0 (12.6)	302.0 (12.3)	33.0 (15.6)
60 \leq age < 75	1145.0 (43.0)	1047.0 (42.8)	98.0 (46.2)
75 \leq age < 90	1160.0 (43.6)	1080.0 (44.1)	80.0 (37.7)
\geq 90	20.0 (0.8)	19.0 (0.8)	1.0 (0.5)
Insurance types, n(%)			
URBMI	212.0 (8.0)	/	212.0 (100.0)
UEBMI	2448.0 (92.0)	2448.0 (100.0)	/
Disease subtypes, n(%)			
SP	1319.0 (49.6)	1211.0 (49.5)	108.0 (50.9)
IPD	1341.0 (50.4)	1237.0 (50.5)	104.0 (49.1)
Hospital levels, n(%)			
Primary	103.0 (3.9)	94.0 (3.8)	9.0 (4.2)
Secondary	506.0 (19.0)	472.0 (19.3)	34.0 (16.0)
Tertiary	2051.0 (77.1)	1882.0 (76.9)	169.0 (79.7)
Length of stay (days)			
Mean \pm SD	20.0 \pm 26.3	20.2 \pm 26.9	17.8 \pm 17.7
Median(25th–75th)	14.0 (10.0–20.0)	14.0 (10.0–20.0)	12.0 (9.0–19.0)
Days < 15, n(%)	1457.0 (54.8)	1325.0 (54.1)	132.0 (62.3)
15 \leq Days < 30	855.0 (32.1)	800.0 (32.7)	55.0 (25.9)
Days \geq 30	348.0 (13.1)	323.0 (13.2)	25.0 (11.8)
Comorbidities, n(%)			
None	1506.0 (56.6)	1349.0 (55.1)	157.0 (74.1)
Hypertension	946.0 (35.6)	900.0 (36.8)	46.0 (21.7)
Diabetes	306.0 (11.5)	296.0 (12.1)	10.0 (4.7)
Coronary heart disease	177.0 (6.7)	168.0 (6.9)	9.0 (4.2)
Alzheimer's disease	70.0 (2.6)	68.0 (2.8)	2.0 (0.9)
Schizophrenia	9.0 (0.3)	9.0 (0.4)	0.0 (0.0)
Mood disorders	69.0 (2.6)	67.0 (2.7)	2.0 (0.9)
Admission year, n(%)			
Year 2008	364.0 (13.7)	351.0 (14.3)	13.0 (6.1)
Year 2009	419.0 (15.8)	382.0 (15.6)	37.0 (17.5)
Year 2010	440.0 (16.5)	409.0 (16.7)	31.0 (14.6)
Year 2011	652.0 (24.5)	598.0 (24.4)	54.0 (25.5)
Year 2012	785.0 (29.5)	708.0 (28.9)	77.0 (36.3)

PD Results: Descriptive Statistics

- The mean age of PD patients was **71.4** years old.
- **Males** made up half of the overall sample (50.5%).
- **50.4% were IPD patients**, while the rest (**49.6%**) were patients with SP subtype.
- The average LOS was **20.0** days. A large proportion (54.8%) of patients with PD stayed at hospitals for less than 15 days.



Dementia Results: Direct medical costs of Dementia including AD

Table 3. Direct inpatient costs by types of insurance.

Direct Inpatient Costs	Overall	UEBMI	URBMI	p-Value
No. Patients	5747	5013	734	
Total inpatient costs				0.000
Mean (CNY)	9169.0	9425.0	7420.5	
SD	7899.1	8239.6	4625.2	
Laboratory and diagnostic costs				0.000
Percentage of total inpatient cost (%)	9.7	10.1	6.1	
Mean (CNY)	887.7	951.0	455.3	
SD	1599.2	1662.3	969.8	
Non-medication treatment costs				0.000
Percentage of total inpatient cost (%)	38.5	38.7	36.4	
Mean (CNY)	3526.6	3647.5	2700.8	
SD	3603.9	3727.6	2454.2	
Medication costs				0.000
Percentage of total inpatient cost (%)	38.4	38.5	37.9	
Mean (CNY)	3524.3	3628.2	2814.4	
SD	3946.1	4116.6	2370.0	
Bed fees				0.000
Percentage of total inpatient cost (%)	9.2	8.7	13.9	
Mean (CNY)	847.2	820.5	1029.0	
SD	779.2	752.7	920.5	
Other fees				0.000
Percentage of total inpatient cost (%)	4.2	4.0	5.7	
Mean (CNY)	383.3	377.8	421.0	
SD	414.9	425.2	334.6	
Out-of-pocket spending				0.539
Percentage of total inpatient cost (%)	19.3	18.1	30.0	
Mean (CNY)	1771.9	1705.9	2222.3	
SD	1841.8	1683.0	2643.9	

Table 4. Dementia patient characteristics associated with inpatient costs.

Patient Characteristics No. Patients	Overall n = 5747		UEBMI n = 5013		URBMI n = 734		p-Value
	Mean	SD	Mean	SD	Mean	SD	
Gender							0.077
Female	8880.5	7905.2	9143.9	8239.4	6951.2	4336.8	
Male	9554.8	7875.9	9808.6	8226.3	7967.3	4889.8	
Age group							0.000
18 ≤ age < 50	9310.4	3822.0	10,122.4	4244.6	8373.4	3087.5	
50 ≤ age < 60	10,278.0	8611.8	10,523.7	9190.0	8954.9	4146.0	
60 ≤ age < 70	9721.0	7869.2	10,024.8	8119.6	7712.1	5586.3	
70 ≤ age < 80	9936.5	8828.9	10,351.7	9282.8	7161.5	3772.2	
80 ≤ age < 85	8585.7	7212.7	8709.8	7438.3	7317.4	4081.1	
>85	8083.9	6848.0	8237.7	7014.6	7148.5	5658.5	
Insurance type							\
UEBMI	9425.0	8239.6	9425.0	8239.6	\	\	
URBMI	7420.5	4625.1	\	\	7420.5	4625.1	
Disease type							0.000
AD	8251.9	7394.7	8477.4	7820.9	7029.8	4219.8	
VaD	9934.0	7451.2	10,188.6	7670.2	7442.2	4052.7	
Others	11,394.2	9539.4	11,487.7	9720.5	10,257.8	6918.4	
Comorbidities							0.000
None	8808.6	7965.6	9065.8	8452.3	7569.3	4811.2	
Hypertension	9730.3	8058.1	9971.0	8266.4	6821.4	3842.4	
Diabetes	10,118.2	7378.7	10,077.9	7407.1	12,847.0	4703.9	
Coronary	10,019.0	7497.4	10,116.1	7619.1	8071.7	3979.4	
Hospital level							0.000
Primary	5538.6	3256.6	5615.4	3264.1	4633.1	3079.7	
Secondary	6733.0	5427.8	6879.0	5642.8	5552.9	2950.5	
Tertiary	11,023.0	8907.9	11,455.4	9337.9	8444.4	4987.5	
Length of stay (days)							0.000
Days ≤ 10	6873.5	3583.1	7044.4	3566.8	5866.5	3523.0	
10 < Days ≤ 15	8996.5	4543.6	9132.3	4575.5	7432.1	3844.0	
15 < Days ≤ 30	9056.7	6012.4	9173.4	5878.5	7783.5	7215.9	
30 < Days ≤ 60	8504.1	8758.4	8933.3	9496.0	6476.4	2876.2	
>60 Days	16,757.1	17,622.2	20,114.1	20,449.4	9601.3	2574.5	



PD Results: Direct medical costs of PD

Table 5. Direct medical costs per patient by the type of insurance.

Compositions	Overall	UEBMI	URBMI	p Value
No. Patients	2660	2448	212	
Direct medical costs				
Mean (CNY)	14,514.9	14,606.3	13,459.2	0.060
SD	12,511.2	12,615.6	11,208.9	
Bed fees				
Percentage of direct medical costs (%)	6.1	6.1	5.8	
Mean (CNY)	887.3	896.6	779.6	0.012
SD	1011.7	1029.3	774.3	
Medication costs				
Percentage of direct medical costs (%)	50.3	50.3	50.9	
Mean (CNY)	7307.3	7347.0	6848.7	0.344
SD	7063.4	7151.1	5953.0	
Laboratory and diagnostic costs				
Percentage of direct medical costs (%)	12.9	12.8	14.2	
Mean (CNY)	1877.2	1873.8	1917.0	0.833
SD	1645.1	1627.3	1842.1	
Non-medication treatment costs				
Percentage of direct medical costs (%)	28.0	28.1	26.4	
Mean (CNY)	4062.0	4105.6	3558.7	0.003
SD	5700.9	5748.0	5111.2	
Other fees				
Percentage of direct medical costs (%)	2.6	2.6	2.6	
Mean (CNY)	381.0	383.2	355.2	0.048
SD	720.6	730.3	598.0	
Out-of-pocket spending				
Percentage of direct medical costs (%)	28.1	26.4	50.1	
Mean (CNY)	4085.3	3854.7	6747.9	<0.001
SD	3234.3	2904.9	5120.7	
Inpatient costs				
No. patients having hospitalization	2660.0 (100.0)	2448.0 (100.0)	212.0 (100.0)	
Mean (CNY)	13,551.4	13,651.0	12,402.2	0.041
SD	12,424.4	12,540.0	10,962.5	
Out-of-pocket spending				
Percentage of inpatient costs (%)	26.0	24.3	47.9	
Mean (CNY)	3527.8	3318.7	5942.2	<0.001
SD	2942.7	2645.4	4648.0	
Outpatient costs				
No. patients visiting outpatient	1432.0 (53.8)	1339.0 (54.7)	93.0 (43.9)	
Mean (CNY)	963.5	955.3	1057.0	0.024
SD	1461.6	1391.4	2112.5	
Out-of-pocket spending				
Percentage of outpatient costs (%)	57.9	56.1	76.2	
Mean (CNY)	557.5	536.0	805.7	0.118
SD	1126.7	1038.8	1848.2	

Table 6. Parkinson's disease patient characteristics associated with inpatient costs.

Patient Characteristics	Overall		UEBMI		URBMI		p Value
No. Patients	n = 2660		n = 2448		n = 212		
	Mean	SD	Mean	SD	Mean	SD	
Gender							
Female	13,291.5	11,917.0	13,291.0	11,839.8	13,295.2	12,592.1	0.040
Male	13,806.8	12,902.7	13,984.8	13,152.1	10,665.7	6488.1	
Age groups							0.030
18 ≤ age < 60	11,505.0	8643.7	11,452.6	8532.7	11,984.6	9732.7	
60 ≤ age < 75	13,205.4	12,166.6	13,363.5	12,264.3	11,515.8	10,984.1	
75 ≤ age < 90	14,443.9	13,493.1	14,500.8	13,633.3	13,676.5	11,478.5	
>90	15,878.5	11,650.0	16,130.0	11,913.4	11,101.4	/	
Disease subtypes							0.040
SP	12,975.4	11,037.9	12,940.9	10,990.5	13,362.4	11,602.7	
IPD	14,118.1	13,631.9	14,346.2	13,859.9	11,405.1	10,216.0	
Hospital levels							<0.001
Primary	9103.1	10,913.9	9097.4	11,344.3	9162.6	4754.9	
Secondary	11,944.7	13,582.5	11,872.0	13,435.2	12,953.4	15,676.9	
Tertiary	14,171.2	12,117.5	14,324.6	12,277.0	12,463.8	10,047.8	
Length of stay (days)							0.160
Days < 15	8794.3	4209.8	8836.6	4260.9	8369.4	3644.6	
15 ≤ Days < 30	13,890.4	7331.3	13,966.3	7455.4	12,786.2	5124.5	
Days ≥ 30	32,636.0	22,708.1	32,619.4	22,932.6	32,850.8	19,990.2	



Dementia and PD Results: Direct medical costs

- Overall, the mean total inpatient costs of **dementia patients** was **CNY 9,169.0** (USD 1479.8 in 2013), the mean total direct medical costs of **PD patients** was **CNY 14,514.9** (USD 2,299.4 in 2012)

	Dementia	PD
Direct medical costs	Inpatient: CNY 9,169.0	Total: CNY 14,514.9 Inpatient: CNY 13,551.4; Outpatient: CNY 963.5
Insurance type	UEBMI: CNY 9425.0 URBMI: CNY 7420.5	UEBMI: CNY 14,606.3 URBMI: CNY 13,459.2
Disease subtypes	AD: CNY 8251.9 VaD: CNY 9934.0	SP: CNY 12,975.4 IPD: CNY 14,118.1



Dementia Results: Influential Factors of Inpatient Costs

Table 5. Factors associated with total inpatient costs (EEE Model).

Influential Factors	Overall			UEBMI			URBMI		
	n = 5747			n = 5013			n = 734		
	Coef.	Adjusted Std. err.	Marginal Effect	Coef.	Adjusted Std. err.	Marginal Effect	Coef.	Adjusted Std. err.	Marginal Effect
Gender									
Female (Reference)									
Male	0.043	0.028	409.2	0.063 **	0.024	594.1	0.033	0.089	262.3
Age group									
18 ≤ age < 50 (Reference)									
50 ≤ age < 60	0.055	0.116	540.0	-0.053	0.108	-494.9	0.240	0.168	2342.6
60 ≤ age < 70	0.073	0.097	720.2	-0.020	0.083	-186.9	0.233	0.217	2184.3
70 ≤ age < 80	0.092	0.093	886.8	-0.016	0.077	-152.5	0.160	0.188	1352.3
80 ≤ age < 85	0.043	0.096	415.9	-0.060	0.079	-562.1	0.260	0.211	2393.7
≥ 85	0.074	0.095	722.7	-0.057	0.078	-530.1	0.352	0.208	3645.1
Insurance type									
URBMI (Reference)									
UEBMI	0.200 ***	0.046	1714.2	\	\	\	\	\	\
Disease type									
AD (Reference)									
VaD	0.136 ***	0.030	1354.4	0.135 ***	0.027	1317.3	0.069	0.089	564.4
Others	0.212 ***	0.033	2209.9	0.158 ***	0.03	1567.3	0.426 ***	0.12	3982.2
Comorbidities									
None (Reference)									
Hypertension	0.091 ***	0.028	870.3	0.067 ***	0.026	642.7	0.101	0.083	793.2
Diabetes	0.049	0.037	481.2	0.040	0.036	384.7	0.370 **	0.166	3724.5
Coronary	0.049	0.033	471.9	0.046	0.03	445.7	0.082	0.103	672.1
Hospital level									
Primary (Reference)									
Secondary	0.252 ***	0.039	2702.0	0.215 ***	0.032	2128.5	0.213	0.197	1950.9
Tertiary	0.721 ***	0.054	6129.6	0.693 ***	0.048	6153.0	0.731 ***	0.23	5097.8



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Dementia Results: Influential Factors of Inpatient Costs

- For dementia patients, **insurance type, dementia subtypes, comorbidities, hospital levels and LOS** were significantly associated with inpatient costs in Guangzhou city ($p < 0.01$).
- Compared with patients under the URBMI scheme, **the inpatient costs for the UEBMI beneficiaries were CNY 1714.2 (US\$276.7) significantly higher** ($p < 0.01$).



Dementia Results: Influential Factors of Inpatient Costs

- The hospitalization costs for **VaD** patients and patients with **other types** of dementia were **CNY 1354.4** and **CNY 2209.9** **significantly higher** respectively **compared to the AD patients** ($p < 0.01$).
- Compared with LOS less than 10 days, hospitalization **costs for the longest LOS group (>60 days)** was CNY 16,933.1 (US\$2732.9) **higher** among the UEBMI patients and CNY 7500.0 (US\$1210.5) **higher** among the URBMI patients ($p < 0.01$).



PD Results : Influential Factors of Inpatient Costs

Table 7. Factors associated with direct inpatient costs (EEE model).

Predictors	Overall (n = 2660)			p Value
	Coef.	Adjusted Std.err.	Marginal Effect	
Gender				
Female (Reference)				
Male	0.007	0.017	86.9	0.707
Age group				
18 ≤ age < 60 (Reference)				
60 ≤ age < 75	0.077 ***	0.028	1027.0	0.006
75 ≤ age < 90	0.131 ***	0.029	1738.0	<0.001
≥90	0.371 ***	0.130	5660.5	0.004
Insurance types				
URBMI (Reference)				
UEBMI	0.069 **	0.031	888.1	0.027
Disease subtypes				
SP (Reference)				
IPD	0.010	0.017	127.4	0.565
Hospital levels				
Secondary (Reference)				
Primary	-0.283 ***	0.045	-3378.7	<0.001
Tertiary	0.459 ***	0.027	5523.9	<0.001
Length of stay (days)				
Days < 15 (Reference)				
15 ≤ Days < 30	0.454 ***	0.023	6451.2	<0.001
Days ≥ 30	1.497 ***	0.056	29,804.3	<0.001
Comorbidities				
None (Reference)				
Hypertension	-0.01	0.017	-128.9	0.574
Diabetes	0.043	0.026	569.8	0.099
Coronary	-0.004	0.031	-52.3	0.898
Alzheimer's disease	-0.122 **	0.047	-1543.6	0.010
Schizophrenia	0.087	0.128	1188.7	0.496
Mood disorders	0.164 ***	0.047	2305.5	<0.001
Year				
Year 2008(Reference)				
Year 2009	0.091 **	0.036	1230.0	0.011
Year 2010	0.110 ***	0.031	1493.2	<0.001
Year 2011	0.108 ***	0.029	1454.4	<0.001
Year 2012	0.158 ***	0.028	2143.1	<0.001
λ	0.213 **	0.092		
θ1	0.238 ***	0.026		
θ2	2.547 ***	0.134		

PD Results : Influential Factors of Total Inpatient Costs



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- The **type of insurance**, age, hospital levels, **LOS** and **comorbidities** were significantly correlated with **inpatient costs of PD**.
- Compared with the URBMI patients, the inpatient costs of PD were CNY 888.1 **higher for the UEBMI** patients ($p < 0.05$)
- Inpatient costs were CNY 6,451.2 **higher for longer LOS group ($15 \leq \text{Days} < 30$)**, and CNY 29,804.3 **higher for the longest LOS group ($\text{Days} \geq 30$)**, compared to an LOS of less than 15 days ($p < 0.01$).



Discussions

- This was the **first** study using a large sample from an entire city's claims databases to **estimate the direct medical costs of dementia (including AD) and PD** in Guangzhou city, Southern China.
- The findings of this study suggested that **strategies to reduce the LOS** might be an effective method to **contain the costs of AD and PD**.
- We suggest providing support for the development of a comprehensive **Long-term care insurance system**, and use **telemedicine** for the treatment of **patients with AD and PD** in China.



Discussions

- The type of health insurance (**UEBMI**) was significantly correlated with higher inpatient costs of dementia and PD patients.
- UEBMI enrollees had **higher reimbursement rates and ceiling, and more comprehensive benefit packages**, which may lead to higher expenditures.
- In order to reduce the inequality caused by the insurance types, efforts should be made to **improve and consolidate the fragmented health insurance system** in China.




Conclusions

- **The direct medical costs of patients with AD and PD were high** compared to the GDP per capita in Guangzhou City, and different between the two evaluated types of insurance.
- **AD & PD costs** were mainly driven by the **insurance type** and **lengthy hospital stays**.
- Policymakers could consider **reduce the gaps** between the two urban insurance schemes in benefit levels, provide support for the development of a **long-term care insurance** system and promote **the use of telemedicine** in China.



Article

Costs of Hospitalization for Dementia in Urban China: Estimates from Two Urban Health Insurance Scheme Claims Data in Guangzhou City

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Abstract: *Background:* Dementia is one of the public health priorities in China. This study aimed to examine the hospitalization costs of patients with dementia and analyzed the factors associated with their inpatient costs. *Methods:* This was a prevalence-based, observational study using claims data derived from two urban insurance schemes during the period from 2008 through 2013 in Guangzhou. The extended estimating equations model was performed to identify the main drivers of total inpatient costs. *Results:* We identified 5747 dementia patients with an average age of 77.4. The average length of stay (LOS) was 24.2 days. The average hospitalization costs per inpatient was Chinese Yuan (CNY) 9169.0 (CNY 9169.0 = US\$1479.8 in 2013). The mean inpatient costs for dementia patients with the Urban Employee-based Basic Medical Insurance (UEBMI) scheme (CNY 9425.0 = US\$1521.1) were higher than those for patients with the Urban Resident-based Basic Medical Insurance scheme (CNY 7420.5 = US\$1197.6) ($p < 0.001$). Having UEBMI coverage, dementia subtypes, having hypertension, being admitted in larger hospitals, and longer LOS were significantly associated with hospitalization costs of dementia. *Conclusions:* The costs of hospitalization for dementia were high and differed by types of insurance schemes. Dementia was associated with substantial hospitalization costs, mainly



Article

Direct Medical Costs of Parkinson's Disease in Southern China: A Cross-Sectional Study Based on Health Insurance Claims Data in Guangzhou City

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Abstract: Background: Parkinson's disease (PD) is the second most common neurodegenerative disorder. This study aims to evaluate the direct medical costs of patients with PD using a large sample from an entire city and to identify the potential factors correlating with their inpatient costs in Guangzhou City, Southern China. Methods: This retrospective cross-sectional study uses data obtained from the Urban Employee-based Basic Medical Insurance (UEBMI) and the Urban Resident-based Basic Medical Insurance (URBMI) administrative claims databases in Guangzhou City from 2008 to 2012. The total sample was comprised of 2660 patients with PD. Costs were evaluated for the total sample and by types of insurance. The composition of costs was compared between the UEBMI and URBMI subgroups. The extended estimating-equations model was applied to identify the potential impact factors influencing the inpatient costs. Results: The direct medical costs per patient with PD were CNY 14,514.9 (USD 2299.4) in 2012, consisting of inpatient costs of CNY 13,551.4 and outpatient costs of CNY 963.5. The medication costs accounted for the largest part (50.3%). The inpatient costs of PD patients under the UEBMI scheme (CNY 13,651.0) were significantly higher than those of patients in the URBMI subgroup (CNY 12,402.2) ($p < 0.05$). The proportion of out-of-pocket spending out of inpatient and outpatient costs for UEBMI beneficiaries (24.3% and 56.1%) was much



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Thank you very much!

