

# A preliminary casemix classification system for Home and Community Care Clients in Western Australia

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## Abstract

*The objective of the study was to examine the feasibility of using routinely available assessment, Minimum Data Set (MDS), socio-economic, geographic and unit cost data to define a discrete number of clinically meaningful, cost-homogeneous Home and Community Care (HACC) client groups. Participants included new and existing Western Australian (WA) HACC beneficiaries from 1 January to 31 September 2001. Seventy two HACC agencies from metropolitan and rural regions participated, which represented 29% of the sector. A total of 9,404 quarterly periods of care contributed to the exploratory classification analysis and 12,697 to the confirmatory analysis. The final structure contained nine terminal nodes, achieved an  $R^2$  of 23.7%, and was robust to fluctuations in cost. Higher costs were associated with increased functional dependency and the need for clinical services. The classification is empirically grounded, simple and robust, and has a number of potential policy and practice applications. Further refinement is required to improve its suitability as a funding tool.*

## Background to the study

The HACC Program provides support services to assist frail older people and people with disabilities to remain living at home rather than in residential care (Commonwealth of Australia 2002). The Program receives large proportions of Commonwealth and state/territory community care budgets, with an estimated total annual budget of \$1.1 billion in 2002-03 (Commonwealth Department of Health & Ageing 2002a). In 2000-01, 494,000 Australians received HACC services (Australian National Audit Office 2002).

Australia, like most western societies, is faced with growing pressure to expand community-based long term care. However, evidence about its cost effectiveness is inconclusive (Hedrick & Inui 1986; Weissert & Hedrick 1994; Fine & Thompson 1995). Part of the problem is that the relationship between client characteristics and the use of community care is poorly understood. Developing a classification that uses client characteristics to predict resource requirements is a step towards addressing this challenge.

Australia has made significant advances in designing client classification systems for a number of care settings, including acute inpatient care (Commonwealth Department of Health & Ageing 2002c), subacute and non-acute care (Eagar *et al.* 1997), specialist mental health services (Burgess *et al.* 1999) and residential care (Rhys Hearn 1997). Developing a classification for the full spectrum of HACC-type services brings an additional level of complexity, because of the multiple determinants of service use, the impact of informal care, and difficulties in collecting standardised information and defining the length of a care episode (Bjorkgren *et al.* 2000; Eagar & Owen 2001).

Most community classification research has originated from the United States. The most salient classifications are those that cover a broad range of home care services provided by both skilled and unskilled personnel, that is, classifications that are not purely focused on home health services. There are only four US classifications of this kind:

- Resource Utilisation Groups for Home Health Care (RUG-HHC) (Foley *et al.* 1986);
- Home Care Classification (HCC) (Coughlin *et al.* 1992);
- Veterans' Affairs Home Care Groups (HCGs) (Smith *et al.* 1992); and
- RUG-III based classification for Home Care (RUG-III/HC) (Bjorkgren *et al.* 2000).

The models have little similarity in structure, other than the use of functional dependency as a classifier in all but the HCGs model. Most were supported by routine administrative databases that contained a breadth of data resources currently unavailable in the HACC Program. Furthermore, data collection frequently required an advanced level of assessor skill, which is generally unachievable in the HACC Program. Lastly, there are significant differences between the US and Australian community care systems, thus limiting the usefulness of methodological comparisons.

The Australian federal government has commissioned several reports about classifying home care (Lewin & Eagar 1996; Hindle 1998; Eagar & Owen 2001). There has been only one, large scale, multi-agency study that covered a large spectrum of HACC-type services (HealthTech 1997). Funded by the South Australian Health Commission, the study developed a classification and associated cost weights for South Australian Domiciliary Care and Royal District Nursing Services (RDNS). It built on a 1995 study with similar aims, which was criticised for data inaccuracy, its small sample and short follow-up. The second attempt yielded weak variance explanation (~14%) and also had a number of methodological shortcomings.

### *Objective*

This study attempted to accelerate work toward the achievement of a nationally consistent classification for the HACC Program. Its objective was to examine the feasibility of using routinely available assessment, HACC MDS, socio-economic, geographic and unit cost data to define a discrete number of clinically meaningful, cost-homogeneous client groups.

## **Methods**

### *Sites*

The data for this analysis were obtained in 2001 from a sample of HACC agencies in Western Australia (WA). The project sites were self-selected. The project was originally designed to include HACC agencies and their clients throughout metropolitan WA. This was later extended to participating HACC agencies in rural WA regions, including the Great Southern, South West, Kimberley, Wheatbelt and Goldfields. HACC agencies meeting the following criteria were eligible: 1) agencies collecting and reporting the HACC MDS; and 2) at least one agency in the region willing to use the study assessment protocol. Forty-eight of approximately 138 metropolitan HACC agencies and 66 of approximately 108 rural HACC agencies met these criteria and agreed to participate. A number of agencies withdrew prior to commencement of the study, thus reducing the number of participants to 39 metropolitan and 33 rural agencies. The largest providers of HACC services in WA (those with annual budgets in excess of \$1M) were all included in the sample.

### *Subjects*

The sample consisted of all clients active on the first day of the study period (1st January 2001), in addition to all new admissions throughout the study period (January to September 2001). Clients meeting the following inclusion criteria were eligible: 1) frail aged or disabled who were receiving home care services directed at maintenance and support; 2) aged 18 years or older; and 3) able to provide informed written consent, or had

a carer willing to perform this role. While the project sample was made up of the clients of self-selected participating agencies, this was acceptable because the objective of the study was not to estimate population parameters.

### *Data collection*

Two types of data were required, one to form the casemix measure and the other to measure HACC service use. Routine sources of information were used wherever possible to maximise agency compliance and to examine the feasibility of using routinely collected information to predict HACC service use.

Data to construct the casemix measure were collected from four sources. Socio-demographic characteristics were drawn from the HACC MDS, which became a national mandatory reporting requirement in January 2001. Geographic remoteness and additional socio-demographic data were obtained by electronically linking to the Accessibility/Remoteness Index of Australia (ARIA) (University of Adelaide & ABS 1999) and two indices from the Socio-Economic Index for Areas (SEIFA) (ABS 1996), the latter based on the 1996 Population Census. To reduce the likelihood of misclassification, the ARIA and SEIFA variables were linked to the project database using collection districts (CDs) from the 1996 Population Census (Hyndman *et al.* 1995). Lastly, data about client dependency were collected using a primary assessment form developed and pilot tested on a metropolitan sample of WA HACC clients. The primary assessment consisted mostly of data elements from previously validated scales (e.g., Modified Barthel, Philadelphia Geriatric Assessment Scale), some of which required modification to suit an Australian context. It assessed the functional, sensory and emotional health status of clients. A more detailed description of the data collection protocol is available from the corresponding author.

Data about HACC service use were drawn from the HACC MDS. The HACC MDS identified the type of service and the number of units (i.e., hours, visits, count, cost) delivered to individual clients during three monthly reporting periods. The newly introduced service types (assessment, case management and case planning, review and coordination) were excluded because of reliability and validity concerns. In addition to electronic HACC MDS service records, agencies were required to submit hardcopy careplans to safeguard against the possibility of data extraction or transmission problems with the HACC MDS, which had been largely untested prior to the study.

The data collection period extended from January 2001 to September 2001, which coincided with three HACC MDS reporting periods. The HACC MDS records were submitted electronically in a pre-defined format specified by the National HACC Program. Assessment data were submitted both electronically and as hardcopy records.

Service data were linked to client assessment records using the HACC Statistical Linkage Key (SLK), which is a 14-character code derived from the name, date of birth and gender of the client. When the linkage process failed to find a service match, agencies were contacted to verify client service activity during the reporting period. Care plans were also consulted to identify whether the carer of the person with the disability also received HACC services (e.g., respite). Carers had a unique HACC SLK and there was no other way of linking these services back to the person with the disability.

All agencies attended a training session to familiarise them with the study protocols. Two researchers conducted all training sessions. Two researchers also reviewed every data item used to construct the casemix measure. An electronic newsgroup was established to report common data quality issues. Telephone support and on-site refresher training were available throughout the study period. Computerised editing checks were developed for the HACC MDS service data. These efforts resulted in a database with maximum internal consistency and validity and minimal missing data.

### *Costing method*

HACC services were costed using retrospective unit cost data, which was a contractual reporting requirement of HACC agencies. The intention was to source de-identified data from the Department of Health for all

consenting agencies. However, failure to resolve the conditions of data release resulted in the researchers approaching agencies directly. Thirty of the 72 participating agencies agreed to this request. One agency supplied unit cost data that were HACC MDS compliant. The cost data from the remaining 29 agencies were for the period 1999/2000.

At the time, there had been no rigorous evaluation of unit cost data from WA HACC agencies. There was, however, ample anecdotal evidence to question the reliability of the data. A detailed evaluation of the HACC unit cost framework was beyond the scope of this study. However, to maximise internal consistency and validity, agencies were contacted to provide an informal assessment of their cost data quality. Unit cost data were excluded from the analysis based on the following criteria: 1) agency did not meet all worker entitlements; 2) no independent audit of unit costs; 3) agency used insufficient or ambiguous data, lacked standardised or automated bookkeeping or financial management processes, or used ad-hoc procedures to calculate unit costs (e.g., inconsistent apportionment rules); or 4) agency applied the same unit cost estimate across all service types. Nine agencies met one or more of the above exclusion criteria, which left cost data from 21 agencies available for analysis.

Community nursing costs were not available from the state's largest provider. Whilst cost data were available from rural/remote agencies, these agencies operated with minimal nursing staff and provided general nursing care only. Therefore, it was unlikely these costs were representative of the state's largest provider, which provided technical nursing (services such as wound care, -ostomy care, intravenous therapy) and had a significantly larger workforce. Similar agencies in other states were therefore approached to supply these data, and two obliged. A third source of nursing data was an insurance company with a trauma and disablement policy that reimbursed the policy holder for the total cost of all services delivered by home care agencies (including technical nursing). To improve comparability, the cost of consumables was excluded from all three sources.

A mean unit cost and 95% confidence interval was calculated from the community nursing data. To verify whether the estimate was representative of the WA setting, the state's largest provider was asked whether its own unit cost was captured within the 95% confidence interval. This was confirmed.

The mean unit cost was also calculated for the remaining service types. In recognition of the small sample of costs, we explored whether fluctuations in the cost data affected the variance explained in the final classification model. Perturbed service costs were generated for each service type using the Monte Carlo approach. Twenty Monte Carlo data sets were generated for each service type.

### *Classification analysis*

The purpose of the analysis was to develop a classification model that described the relationship between client characteristics and their use (i.e., cost) of HACC services. To facilitate interpretation, a branching structure was developed. This involved developing a set of discrete groups that were homogeneous with regard to client characteristics and costs. This differed from the additive approach, which describes people using a single equation comprised of more than one continuously varying casemix dimension (Manton & Hausner 1987).

Two data set modifications occurred prior to analysis. First, all assessment-only cases ( $n=404$ ) were removed. As previously outlined, the quality of "assessment" data reported in the quarterly HACC MDS reports was highly variable and likely to compromise accuracy rather than make any meaningful contribution. Additionally, extremely low costs were trimmed from the data set. The total cost for a period of care had to be equivalent to the mean cost of transport to be eligible for inclusion. No high cost outliers were removed from the data set.

Two models were developed. To evaluate the classification potential of all variables, the sample was first reduced to periods of care that contained no missing values for any of the data items, referred to as the Model1 data set. Having identified the chief explanatory variables from the Model1 data set, the classification model was refitted to the larger sample, referred to as the Model2 data set. Periods of care were excluded from the Model2 dataset only if data were missing for any of the likely explanatory variables (client characteristics only) identified during analysis of the Model1 data set. The Monte Carlo sensitivity analysis was performed on the Model2 data set.

Analyses were performed using the PC Group software. To avoid over-fitting the data, each class needed to contain at least 25 cases for it to be considered a stable split. Additionally, a recommended partition was accepted only if it contributed at least 0.5% variance reduction to the overall tree. Partitioning variables were rejected if the researchers felt they did not make clinical sense or risked introducing perverse incentives.

## Results

### *Client Characteristics*

Figure 1 summarises the client characteristics. There were 5,687 HACC clients recruited to the study, with the majority (73.6%) of these drawn from metropolitan Perth, WA. The sample included a small number (n=149) of Aboriginal clients. The typical client was female, aged 76 years, of Australian or British descent, lived alone in a private residence, received an aged care pension, and was relatively functionally independent.

Total expenditure on HACC services by the participating sites during the nine-month study period was \$9.3M. There were 973 quarter-year periods of care (for 296 clients) that equalled or exceeded a daily cost of \$24.24, which is equivalent to the residential subsidy rate for the lowest dependency client category (called RCS level 7). Of these high cost episodes, the mean daily cost was \$43.53, which approximates the WA RCS Level 5 subsidy rate (Commonwealth Department of Health & Ageing 2002b).

**Figure 1: Selected Client Characteristics (n=5,687)**

Client Characteristic	Number	%
<b>Site</b>		
• Metropolitan	4,180	73.6
• Rural/Remote	1,507	26.4
<b>Sociodemographic</b>		
• Age		Mean = 75.6
• Gender		
Female	3,906	68.7
Male	1,781	31.3
• Country of birth		
Australia	3,409	59.9
United Kingdom	1,181	20.8
Europe	558	9.8
• Indigenous	149	2.6
• Living arrangements		
Alone	3,033	53.3
Family	2,458	43.2
Others	176	3.1
• Carer	2,764	48.6
<b>Economic</b>		
• Receiving Government pension or benefit	5,061	89.0
• Accommodation setting		
Own home – owned or purchasing	3,888	68.4
Private or public rental	1,125	19.8
Retirement village	280	4.9

Figure 1 continued...

Client Characteristic	Number	%
<b>Functional status</b>		
• Instrumental Activities of Daily Living (IADL)		
One IADL dependency	602	10.6
Two or three IADL dependencies	1,379	24.2
Dependent with all IADLS	862	15.2
IADL summary score (8-24)	Mean = 13.7	
• Activities of Daily Living (ADL)		
No ADL dependency	3,3437	60.4
ADL summary score(10-30)	Mean = 12.2	
<b>Emotional status</b>		
• Sad or depressed	2,660	48.4
• Isolated or lonely	2,251	41.0
<b>Service Use</b>		
• Activity		
None	404	7.1
Only one reporting quarter	937	16.5
Two reporting quarters	1,228	21.6
Three reporting quarters	3,118	54.8

## Notes:

IADL refers to domestic-type activities eg cooking, shopping, transport.

ADL refers to self care-type Activities of Daily Living eg mobility, bathing.

Higher functional status scores indicate higher levels of dependency .

## Classification Results

### Model 1

The dependent variable was the total HACC-related cost accumulated for each client during each three monthly HACC MDS reporting period. The predictor variables for each client were assumed to remain unchanged from one period to the next unless otherwise notified by HACC agencies. Of the 12,747 periods of care, 9,404 were available for Model1 analysis following deletion of 3,322 records with missing data and 11 low cost outliers. The majority of missing data related to ARIA and SEIFA codes (36.1%, n=1,202), which could not accurately be linked to the database because the Collection District was unknown. A further 1,130 periods were removed because data about pension status, accommodation setting or carer residency status were missing. Missing data were scattered across the other remaining variables. The statistical performance of the model was described in terms of the coefficient of multiple determination ( $R^2$ ) and the coefficient of variation (CV). The  $R^2$  statistic represented the proportion of total variation in the dependent variable (i.e., cost) that was explained by the predictive power of all the explanatory variables included in the model. The CV statistic measured the homogeneity within classes (i.e., CVs less than 1 indicated that classes were relatively homogeneous).

Figure 2 summarises the MODEL1 classification. The final structure contained 11 terminal nodes and accounted for 23.5% of the variance reduction in cost (i.e.,  $R^2$  was 23.5%). Six of the classes had CVs greater than 1, indicating they were relatively heterogeneous. It categorised the sample using three predictor variables: ADL dependency (i.e., ADL summary score), the need for clinical services, and level of IADL dependency (i.e. IADL summary score). There was an 8.8 fold difference between the least (IADL1) and most expensive (CLINH-YES) client groups. Key features of the model were: 80.2% of care episodes were in the two lowest cost classes (IADL1 and IADL2); the remaining 19.8% of care episodes were assigned to classes that had above average costs (i.e., cost weight above 1); and higher costs were associated with increased functional dependency and the need for clinical services. Note, as no measure of clinical need or clinical complexity is routinely used in community care, need (dichotomous yes/no) was established retrospectively using service use data.

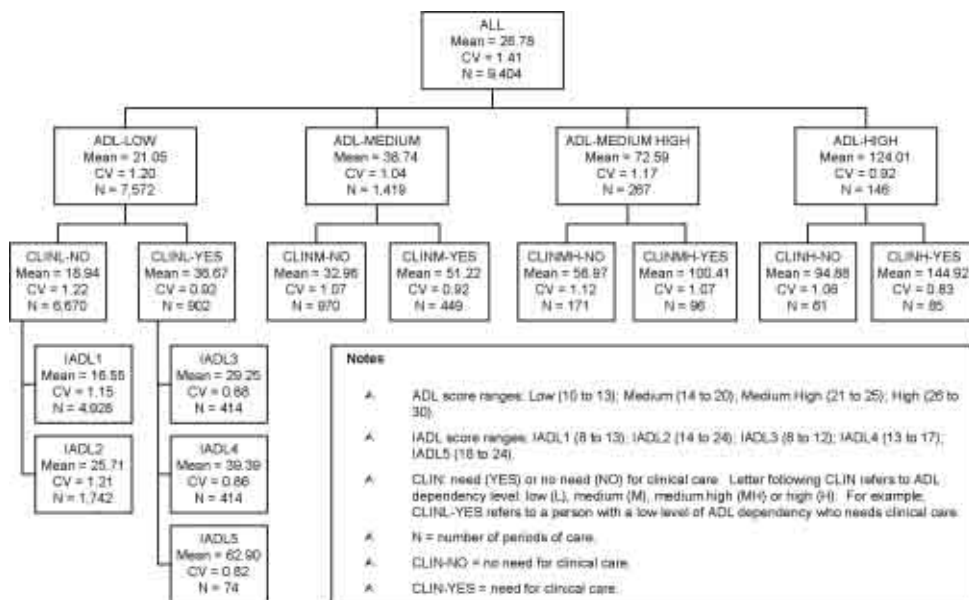
The ADL summary score was the strongest predictor of cost, accounting for 17.9% of the variance. Postcode was the next strongest predictor across all dependency levels, explaining a further 18.8% of the variance. It was, however, rejected as a classification variable because the ARIA and SEIFA indices, for which postcode was possibly acting as a proxy, were at best only weakly related to cost.

The need for clinical services was the next strongest predictor of cost for the ADL-Low and ADL-Medium categories, increasing the  $R^2$  by a further 1.9% and 0.8% respectively. The clinical splits in the ADL-Low group were further partitioned by level of IADL dependency, adding a further 1.4% to  $R^2$ . No other partitioning variables identified by the software met the 0.5% “minimum gains” criterion to justify adding a further level of complexity to the model.

The ADL-Medium High category was also partitioned on the basis of clinical needs (0.9% variance reduction). However, the two SEIFA Indices (that is, the Index of Economic Resources and Index of Relative Social Disadvantage) and IADL summary score explained a greater amount of variance. The IADL score was rejected because it produced clinically nonsensical results (i.e., less dependent people were more costly). Similarly, the IRSD and IER pointed to possible equity concerns within the sample, but neither variable contributed to the classification model in any meaningful way.

It proved difficult to partition the ADL-HIGH class because of the small sample ( $n=146$ ). The strongest predictors of cost were (in order): IER (3.9%), age (3.7%), region (2.7%) and hearing (2%). IER and region were rejected because they made no meaningful contribution, other than alerting to possible equity concerns as mentioned above. We were cautious about adding age to the model without knowing whether it was acting as a proxy for diagnosis, prognosis or some other client characteristic, or was in fact reflecting purchaser or provider characteristics (e.g., funding and targeting intentions). Additionally, the recommended partitions for all variables, including hearing, produced groups with fewer than 25 observations. Attempts to stabilise the group sizes by reducing the number of partitions drastically reduced the explained variance of each variable. To maintain consistency with the three other dependency levels (i.e., low, medium and medium high), the ADL-HIGH class was partitioned on clinical need, which reduced the variance in cost by a further 0.7%.

**Figure 2: Classification structure of Model1 using all available variables**



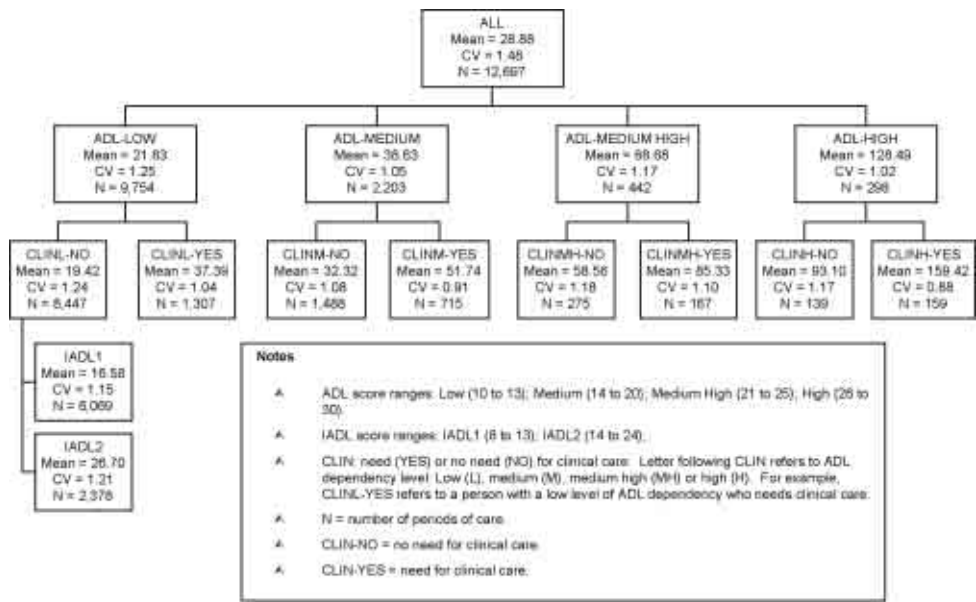


Model 2

MODEL2 responded well to fluctuations in cost, with the  $R^2$  ranging from 22.8% to 26.6%, and averaging 24.2% across the 20 Monte Carlo data sets. All of the partitions recommended in MODEL1 produced the same cost trends in MODEL2 (i.e., increased costs were associated with increased functional dependency and the need for clinical care). However, despite the sound overall performance of the model, there were two specific partitions that performed poorly during the MODEL2 testing, in terms of the percent variance reduction each partition contributed to the overall model. Firstly, the partitioning of the CLINL-YES class into three IADL subgroups contributed only 0.4% to the variance reduction of MODEL2, as compared with 0.6% in MODEL1. Secondly, the partitioning of the ADL-MEDIUM HIGH class into two clinical subgroups contributed only 0.3% to the variance reduction of MODEL2 as compared with 0.9% in MODEL1. Although both of these variables produced clinically meaningful classes, they failed to meet the 0.5% cut-off criterion for adding a further level of complexity to the model. The three IADL subgroups (IADL3, IADL4, IADL5) were therefore pruned from the final model. The clinical partitioning of the ADL MEDIUM HIGH class was retained, however, to achieve consistency across the dependency groups.

Figure 3 summarises the MODEL2 classification, which was developed using data from 12,697 quarters of care. The final structure contained nine terminal nodes and accounted for 23.7% of the variance reduction in cost. The cost difference between the groups was large – over nine to one between the lowest (0.57, IADL1) and highest dimensions (5.52, CLINH-YES). Seven of the classes had CVs greater than one, indicating they were relatively heterogeneous. Removing the clinical partition from the ADL MEDIUM HIGH group reduced the number of terminal nodes to eight and the variance ( $R^2$ ) was reduced to 23.4%.

Figure 3: Classification structure of Model2 using predictor variables from Model1





## Discussion

This study developed a classification that used client characteristics to predict HACC resource use in Western Australia. Before discussing the main findings and their implications, a review of the study limitations is required.

### *Study limitations*

This study had several limitations that might affect the validity of the results. First, the sample of HACC agencies and clients recruited to the study was of small size and essentially self-selected. A key to the applicability of the classification model(s) across all WA regions, and potentially other Australian states, depends on the relative differences between the groups being maintained and the variance explanations remaining at 23% or better. This remains to be tested.

Second, several problems were encountered with the HACC MDS. These included:

- inaccurate recording of client details needed to generate the HACC SLK;
- inability to conveniently trace carer services to a person with a disability;
- consistent interpretation problems with the carer availability and client living arrangement data items; and
- poor data quality for the “newly” introduced HACC services types (i.e., assessment, casemanagement, case planning/review/co-ordination; and counselling/information/advocacy).

Third, it was difficult to source valid and reliable unit cost data to use in the cost analysis. Although we were confident with the internal validity of the reduced sample of costs used, we cannot guarantee their generalisability. The most recent cost data were not compliant with the HACC MDS in that they had been calculated for the services funded in agency contracts for 1999/2000 or 2000/2001, which preceded outputs being defined in terms of the HACC MDS. This was, however, less of a problem than at first anticipated as activity data for the new HACC MDS defined services were found to be of such a poor quality that they were not included in the analyses. Of greater concern was that these data were collected for several years, but not used to establish robust cost estimates, to perform inter or intra state comparisons, to develop national community care costing standards, or to refine the costing framework. This heightens concerns that the HACC Unit Cost Framework has limited usefulness.

Fourth, the project measured resource use over a pre-defined period of three months, which coincided with the HACC MDS reporting periods. Defining the dependent variable in this way may have added random error, particularly for individuals who had not received care throughout the whole period. Even so, the resultant classification was able to explain 23.7% of the cost variance. This would undoubtedly have been improved if service start and end dates had been part of the MDS.

Fifth, the need for allied health or community nursing services was established retrospectively using HACC MDS service records, rather than collected at the point of assessment. There were three major problems with this approach. First, it defied the very purpose of classification because it prevented prediction of the resource needs of an individual. Second, it did not describe the person's need, but rather, the service response to the need. For example, it failed to account for different levels of nursing acuity/severity, which might explain why the predictive strength of the variable was limited for the two highest dependency groups. Third, it potentially led to the misclassification of individuals who had clinical needs that were being met by non-HACC sources.

Lastly, the classification was based on existing patterns of service use. Similar to the development of RUG-III for US nursing homes (Fries *et al.* 1994), this study did not address whether the levels of current care were “appropriate” or “acceptable”. This may have contributed significantly to the unexplained variance, particularly if agencies differed in their opinions of what constituted appropriate care. Of equal concern is the possibility that service use reflected what care was available rather than what was needed, and the model consequently entrenched under-servicing. The potential interaction of these two factors – undersupply or rationing of levels of care applied inequitably (i.e., not according to need) – would be a serious barrier to the use of any costing model which draws on existing patterns of utilisation.

### *Key findings*

We developed a branching classification model that had nine terminal nodes, explained 23.7% of the variance in cost and was robust to fluctuations in cost estimates. The data did not justify a more complicated classification structure. Three client characteristics consistently predicted HACC resource use: ADL dependency, need for clinical services and IADL dependency. ADL dependency was the strongest predictor of resource use. Small sample sizes limited our ability to partition the higher dependency classes.

This study represented the first multi-agency attempt to develop a classification that covered the full breadth of HACC services. The model was derived using data from metropolitan, rural and remote regions of WA. It therefore has better inherent statewide applicability, responding to the criticisms of the South Australian model (HealthTech 1997). It may also have broader appeal because it was based on HACC clients more generally, rather than agency-specific beneficiaries. Furthermore, the classification represented a significant statistical improvement on the South Australian model, explaining 23.7% of the variance in cost compared with 14.1%. Lastly, consistent with the South Australian study, this study found ADL dependency was the best predictor of resource use. This finding was also consistent with three of the four international classifications mentioned previously, with the exception of the HCGs model.

Contextual differences and the reduced richness of routinely available data made it difficult to compare the results of this study with US classifications. It must also be remembered that the US has been pursuing home care classification since the 1980s, and so it would be unfair to expect similar performance from an initial Australian classification. Notwithstanding these comments, a number of broad comparisons are possible, as discussed below.

The statistical performance of this HACC model compared favourably with US home care classifications, which achieved modest  $R^2$ s of 20% to 33.7%. Consistent with Foley *et al.* (1986), a summative ADL score was found to perform better than individual ADL variables. Furthermore, this study represents one of the few classifications to acknowledge the importance of domestic-type instrumental activities of daily living to describe the resource use of the majority of clients with little or no ADL dependency, but with minimal to extensive domestic care (i.e., non-personal care) needs. The only other classifications to include IADLS are the RUG-HHC and RUG-III/HC. Again, all studies found that a summative IADL score was more useful than individual IADL variables.

The main structural difference between the branching model developed in this study and the strongest performing US models (i.e., RUG-HHC and RUG-III/HC) was the choice of the third predictor variable. All three studies used a clinical typology to identify people with particular medical conditions or medical care needs. However, the US clinical typologies were significantly more sophisticated than the simple clinical need dichotomy (yes/no) used in this study.

The fact that carer variables were not found to predict cost is another consistency between this study and previous home care classifications. The community care system is underpinned by substantial reliance on informal support networks (Montgomery 1999; Madge 2000). Why informal support has not been identified as a significant classification variable is therefore perplexing. Perhaps it is because the measures used in classification studies are too crude to adequately measure carer input. Alternatively, the multi-factorial and ever-changing nature of informal care, coupled with the fact that it is often driven by factors unrelated to client need (e.g., gender, cultural norms, generation and social class), might be complicating efforts to identify a consistent pattern.

The final point relates to the use of cost as a dependent variable in the classification analyses. Only two US home care classifications, HCGs and RUG-III/HC, have used a similar approach. However, sourcing adequately reliable data on costs proved problematic for the present study. Concerns about the accuracy of cost data are a common problem encountered in classification studies. The present study has been methodologically enhanced, because it tested the robustness of the models to simultaneous fluctuations in the cost estimates. Arguably, a crude sensitivity analysis was performed on the RUG-III/HC using different levels of wage weights, but on the scant details provided, it appears the approach was less statistically rigorous than the approach used in this study.

### ***Implications***

The classification developed in this study is an initial step toward standardisation. It provides a way of standardising differences in HACC client types and their expected resource requirements on the basis of functional dependency and the need for clinical care. Admittedly, the simplicity and modest variance explanation of the classification reflects limitations with data availability and the inherent complexity of the industry. Any applications that arise from this study would require a significant amount of validation work to ensure state-wide or national applicability, and would need to address the limitations arising from possible inequities and under-supply of existing service provision noted above.

To date, policy direction and program management in the HACC program have been based on historic commitments, imprecise definitions of the target population, and subjective evaluation of regional and population needs. In its current form, the classification developed here provides a framework to:

- improve estimations of the size of the population needing home care;
- rethink the basic assumptions of the HACC Program;
- improve targeting and resource allocation;
- set budget targets, based on the prevalence of people with different levels of disability and needs for clinical care;
- achieve rigorous justification of expenditure by setting spending limits for people based on their assessed level of need, particularly for high-cost clients; and
- improve comparability across service providers and provide them with an impetus to adopt policies and practices that promote a cost conscious environment.

Lastly, a word of caution. It is premature to use this model to support a casemix payment system for the HACC Program. Few would argue that the general logic of casemix funding is necessarily preferable to the current system that funds service outputs unrelated to client characteristics. However, as Fries *et al.* (1994) convincingly argue, whilst good payment systems must be based on good classifications systems, the design of payment systems is considerably more complex than the simple incorporation of a classification system. There are a variety of additional issues that must be considered, such as regional wage differentials, provider-specific characteristics (e.g., size, staff type and location) and the temporal responsiveness of the payment system to changes in client casemix (Fries *et al.* 1994). The HACC Program has significant work to do in this area. Priority attention must be given to seeking an independent review of the HACC unit cost framework, its use and the accuracy of the resultant data.

In conclusion, this study advances the use of classification as a conceptual framework to understand the relationship between client characteristics and the cost of home care. It provides an empirically grounded classification system that is simple, robust and has a number of potential policy and practice applications. It is hoped that this concept-building research will accelerate work toward, and set the foundation needed, for a nationally consistent classification of community care.

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