Tools to Inform Policy
Chinese communities' Action in Response to Dementia
華人社會認知障礙症策略工具

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Association of comorbidity with healthcare utilisation in people living with dementia, 2010-2019
A population-based cohort study

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Introduction

- People living with dementia (PLwD) have:
  - higher rates of hospital admissions
  - longer hospital stays
  - more frequent primary care consultations & A&E visits
  - **comorbidity**
- Comorbidity in PLwD
  - key to healthcare utilization in PLwD
  - complex relationship
- Population-based evidence: allow sufficient sample size & follow-up duration to discover patterns & inform policy

Zhu CW, et al. *J Gerontol A Biol Sci Med Sci* 2015; 70(11): 1448-1453; Phelan EA, et al. *JAMA* 2012; 307(2): 165-72; Kingston A, et al, for the MODEM project. *Lancet Public Health* 2018; 3(9): e447-e455; Chen T-B, et al. *PloS ONE* 2017; 12(4): e0175475; Browne J, et al. *BMJ OPEN* 2017; 7(3): e012546-e.

Why Hong Kong?

- Evidence mostly from Western countries
  - Suggests high prevalence of multiple long-term conditions (78.5% - 89.01%) in PLwD
- Chinese: key driving force of global dementia prevalence
- In China, greater comorbidity burden may associate with:
  - length of hospitalization
  - daily expenditures
  - total costs
- However, high-quality, up-to-date longitudinal data lacking
- Hong Kong:
  - an aged society with the world's highest life expectancy at birth
  - 10-year population-based electronic health records available (2010-2019)

MacNeil-Vroomen JL, et al. Alzheimers Dement 2020; 16(9): 1224-33; Kaczynski A, et al. J Alzheimers Dis 2019; 68(2): 635-46; Afonso-Argiles FJ, et al. BMC Geriatr 2020; 20(1): 453; Mondor L, et al. PLOS MED 2017; 14(3): e1002249. Griffith LE, et al. BMC Geriatr 2016; 16(1): 177; GBD 2019 Dementia Forecasting Collaborators. Lancet Public health 2022; 7(2): e105–e125; Jia L, et al. Lancet Neurol 2020; 19: 81-92; Wang QH, et al. Neurosci Bull 2017; 33(6): 703-710; Yan X, et al. J Alzheimers Dis 2019; 69(3): 795-806; Ni MY, et al. Lancet Public Health. 2021; 6(12): e919-e931.

Flow chart of study population selection

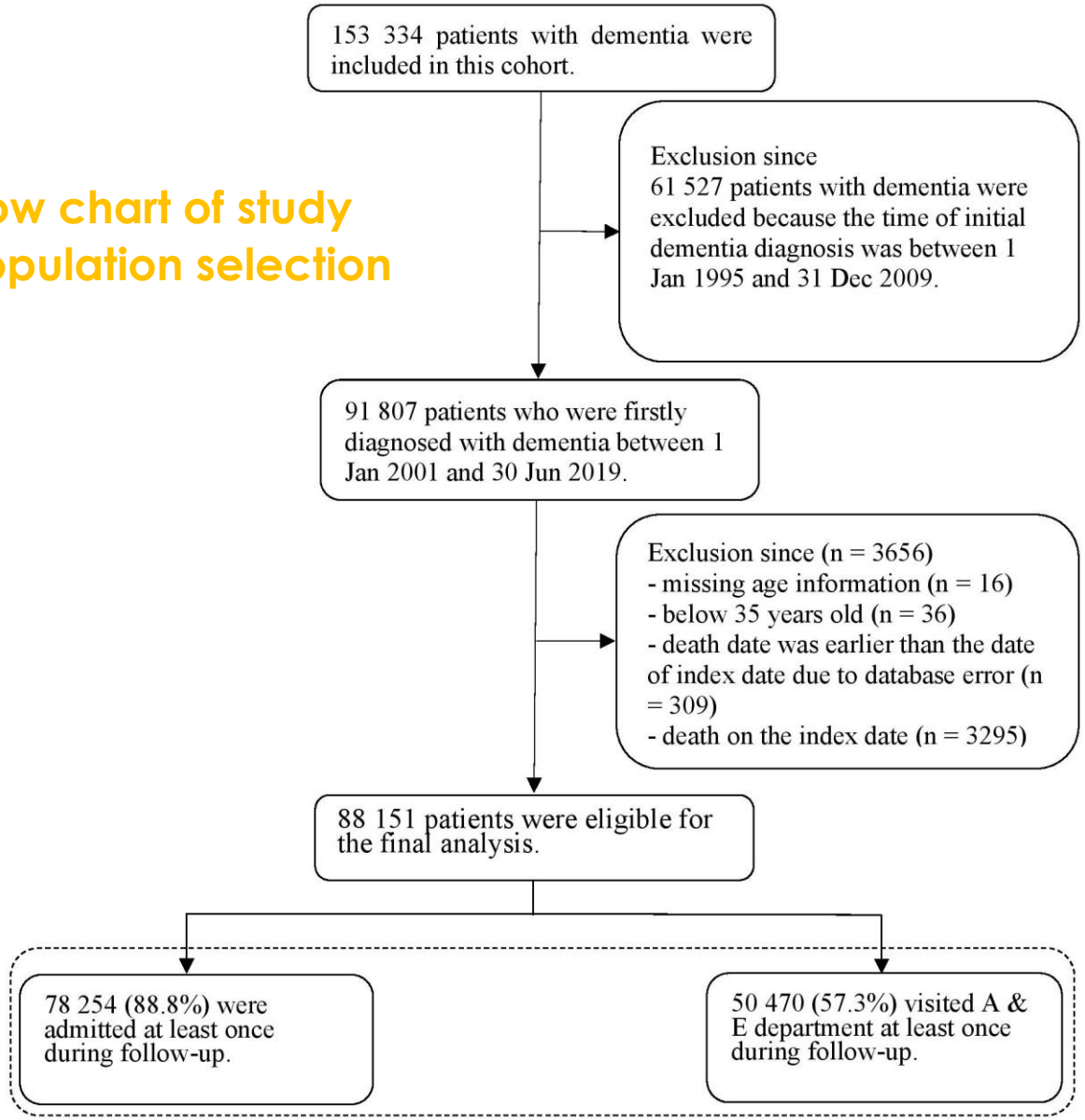


Figure 1 Flow chart of study population selection

Note: A & E = Accident & Emergency.

CDARS in Hong Kong

- Clinical Data Analysis and Reporting System
- Hospital Authority
- In this study:
  - ICD-9-CM codes 290, 294·[1,2,8], 331·[0,1,82]
  - anyone with a dementia diagnosis
  - 1 Jan 2010 – 30 Jun 2019
  - Index date: first dementia diagnosis
  - Follow-up period: between the index date and death or 31 Dec 2019 (whichever earlier)
  - patient records de-identified for privacy

Measures

- Comorbidity
  - Long-term conditions prior to/on the index date
  - Classified into 60 conditions (incl. dementia)
  - Defined as ≥1 conditions simultaneously in addition to dementia
  - Total no. of conditions: 0-1, 2-3, 4-5, 6-7, 8+
- Specific conditions of interest
  - conditions with ≥5% prevalence
  - combined categories that were moderately or highly correlated
- Covariate
  - age, sex, history of healthcare utilization

- Healthcare Utilization
  1. Rates of all-cause hospitalizations
  2. A&E visits

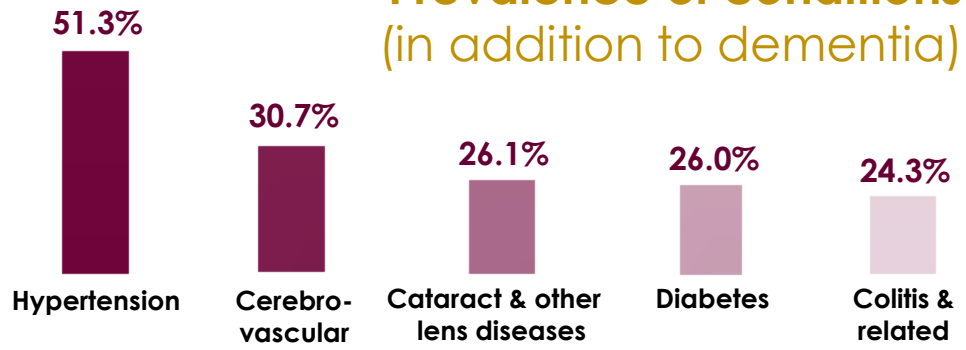
Calderón-Larranaga A, et al. J Gerontol A-Biol 2017; 72(10): 1417-23.

Analyses & Sample

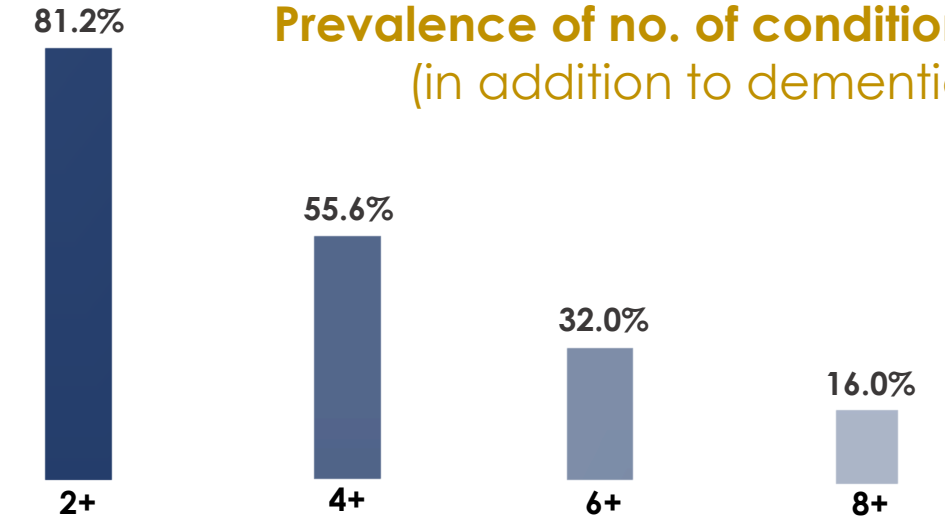
- Unadjusted healthcare utilization rates: by no. of conditions & by specific conditions
- Adjusted rate ratios & confidence intervals: fitted 8 negative binomial regression models for healthcare utilization associated with no. of conditions & specific conditions
- Missing values: listwise deletion
- All analyses conducted using R Version 4.0.5

- Included sample: **n=88,151** PLwD
- **59.3% women**
- Mean **age 82.9** (SD 8.6) years
- Total follow-up time: **272,685 person-years**
- Median follow-up time: **2.5 years** (interquartile range 1.0-4.7 years)

Prevalence of conditions
(in addition to dementia)



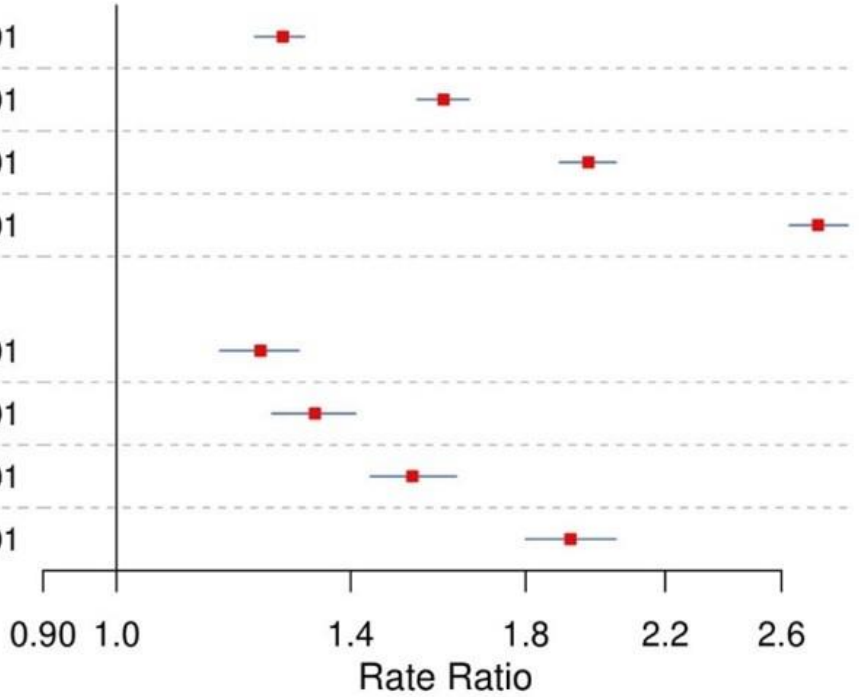
Prevalence of no. of conditions
(in addition to dementia)



Adjusted rate ratios for **all outcomes** by

number of conditions

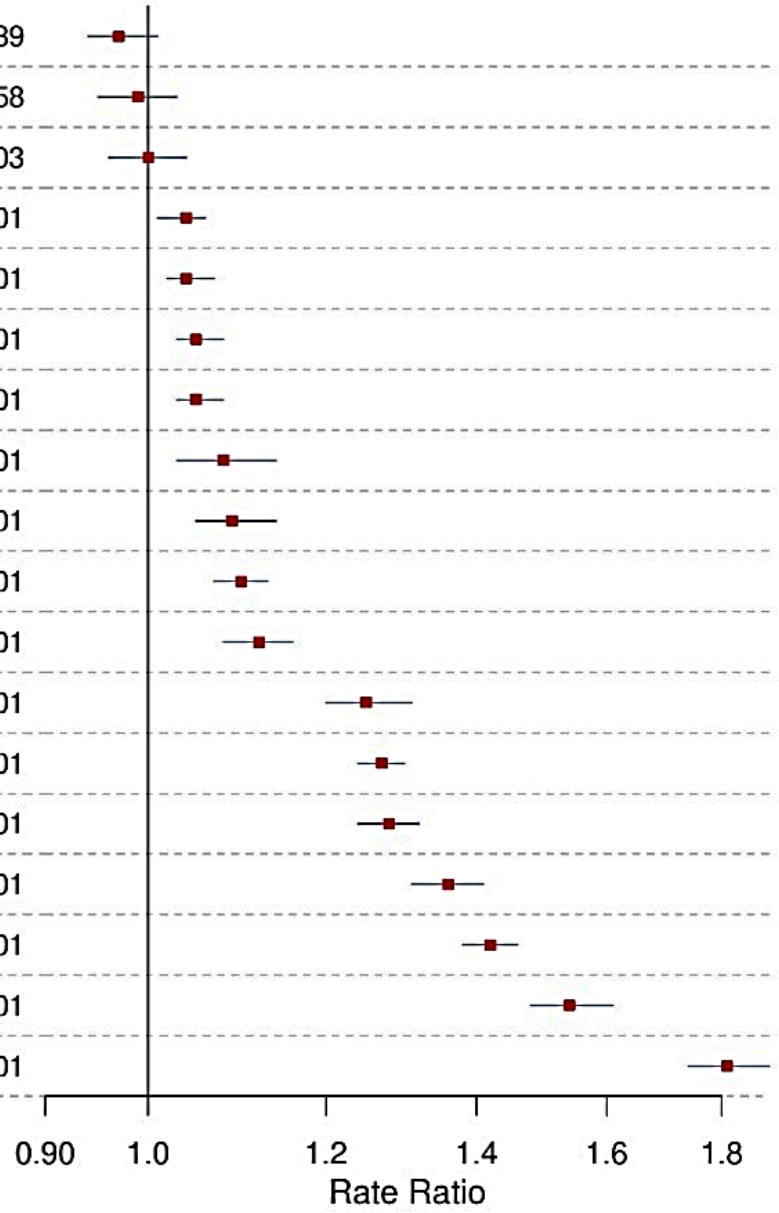
Variable	RR (98.75% CI)	P value
No of comorbid chronic conditions (Reference = 0–1)		
Hospitalizations		
2–3	1.27 (1.22–1.31)	<0.001
4–5	1.60 (1.54–1.66)	<0.001
6–7	1.97 (1.89–2.05)	<0.001
8+	2.74 (2.63–2.86)	<0.001
A & E department visits		
2–3	1.23 (1.16–1.30)	<0.001
4–5	1.33 (1.25–1.41)	<0.001
6–7	1.53 (1.44–1.63)	<0.001
8+	1.92 (1.80–2.05)	<0.001



Adjusted rate ratios for **hospitalisation** by

specific conditions

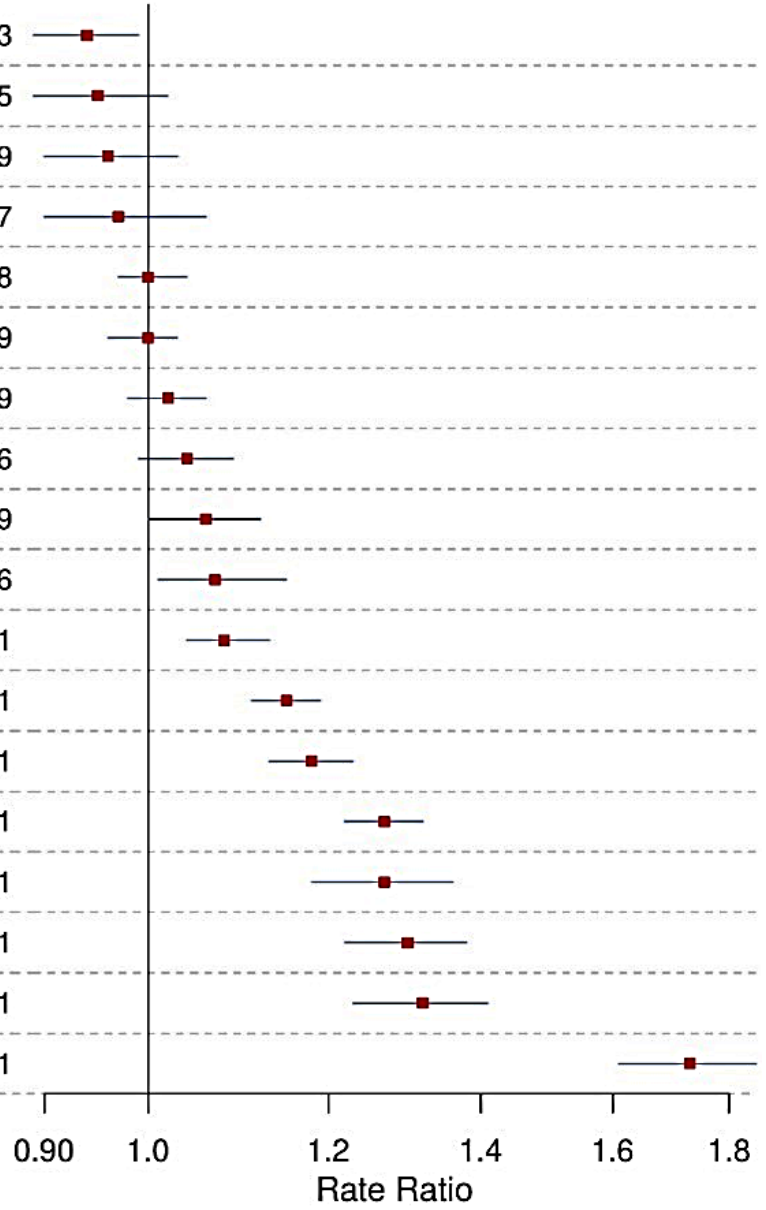
Variable	RR (98.75% CI)	P value
Osteoarthritis and other degenerative joint diseases	0.97 (0.94–1.01)	0.039
Dorsopathies	0.99 (0.95–1.03)	0.558
Other genitourinary diseases	1.00 (0.96–1.04)	0.803
Hypertension, diabetes, and dyslipidemia	1.04 (1.01–1.06)	<0.001
Cataract and other lens diseases	1.04 (1.02–1.07)	<0.001
Chronic neurological diseases	1.05 (1.03–1.08)	<0.001
Colitis and related diseases	1.05 (1.03–1.08)	<0.001
Osteoporosis	1.08 (1.03–1.14)	<0.001
Depression and mood diseases	1.09 (1.05–1.14)	<0.001
Esophagus stomach and duodenum diseases	1.10 (1.07–1.13)	<0.001
Inflammatory arthropathies	1.12 (1.08–1.16)	<0.001
Other respiratory diseases	1.25 (1.20–1.31)	<0.001
Chronic cardiovascular disease	1.27 (1.24–1.30)	<0.001
Solid neoplasms	1.28 (1.24–1.32)	<0.001
COPD emphysema chronic bronchitis	1.36 (1.31–1.41)	<0.001
Anemia	1.42 (1.38–1.46)	<0.001
Chronic ulcer of the skin	1.54 (1.48–1.61)	<0.001
Chronic kidney diseases	1.81 (1.74–1.89)	<0.001



Adjusted rate ratios for **A&E visits** by

specific conditions

Variable	RR (98.75% CI)	P value
Osteoarthritis and other degenerative joint diseases	0.94 (0.89–0.99)	0.003
Other genitourinary diseases	0.95 (0.89–1.02)	0.055
Dorsopathies	0.96 (0.90–1.03)	0.149
Osteoporosis	0.97 (0.90–1.06)	0.407
Hypertension, diabetes, and dyslipidemia	1.00 (0.97–1.04)	0.748
Chronic neurological diseases	1.00 (0.96–1.03)	0.729
Cataract and other lens diseases	1.02 (0.98–1.06)	0.209
Esophagus stomach and duodenum diseases	1.04 (0.99–1.09)	0.026
Inflammatory arthropathies	1.06 (1.00–1.12)	0.009
Depression and mood diseases	1.07 (1.01–1.15)	0.006
Colitis and related diseases	1.08 (1.04–1.13)	<0.001
Chronic cardiovascular disease	1.15 (1.11–1.19)	<0.001
Solid neoplasms	1.18 (1.13–1.23)	<0.001
Anemia	1.27 (1.22–1.32)	<0.001
Other respiratory diseases	1.27 (1.18–1.36)	<0.001
COPD emphysema chronic bronchitis	1.30 (1.22–1.38)	<0.001
Chronic kidney diseases	1.32 (1.23–1.41)	<0.001
Chronic ulcer of the skin	1.73 (1.61–1.85)	<0.001



Discussion

1 Similar to Western populations, **high prevalence** of comorbidity

Taking account of comorbidity in **tailoring the care approach** and developing healthcare plans for people with dementia.

2 But **high rate of hospitalization & A&E visits** possibly linked to later diagnosis, reliance on hospital & emergency care & under-utilization of outpatient care

3 Healthcare utilization **increased considerably with no. of co-occurring long-term conditions**

4 Substantial differences by specific conditions, **chronic kidney diseases** (highest hospitalisations) & **chronic ulcer of the skin** (low prevalence but high demand for emergency medical resources; maybe linked to bedbound)

Thank You

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Limitations

- Inherent limitations with the database employed
- Used fixed, not time-varying, covariates
- All-cause instead of cause-specific healthcare utilization which may limit the potential clinical implications
- Information on severity of dementia and continuity of care not available (may be associated with utilization and costs)

Sensitivity Analyses

- Individuals with follow-up <1 year (likely due to vulnerabilities prior to the initial dementia diagnosis) excluded
  - may have high healthcare service utilization rates
  - may lead to an overestimation of healthcare utilization by the cohort
- Excluded those with conditions with a prevalence <2% in the sample
  - to observe whether it could generate potential effects on the association between the number of long-term conditions with utilization and costs
- combined chronic kidney diseases with the traditional cardiovascular disease risk factors (including hypertension, diabetes, and dyslipidemia) into one category
  - preliminary analysis showed its moderate correlation with diabetes
  - clinical evidence of association between chronic kidney disease and CVD risk
- Similar association patterns were found in the subgroup analysis and in three sensitivity analyses