

Health Services and Outcomes Research

- Aligned to the Ministry of Health (MOH)'s *Healthier SG* strategy, NHG is actualising its *River of Life* (ROL) through the Accountable Care Organisation – Integrated Care Organisation (ACO-ICO) framework, to improve the health and well-being of the population we serve. Health Services and Outcomes Research (HSOR) supports this care transformation journey by providing best available evidence for decision-making and knowledge translation to our stakeholders, and by building capacity and advancing knowledge in health services research.

1. DEVELOPING A DASHBOARD TO STUDY THE NHG POPULATION

HSOR collaborated with Group Integrated Care (GIC) to develop a planning dashboard that provides stakeholders with a platform to explore aggregated demographic and healthcare data on patients residing in the NHG catchment area. Viewed through a system comprising maps, charts, and tables, users are able to examine data on demographics, chronic disease prevalence, ROL segments of care, and healthcare utilisation, as well as overall and per capita healthcare cost of known patients. Additionally, the dashboard includes information on the Community Health Assist Scheme General Practitioner (CHAS GP) clinics within the Central-North region, and clinic-level data. The data is presented via four geographic segmentations: i) Integrated Care Office (ICO), ii) Urban Redevelopment Authority (URA) planning area, iii) URA subzone, and iv) postal code (Figure 1). Available are summarised data sets of specific locations. This comprehensive overview of the NHG patient population will help stakeholders gain a deeper understanding of our patients, to better inform and facilitate resource and policy planning.

Figure 1. Pop-up summaries of health information using the ICO planning dashboard

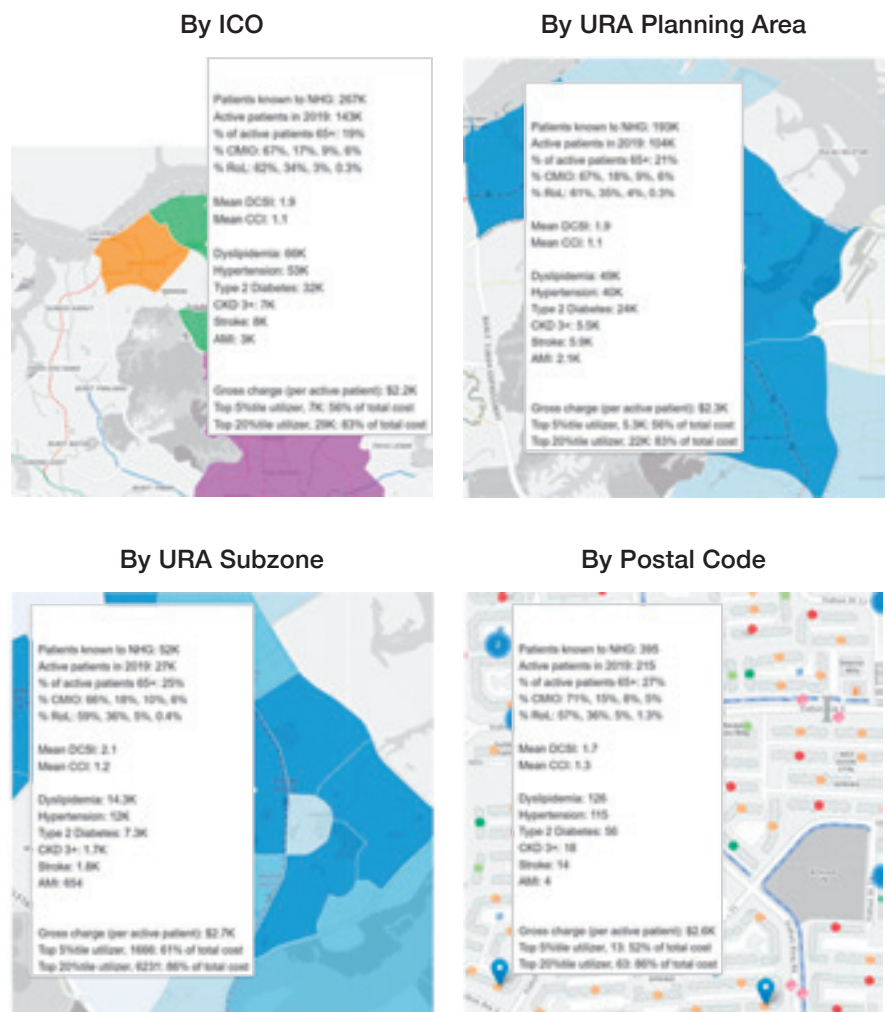
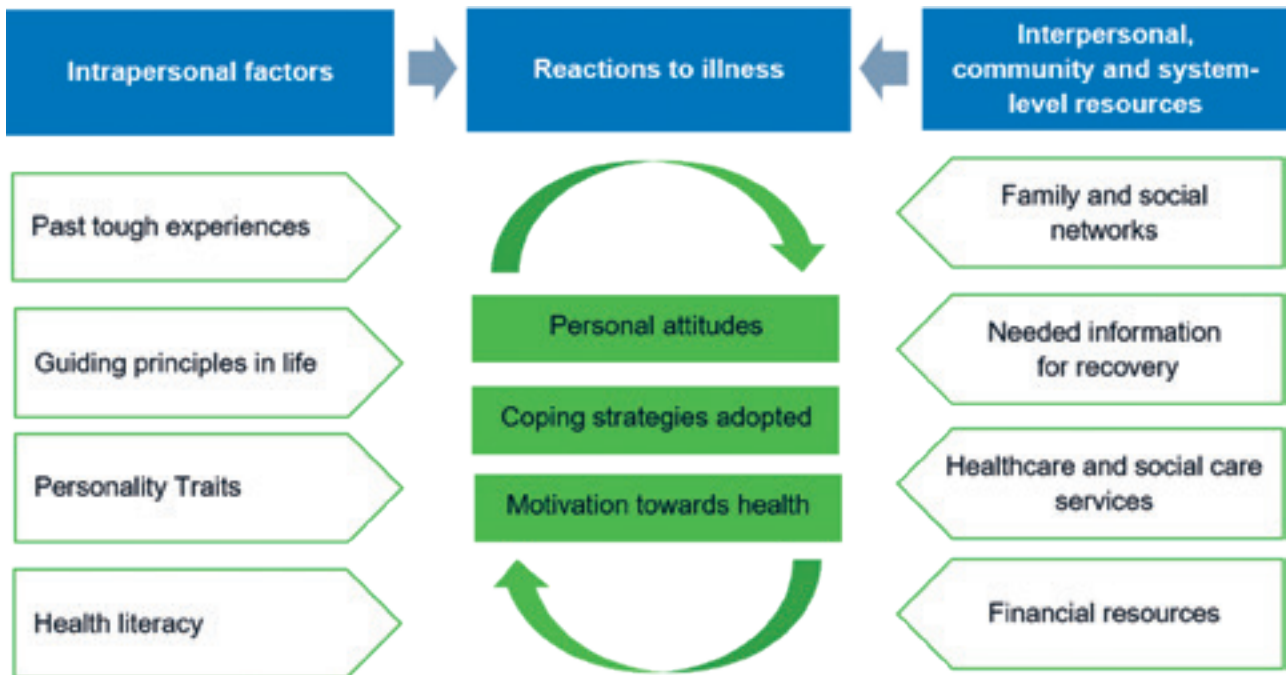


Figure 2. Factors influencing health resilience and their processes and interactions



2. IDENTIFYING FACTORS ASSOCIATED WITH RESILIENCE IN THE COMMUNITY

Some 65 residents living within the Central-North region of Singapore were interviewed in a qualitative study, to understand their perspectives on how they prepared for, dealt with, and overcame challenges and the impact of health adversities. These residents had experiences of being unwell, or taking care of someone who had been unwell in the past 5 years, and were from varying age groups. Semi-structured interviews were conducted with the participants, of which 14 were caregivers. Health resilience was found to be dynamic and comprised systemically impacted multi-layer interactions across interlinked, intrapersonal, reaction-related, interpersonal, community, and system-level factors (Figure 2).

Intrapersonal factors, such as previous tough life experiences, guiding principles in life, personality traits, and health literacy, were interlinked closely with perceived availability, accessibility or support accorded by community and system-level resources. These intra-, inter- and extra-personal factors influenced one's reactions to illness, such as personal attitudes, coping mechanisms adopted, and motivation towards health, which ultimately influenced the individual's ability to manage external and internal demands of their health challenges. Identifying the factors that influence health resilience and understanding their processes and interactions can help inform public health services on how to better support individuals to minimise or overcome the ill effects of health and life adversities.

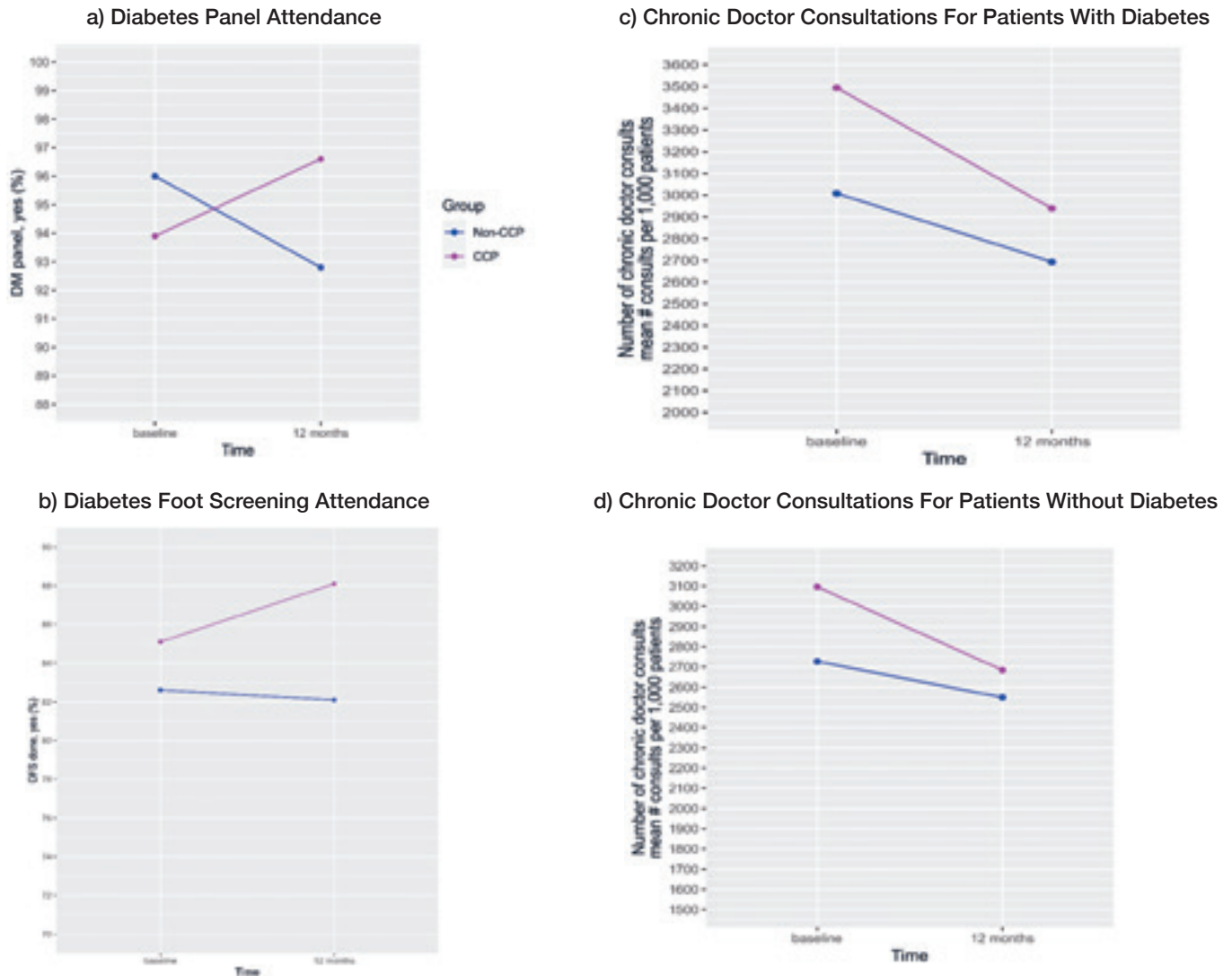
3. EVALUATION OF A CHRONIC CARE PLAN AT ANG MO KIO POLYCLINIC

The Chronic Care Plan (CCP), a pre-paid bundle payment scheme, was introduced at Ang Mo Kio Polyclinic in January 2019. Key features included (i) pre-payment using Medisave and Flexi-Medisave and/or out-of-pocket, (ii) enrolment incentives, (iii) shared decision-making on chronic disease management, and (iv) financial rewards for achieving pre-specified health targets. A study was conducted to evaluate the impact of CCP on patients' adherence to care processes, chronic disease control, polyclinic healthcare utilisation, and total polyclinic gross charges at 1 year. Patients who had similar characteristics to the CCP patients and were followed up at the polyclinic for chronic conditions, but

not enrolled in CCP, served as the control group.

At 1 year, CCP patients with diabetes (n=2,359) were more likely to adhere to the diabetes test panel and foot screening compared to the control group, and a larger decrease in the number of doctor consultations for chronic care was observed. A similar decrease was also noted in the 2,455 CCP patients without diabetes (Figure 3). No significant differences were observed in chronic disease control, polyclinic healthcare utilisation, and total polyclinic gross charges. Findings suggest that a pre-paid chronic care financial package coupled with financial incentives could be useful to encourage adherence to care processes.

Figure 3. Adherence to care processes and chronic doctor consultations



4. ASSOCIATION OF SOCIAL ISOLATION, SOCIAL PARTICIPATION, AND LONELINESS WITH FRAILTY IN OLDER ADULTS

In the longitudinal Population Health Index Survey conducted in the Central region of Singapore, 606 participants aged 60 years and above were surveyed over 1 year. The mean age of the participants at baseline was 70.9 years old: 84.3% were Chinese, and 52.0% had no formal education or primary school qualification. Also, 58.6% were married, and 19.6% lived alone. Based on the 6-item Lubben Social Network Scale, 17.7% of participants were socially isolated from family members and 47.4% were socially isolated from friends. Based on the 3-item University of California, Los Angeles Loneliness scale, 7.3% of participants were categorised as feeling lonely. Social participation scores were measured using the social role domain of the Late-Life Function and Disability Instrument,

while level of frailty was measured with the Clinical Frailty Scale.

The associations between the above-mentioned social isolation, social participation, and loneliness with frailty were examined in an ordinal logistic regression model adjusted for demographics, lifestyle, and health-related factors. While scores denoting the extent of social isolation from family and friends were not associated with frailty; loneliness was. In addition, increased frequency of social participation was associated with lower levels of frailty (Table 1). Findings remained similar even after accounting for gender differences in the relationships. These observations suggest that loneliness and frailty should be measured and addressed concurrently among community-dwelling older adults.

Table 1. Associations of social isolation, social participation, and loneliness with level of frailty

	Adjusted Odds Ratio (95% CI)	p-value
LSNS-6 Family subscale scores	1.05 (0.97 - 1.14)	0.231
LSNS-6 Friends subscale scores	0.99 (0.92 - 1.07)	0.782
Social participation scores	0.96 (0.93 - 0.99)	0.019
Feeling lonely (Ref: Not lonely)	2.90 (1.44 - 5.84)	0.003

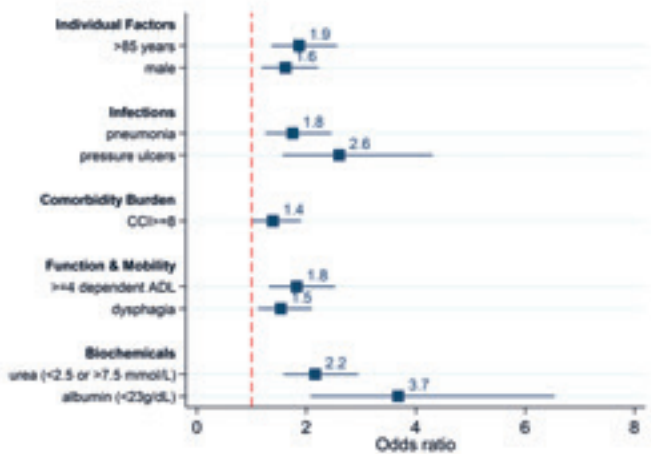
Number of observations: 782; number of individuals: 282. CI: confidence intervals; LSNS: Lubben Social Network Scale

5. PREDICTING MORTALITY IN ADVANCED DEMENTIA PATIENTS: THE PROGNOSTIC MODEL FOR ADVANCED DEMENTIA (PRO-MADE)

In Singapore, where dementia caregiving occurs primarily at home, early identification of individuals with advanced dementia (AD) can support proactive planning and the introduction of palliative care for such patients at high risk of one-year mortality. To support these efforts, HSOR collaborated with the Department of Palliative Medicine of Tan Tock Seng Hospital (TTSH) and the Geriatric Education and Research Institute to develop the PRO-MADe. This logistic regression model identifies AD patients at high risk of death within one year, therefore facilitating timely referrals to palliative care.

To develop this model, participants diagnosed with AD at inpatient or outpatient settings in TTSH were identified in a retrospective cohort study. Of the 1,077 AD patients studied, 318 patients died (29.5%), of which 996 patients (92.5%) were at Functional Assessment Staging Tool stage 7C. Potential prognostic variables were determined based on a scoping review previously conducted by the study team. The final model included age, gender, infections, comorbidity burden, function, mobility, and biochemical markers as predictors of mortality (Figure 4). The model

Figure 4. Predictors of mortality in Advanced Dementia



was able to distinguish the patients who were at high risk of mortality within one-year of AD diagnosis (optimism-adjusted area under the receiver operating curve: 0.763). Together with physicians and resources, PRO-MADe will be optimised and operationalised for use in the clinical setting.