

## Research Assessment Exercise 2020

### Impact Case Study

**University:** The University of Hong Kong

**Unit of Assessment (UoA):** 11 - Mathematics & Statistics

#### **Title of case study:**

Statistical underpinning of a standardized home care assessment tool for the elderly in Hong Kong

#### **(1) Summary of the impact**

A comprehensive assessment tool to evaluate the health outcomes and care needs for Hong Kong Chinese elders, MDS-HC(HK), was developed and statistically validated. Optimal classification algorithms were derived for efficient service matching. It has been adopted by Hong Kong's Social Welfare Department as the Standardized Assessment for Elderly Services to ascertain the care needs of elders and match them with timely, appropriate services. It facilitates prioritization of services to the neediest and effective allocation of public resources. About 160,000 assessments have been completed using MDS-HC(HK) since October 2013, with an estimated saving over HKD 5.5 billion during this period. More importantly, elders have had better health outcomes and improved quality of life.

#### **(2) Underpinning research**

Background:

It is a worldwide trend that people are living longer and the population is ageing. The Hong Kong elderly population reached 759,200(11.2%) in 2000, accounting for a disproportionately high proportion of total health care spending: 60% of outpatient clinic services and 40% of hospital beds provided by the government were utilized by the elderly in that year. There were about 20,000 elderly persons on the waiting list for government-subsidized residential care services. The application date was the main factor in determining the order of service provision. People with more care needs did not have priority over those with fewer needs. Moreover, applicants were required to be assessed by referring agents, health-care professionals and service providers using different tools to confirm their eligibility and suitability for the services. There were several major concerns. First, a standardized assessment tool was lacking. Second, there was no mechanism to deal with disagreements between referring agents and service providers. The elderly-in-need became the victims of this uncoordinated service delivery system with its mismatched services and inappropriate allocation of public resources.

Objectives:

With a gate-keeping initiative for elderly services to ensure the best allocation of resources and prioritization of services to the neediest elderly, the objectives were to:

1. develop a unified standard assessment tool for elderly services;
2. carry out a statistical validation of MDS-HC(HK);
3. develop a screening algorithm for service-matching and prioritization models using discriminant analysis;
4. prepare a user manual for the instrument;
5. design a protocol for training and accrediting assessors;
6. digitalize the assessment tool for simple implementation;
7. facilitate further research to improve elderly services for the community.

MDS-HC was developed by Inter-RAI in 1994, an international group of academics and clinicians committed to improving and promoting care for the elderly. It has been mandated for use in long-term care institutions in the US, Ireland, Japan and Canada. To suit the Chinese cultural setting in Hong Kong, we revised the questions in MDS-HC substantially in 2000 to make it suitable for local implementation, while maintaining the uniformity of the instrument to allow comparisons across countries, and called it MDS-HC(HK). Face, content and concurrent validity, inter-rater reliability of

MDS-HC(HK) were statistically assessed. It was designed to permit service providers to identify and appropriately respond to 30 Client Assessment Protocols (CAPs). Together with the 14 clinical outcome measures, MDS-HC(HK) is a comprehensive assessment tool that helps the government to establish important objective guidelines for service-matching and prioritization.

Statistical influence diagnostic methods were developed by Prof Fung and Dr Kwan [Ref.1-3] for the validation of MDS-HC(HK) [Ref.4] carried out by Drs Lam and Kwan in 2000 (Objectives-1,2). The validated instrument can help clinicians to develop individualized, comprehensive and effective care plan for each client. For this purpose, the team (including a social worker [Prof. Chi] and a clinician [Prof. Lam]) developed in late 2000 a robust and effective screening algorithm for setting access priorities for different services using innovative influence diagnostic methods with discriminant and factor analyses [Ref.1-3] (Objectives-3,4&5). This step was particularly important as different countries had different services that experiences from other countries could not be borrowed. The instrument was digitalized by Lam and Kwan. It can be administered easily by tablet or laptop with low input errors (Objective-6). Data generated can be used for further research to improve services to elderly people in the community [Ref.5,6] (Objective-7).

Lam has been an Assistant Professor at HKU since 1995 and is now Associate Professor. Fung has been a Professor at HKU since 1988. Kwan was a PhD student and postdoctoral fellow under Fung and Lam's supervision respectively, and is now lecturer.

### (3) References to the research

- [1] **Fung, W.K.**, Zhu, Z-Y, Wei, B-C, He, X. (2002). Influence diagnostics and outlier tests for semiparametric mixed models. *Journal of the Royal Statistical Society Series B*, **64**(3), pp565-579. [<https://rss.onlinelibrary.wiley.com/doi/abs/10.1111/1467-9868.00351>]  
[Citations in Google Scholar: 103, by 26 June, 2019]
- [2] He, X., **Fung, W.K.** (2000). High breakdown estimation for multiple populations with applications to discriminant analysis. *Journal of Multivariate Analysis*, **72**, pp151-162. [<https://www.sciencedirect.com/science/article/pii/S0047259X99918572?via%3Dihub>]  
[Citations in Google Scholar: 114, by 26 June, 2019]
- [3] **Kwan, C.W.**, **Fung W.K.** (2005). Influence curves for factor loadings. *British Journal of Mathematical and Statistical Psychology*, **58**(2), pp345-358. [<https://onlinelibrary.wiley.com/doi/abs/10.1348/000711005X66923>]  
[Citations in Google Scholar: 2, by 27 June, 2019]
- [4] **Kwan, C.W.**, Chi, I., Lam, T.P., **Lam, K.F.**, Chou, K.L. (2000). Validation of minimum data set for home care assessment (MDS-HC) for Hong Kong Chinese elders. *Clinical Gerontologist*, **21**(4), pp35-48. [[http://dx.doi.org/10.1300/J018v21n04\\_04](http://dx.doi.org/10.1300/J018v21n04_04)]  
[Citations in Google Scholar: 60, by 26 June, 2019]
- [5] Chi, I., Chou, K.L., **Kwan, C.W.**, **Lam, K.F.**, Lam, T.P. (2006). Use of the minimum data set – home care: a cluster randomized controlled trial among the Chinese older adults. *Aging & Mental Health* **10**(1), pp33-39. [<http://dx.doi.org/10.1080/13607860500307712>]  
[Citations in Google Scholar: 22, by 26 June, 2019]
- [6] Chi, I., Yip, P.S., Chiu H.F., Chou K.L., Chan K.S., **Kwan C.W.**, Conwell Y, Caine E. (2005). Prevalence of depression and its correlates in Hong Kong's Chinese older adults. *Am J Geriatr Psychiatry*. **13**(5), pp409-416. [<https://www.sciencedirect.com/science/article/abs/pii/S1064748112614286?via%3Dihub>]  
[Citations in Google Scholar: 153, by 26 June, 2019]

### (4) Details of the impact

Given the rapidly aging population, one challenge faced by the Hong Kong government was to improve the health-care delivery system to respond to the needs of the growing elderly population in

a fiscally and clinically responsible manner. HKU researchers statistically validated MDS-HC(HK) for use in the Hong Kong context, adapted its robustness and fitness to Chinese culture, and strengthened its ability to identify clients' needs and problems [Ref.4]. Evidence can be found in LegCo papers [Sources-1,2] and the endorsement from the current Assistant Director (Elderly) of Social Welfare Department (SWD) [Source-3].

Further work mentioned in Sources-1&2:

- 1) The instrument has over 150 questions mostly on functional and health statuses. It takes about 25-30 minutes to complete. To make the process more efficient, the team developed an electronic form of the instrument. The 30 CAPs and 14 clinical outcome measures for each client would be calculated and data collected would be sent to the main server automatically.
- 2) An efficient statistical screening algorithm was developed for service matching and prioritization. It also helps the service providers to formulate individualized effective care plans for the clients.
- 3) A user manual was developed to provide information to facilitate accurate and consistent assessment of community-based clients.
- 4) Assessors are required to go through training and accreditation on the use of MDS-HC(HK). A training protocol was developed for accredited assessors, who should be experienced practitioners such as nurses, physiotherapists and social workers in the field of elderly services to minimize differences between the assessors and so maintain a high degree of consistency.

An agreement/contract was signed [Source-4] confirming that the whole package as described above was adopted by the SWD of the HKSAR [Source-5] as a Standardized Care Need Assessment Mechanism for Elderly Services (SCNAMES) to ascertain the care needs of elders and match them with appropriate services. These included admission to homes for the aged, care-and-attention homes, nursing homes, day-care centres for the elderly, enhanced home and community care services, and integrated home care services (for disabled and frail cases) [Source-6].

Due to the uniformity, comprehensiveness, robustness and reliability of the tool, SWD introduced a Central Waiting List for Subsidized Long Term Care Services (CWL) to facilitate service allocation in 2003. Since then, the SCNAMES Offices have been providing one-stop services for elders who apply for subsidized long-term care services, assessing their care needs with MDS-HC(HK), matching them with appropriate services and placing them on the CWL accordingly [Source-2].

The tool facilitates effective allocation of public resources and prioritization of services to the neediest. By April 30, 2019, a total of 447,483 referrals had been received and 408,281 assessments had been completed by the five multi-disciplinary SCNAMES Offices. It is estimated that about 200,000 referrals were received and 160,000 assessments were completed between October 2013 and August 2019. There were only about 700 cases in which there was some disagreement about the assessment results, with only two appeal cases in the past 10 years. Both appeal results were not established. To cope with the demand for the service, assessors are trained using the protocol developed by HKU. There are a total of 3,382 accredited assessors as at April 30, 2019. [Source-7].

The implementation of MDS-HC(HK) can speed up the matching of a suitable applicant to a vacant place in a subvented care-and-attention home two months faster on average. Whilst each place costs around HKD15,000 per month [Source-8], it is estimated that at least HKD 4.8 billion has been saved in relation to the 160,000 assessed applicants since October 2013. Moreover, independent research [Source-9] concluded that MDS-HC provided a cost-saving approach to reducing institutionalization and functional decline in older people living in the community. Assuming that demand for health services remains constant, the total cost of care can be reduced by 21% and yet health outcomes can be improved. If the health service costs HKD 20,000 for each elderly person on average, a further HKD 0.7 billion would have been saved since October 2013. A more important impact is that the 408,281 assessed elderly received the most appropriate, timely service to achieve better health

outcomes and improved quality of life. The Chairman of the Elderly Commission considered MDS-HC(HK) as an important contribution to the betterment of the elderly community with great impacts that not only does it allow the government resources to be better utilized, it also helps tailor subject-specific care plans for the elders [Source-10].

The data from each assessment is sent to the central server of Inter-RAI (copyright owner of MDS-HC(HK)). Members of Inter-RAI from all over the world can download the data for research purposes and make comparisons because the instrument has been standardized and is consistent among different countries. Many research papers have been generated from the data since then (at least 20, see [Ref.4-6]). Local research using the data generated by the instrument will have further impacts on the society, fostering new policies for the benefit of vulnerable individuals.

#### **(5) Sources to corroborate the impact**

1. [January 2001] A Legislative Council document stating that SWD had commissioned a HKU consultancy team to develop a standardized assessment tool for the elderly.  
<http://www.legco.gov.hk/yr00-01/english/panels/ws/papers/b578e04.pdf>
2. [July 2014] Two Legislative Council documents on background of the Standardised Assessment tool to the panel on Welfare Services on the LegCo website.  
[https://www.legco.gov.hk/yr09-10/english/panels/ws/ws\\_rccs/papers/ws\\_rccs1006cb2-2315-1-e.pdf](https://www.legco.gov.hk/yr09-10/english/panels/ws/ws_rccs/papers/ws_rccs1006cb2-2315-1-e.pdf)  
[https://www.legco.gov.hk/yr09-10/english/panels/ws/ws\\_rccs/papers/ws\\_rccs1006cb2-2315-2-e.pdf](https://www.legco.gov.hk/yr09-10/english/panels/ws/ws_rccs/papers/ws_rccs1006cb2-2315-2-e.pdf)  
<http://www.legco.gov.hk/yr13-14/english/panels/ws/papers/ws0725cb2-2077-4-e.pdf>
3. [March 2018] A letter from Ms Kit Ling PANG, Assistant Director (Elderly) of SWD to acknowledge that we had participated in the consultancy project and established the reliability and validity of the instrument for Hong Kong use.
4. [September 2000] Draft contract/agreement between InterRAI and the Social Welfare Department.
5. [February 2019] It is stated on the official website of the SWD of the HKSAR that the instrument MDS-HC has been adopted as the assessment tool to ascertain the care needs of the elderly so as to provide and match them with appropriate services since November 2000.  
[http://www.swd.gov.hk/en/index/site\\_pubsvc/page\\_elderly/sub\\_standardis/](http://www.swd.gov.hk/en/index/site_pubsvc/page_elderly/sub_standardis/)
6. [February 2019] Pamphlet describing the assessment procedures for the elders who would be matched with appropriate long-term care services (day care centre, enhanced home and community services, integrated home care services, care-and-attention home and nursing home).  
[http://www.swd.gov.hk/doc/elderly/ERCS/Leaflet%20on%20SCNAMES%20\(Eng\)-revised\(20140912\).pdf](http://www.swd.gov.hk/doc/elderly/ERCS/Leaflet%20on%20SCNAMES%20(Eng)-revised(20140912).pdf)
7. [February 2019] The document from the following SWD website shows the breakdowns of the total number of referrals received for MDS-HC and completed assessments up to April 30, 2018, with a total of 447,483 and 408,281 cases, respectively.  
[https://www.swd.gov.hk/storage/asset/section/603/en/\(Eng\)\\_statistics\\_on\\_SCNAME\\_\(201904\).pdf](https://www.swd.gov.hk/storage/asset/section/603/en/(Eng)_statistics_on_SCNAME_(201904).pdf)  
The pdf file provided included the numbers for all the available months on the internet, but those between 2010 and 2015 could not be found. The number of assessments was 165,034 as at mid 2010 [Source-2] and 305,642 as at January 2016. Assuming that 75,000 assessments were completed between July 2010 and September 2013, the total number of completed assessments up to September 30, 2013 was estimated to be about 240,000. Hence the total number of completed assessments since October 1, 2103 is estimated to be around 160,000.
8. [March 2018] Head 170 – Social Welfare Department with the subvented costs of the services.  
<https://www.budget.gov.hk/2018/eng/pdf/head170.pdf>
9. [December 2001] Landi, Francesco, et al. "Impact of a New Assessment System, the MDS-HC, on Function and Hospitalization of Homebound Older People: A Controlled Clinical Trial." *Journal of the American Geriatrics Society* 49.10 (2001): 1288-1293.
10. [March 2018] A letter from Dr Ching-choi LAM, the Chairman of the Elderly Commission, HKSAR, and a member of the Executive Council, HKSAR Government.