

Developing a New Zealand casemix classification for mental health services

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This study aimed to develop a casemix classification of characteristics of New Zealand mental health services users. Over a six month period, patient information, staff time and service costs were collected from 8 district health boards. This information was analysed seeking the classification of service user characteristics which best predicted the cost drivers of the services provided. A classification emerged which explained more than two thirds of the variance in service user costs. It can be used to inform service management and funding, but it is premature to have it determine funding.

Key words: Casemix classification, mental health services users, service management

Over recent decades, recognition that variations in the characteristics of patients would be reflected in variations in service costs has led to the development of casemix classifications in medicine. The purpose of these is to classify episodes of care based on those factors which best predict the need for, and the cost of, care. Each class should contain episodes with similar patterns of resource consumption and which are clinically similar. This has been particularly represented by the diagnosis related groups (DRG) casemix classification, which currently forms the basis for the purchasing and cost weighting of personal health services by several governments worldwide.

The mental health sector has lagged behind the general health sector in casemix development (1). A number of earlier attempts were based solely on diagnosis: they performed poorly in predicting resource use, had an unwieldy number of classes and/or were limited to inpatient settings (2-9). Several studies identified the following patient factors as predictive of resource use: diagnosis, severity of symptoms, risk of harm to self or others, level of functioning and social support, co-morbidity, sociodemographic characteristics and stage of illness (10-27).

A large study in Australia (28) found similar results. A number of patient and provider characteristics contributed to a casemix classification model that allowed explanation of two thirds of the variations in service cost. This was the major impetus to developing a New Zealand version of that study, the Mental Health Classification and Outcomes Study (CAOS) (29).

After two years of preliminary planning for the project, eight district health boards (DHBs) contributed

data over a six month period in 2003, between them covering the whole range of DHB provided psychiatric services.

METHODS

Service use was conceptualized as made up of "episodes of care", which for the purposes of this study were defined as a period of contact between a consumer and a "provider" that occurred in one treatment setting. It was thus a managerial, rather than a clinical, concept and could be up to a maximum of 91 days. It did not necessarily coincide with an episode of illness, or with the patient management plans.

The following types of data were to be entered into a regression analysis approach: patient/consumer characteristics as currently provided by the DHBs to the Mental Health Information National Collection system, plus ratings on outcome scales such as the Health of the Nation Outcome Scales (HoNOS) (30); episode of care cost data provided by the DHBs; and staff time.

For this regression exercise, the episodes of care forming the units for analysis were created as shown in Figure 1.

All episode information was collected by the clinical staff members primarily responsible for the patient's care. The additional information collected included ratings on the HoNOS (including the HoNOS 65+ and HoNOSCA for older people and children respectively), the short version of the Life Skills Profile (LSP-16) (31), the Resource Utilisation Groups Activities of Daily Living Scale (RUG-ADL) (32) and the Children's Global Assessment Scale (CGAS) (33). The community based service staff recorded their team code, date of contact, service type, contact dura-

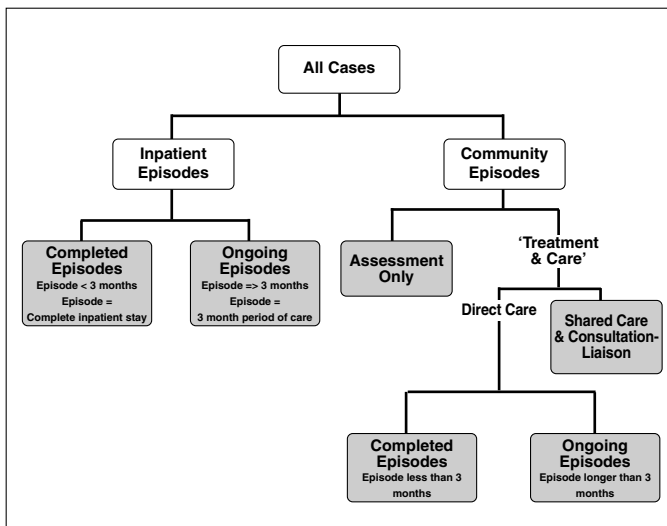


Figure 1 Episode of care model adopted in the study (shaded boxes represent the episode type)

tion, staff label category and the service setting. A resource allocation tool (RAT) was developed which recorded the allocation of inpatient nursing hours/patient. A composite measure reflecting the goal of care for the current episode (Focus of Care, FOC) (28) was added.

The national project team and the New Zealand Health Information Service established a process to match and encrypt all activity data and consolidate it into one file to avoid placing this additional burden on participating sites. Four design rules were adopted for use during the class finding analysis: a) consumer related cost drivers (the cost drivers used in the design of the classification should, wherever possible, be related to consumer characteristics and not to the type, or extent, of services utilised); b) variance reduction (the selection of the cost drivers should result in minimum variation within each class and maximum differences between classes); c) sensible clinical groups (the final classes should be clinically sensible); d) ease of collection (the variables used in the classification should be capable of routine collection, coding and data entry). The dependent or response variable was the cost of an episode of care. The independent variables were those characteristics of consumers that can be measured and that can be demonstrated to be predictive of cost.

PC-Group was used for the class finding. Independent variables were selected from the variety of demographic and clinical measurements recorded for consumers. The 'best' tree was selected as that which accounted for the largest proportion of variation in the cost of care. As this tree was not necessarily clinically the most sensible, PC-Group was also used to improve the clinical logic of the classification. For example, adult inpatient episodes were separated from child and youth episodes because this separation makes clinical sense.

The ultimate aim of the analysis was to form distinct

groups within the data, such that consumers within each group were similar to each other, but different from consumers in the other groups. Similarity and dissimilarity between consumers was measured by the cost of care. Independent variables were compared to find the one which could best split the data into two homogeneous groups that were as different from one another as possible. Successive binary splits were performed on the data until there were no significant improvements to be made. At that time, the best classification solution was reached. In parallel with this class-finding analysis, a number of multi-level models were fitted to the data, which confirmed the choice of variables to be included in the class-finding.

RESULTS

Profile of consumers and episodes

In total, 19,239 episodes of care were captured over the six month study period. These were provided to a total of 12,576 individual consumers. 98% of those consumers received their care only at one DHB. Overall, the male to female ratio was 53:47. 62% of the consumers identified themselves as New Zealand European/Pakeha, 20% as Maori and approximately 5% as Pacific Islanders. On the index of deprivation profile, the consumers were weighted towards the seventh to tenth deciles, this being particularly the case for males.

55% of consumers had only one episode of care during this study period, with a further 40% having two episodes. Approximately 10% of all episodes were inpatient based. The population diagnostic distributions are shown in the Tables 1 and 2.

Schizophrenia, paranoia and acute psychotic disorders accounted for 50% of Pacific people's episodes, 38% of Maori and only 24% of European episodes. In contrast, mood disorders accounted for 30% of European episodes, but only 16% of Maori and 14% of Pacific Island episodes. Anxiety disorders were uncommonly recorded for Maori and Pacific people (less than 1%) and accounted for 4.5% of European episodes.

There were 2,715 inpatient episodes with valid HoNOS ratings, representing 98.5% of all inpatient episodes. The HoNOS score pattern across the items was broadly similar for the three ethnicity groupings, with the average scores on item 1 (Overactive, aggressive, disruptive or agitated behaviour), item 6 (Problems associated with hallucinations and delusions) and item 9 (Problems with relationships) being the most elevated. There were some differences between the three ethnicity groupings for particular items. These differences will be explored in a separate outcome analysis. There were similar findings on all of the other clinical measures. The FOC findings showed major ethnic differences, with higher levels of 'acuity' in the Maori and Pacific inpatients.

The cost differences between the various types of episodes are shown in Table 3. The key general cost findings are: a) child and adolescent episodes cost more than adult

Table 1 Episodes of care by diagnosis – Adults

	Inpatient		Shared community care		Direct community care		All	
	No.	%	No.	%	No.	%	No.	%
Schizophrenia, paranoia and acute psychotic disorders	1328	48.2	222	24.7	3468	32.1	5018	34.7
Mood disorders	783	28.4	248	27.6	3129	28.9	4160	28.8
Personality disorders	124	4.5	27	3.0	344	3.2	495	3.4
Anxiety disorders	29	1.1	25	2.8	430	4.0	484	3.3
Organic disorders	106	3.8	33	3.7	299	2.8	438	3.0
Stress and adjustment disorders	53	1.9	25	2.8	360	3.3	438	3.0
Substance abuse disorders	75	2.7	11	1.2	182	1.7	268	1.9
Eating disorders	9	0.3	35	3.9	82	0.8	126	0.9
Obsessive-compulsive disorders	11	0.4	2	0.2	59	0.5	72	0.5
Mental retardation	23	0.8	7	0.8	20	0.2	50	0.3
Behavioural syndromes associated with physiological disturbances	3	0.1			40	0.4	43	0.3
Disorders of psychological development	6	0.2	1	0.1	26	0.2	33	0.2
Disorders of childhood and adolescence	1		1	0.1	25	0.2	27	0.2
Somatoform disorders	3	0.1	3	0.3	13	0.1	19	0.1
Sexual disorders	4	0.1			10	0.1	14	0.1
Other/missing	197	7.2	257	28.7	2328	21.5	2782	19.2
Grand total	2755	100.0	897	100.0	10815	100.0	14467	100.0

Table 2 Episodes of care by diagnosis – Child/Youth

	Inpatient		Shared community care		Direct community care		All	
	No.	%	No.	%	No.	%	No.	%
Disorders of childhood and adolescence	11	11.8	22	23.9	983	31.0	1016	30.3
Mood disorders	23	24.7	7	7.6	420	13.3	450	13.4
Stress and adjustment disorders	12	12.9	5	5.4	317	10.0	334	10.0
Anxiety disorders	1	1.1	2	2.2	199	6.3	202	6.0
Disorders of psychological development	5	5.4	5	5.4	125	3.9	135	4.0
Substance abuse disorders	1	1.1			104	3.3	105	3.1
Schizophrenia, paranoia and acute psychotic disorders	27	29.0	2	2.2	71	2.2	100	3.0
Mental retardation			1	1.1	54	1.7	55	1.6
Eating disorders	4	4.3	2	2.2	35	1.1	41	1.2
Obsessive-compulsive disorders			2	2.2	34	1.1	36	1.1
Personality disorders	2	2.2			15	0.5	17	0.5
Organic disorders	2	2.2	2	2.2	5	0.2	9	0.3
Somatoform disorders	1	1.1			7	0.2	8	0.2
Behavioural syndromes associated with physiological disturbances					1		1	
Other	4	4.3	42	45.7	797	25.2	843	25.1
Grand total	93	100.0	92	100.0	3167	100.0	3352	100.0

Table 3 Episode cost profile by episode type

	No. of episodes	Mean	Median	Minimum	Maximum	Percentile 25	Percentile 75	CV
Child inpatient - Ongoing	26	\$74,772	\$79,543	\$23,869	\$122,916	\$56,775	\$90,715	0.29
Adult inpatient - Ongoing	1094	\$43,545	\$39,821	\$1,764	\$227,596	\$31,160	\$50,062	0.44
Child inpatient - Complete	67	\$25,762	\$17,633	\$1,612	\$77,175	\$9,374	\$37,366	0.82
Adult inpatient - Complete	1661	\$11,757	\$7,635	\$284	\$108,041	\$3,329	\$15,201	1.08
Child shared community care - Complete	10	\$4,209	\$2,332	\$218	\$17,797	\$885	\$5,349	1.27
Adult shared community care - Ongoing	681	\$1,971	\$1,105	\$64	\$40,837	\$600	\$2,332	1.47
Child direct community care - Ongoing	2613	\$1,867	\$1,207	\$56	\$33,490	\$584	\$2,338	1.15
Child direct community care - Complete	554	\$1,744	\$1,192	\$59	\$17,783	\$476	\$2,272	1.07
Adult direct community care - Ongoing	9034	\$1,694	\$1,085	\$37	\$36,517	\$561	\$2,116	1.14
Child shared community care - Ongoing	82	\$1,682	\$853	\$169	\$8,999	\$407	\$2,213	1.10
Adult shared community care - Complete	216	\$1,673	\$1,100	\$71	\$28,510	\$471	\$1,877	1.47
Adult direct community care - Complete	1781	\$1,560	\$1,010	\$46	\$14,328	\$577	\$1,960	1.06
Child assessment only	102	\$459	\$399	\$131	\$1,109	\$262	\$661	0.54
Adult assessment only	1318	\$423	\$366	\$71	\$1,412	\$233	\$549	0.58

CV – coefficient of variation

episodes; b) complete (short-term) episodes cost more on a per diem basis than ongoing (longer-term) episodes, but they cost less on an episode basis; c) shared care episodes cost at least as much as direct care episodes on both a per diem and an episode basis; d) child and adolescent inpatient episodes cost more than adult inpatient episodes on both an episode and a per diem basis; e) assessment only community episodes cost significantly less on an episode basis but, on a per diem basis, they are the most costly community treatment days. These findings lay the groundwork for the design of the casemix classification.

Pacific Island episodes had the highest average cost for adult episodes (\$9235), followed by Maori (\$7032) and then European (\$3776). The situation was different for child and youth inpatient episodes, where the ‘all other’ group has the highest child and youth episode cost, followed by European

episodes. There were no cost differences between Maori and Pacific child and youth episodes.

Casemix classification

After removing partial episodes, a total of 16,665 episodes were used for class finding (Table 4).

Figure 2 shows the final classification developed. It has a total of 42 classes. For adults, particular HoNOS items, Focus of Care ratings, legal status and ethnicity all contributed significantly as predictive variables for costs. Diagnosis did not. For children and youth, diagnosis (inpatients only), age and HoNOSCA items proved to be useful variables.

The end result is that nine variables were employed in the classification. They fell into three groups: a) a direct service measure, length of stay (used to define complete and ongo-

Table 4 Final data set used for class finding

Episode of care type	Adult		Child and youth		Total	
	No.	%	No.	%	No.	%
Inpatient	2279	16.6	77	2.6	2356	14.1
Assessment only (community)	1318	9.6	102	3.5	1420	8.5
Shared community care	774	5.6	77	2.6	851	5.1
Direct community care	9349	68.1	2689	91.3	12038	72.2
Total	13720	100.0	2945	100.0	16665	100.0

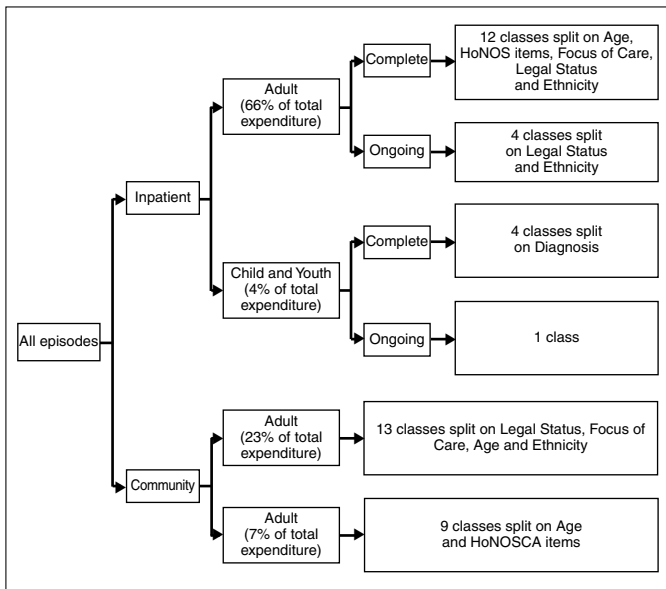


Figure 2 Classification of episodes

ing episodes in the inpatient branch); b) five direct consumer measures (age; ethnicity for adults; HoNOS ratings for adult inpatients; diagnosis for child/youth inpatients; HoNOSCA ratings for child/youth); c) measures which are a blend of consumer and service attributes: assessment only (community), legal status (adults) and FOC (adults).

The average case complexity of the three broad ethnicity groupings is shown in Table 5. Pacific people inpatient episodes have an average weight that is 35% above the national average for inpatient episodes, while Maori inpatient episodes have a weight that is 22% above the national average. The European/Other grouping has an inpatient weight that is 14% below the national average. For community episodes, Pacific episodes have an average weight that is 44% above the national average for community episodes, while Maori inpatient episodes have a weight that is 5% above the national average. The European/Other grouping has a community weight that is 4% below the national average.

Table 5 Average case complexity of the three broad ethnicity groupings

Ethnicity Grouping	Average case weight - inpatient episodes	Average case weight - community episodes	Average case weight - all episodes
Pacific Island	6.00	0.51	1.93
Maori	5.40	0.37	1.49
European/Other	3.83	0.34	0.81
All	4.44	0.36	1.00

DISCUSSION

The statistical performance of the classification is satisfactory. Although this study is large and the results have

statistical strength, two fundamental points need to be borne in mind in discussing it. The first is that this is an essentially descriptive report of current practice reality and cannot be taken to represent best practice. The second is that this is a first ever study of its kind in New Zealand, and can in that sense be thought of as pilot. The amount of data collected, however, makes it very unlikely it will ever be replicated in a similar fashion.

It would have been preferable to use only direct consumer measures instead of including those with significant provider judgement contributions. They are used in the classification when no direct consumer measure could be found that would act as a proxy. In reality, no existing casemix classification consists solely of consumer-related variables. For example, over half the classes in the DRG system are defined on length of stay, the nature of the procedure or the type of intervention. These measures work in the DRG system in the same way that Assessment Only, Legal Status and FOC work in our classification. If the DRG system is the benchmark, the mix of consumer-related and service-related measures in our study is more than acceptable.

Setting an international precedent, this study has resulted in a casemix classification that includes some casemix classes based on ethnicity. The decision to include such classes was carefully considered by all key stakeholders during the design, implementation and analysis phases and makes sense in the New Zealand context. Consistent with clinical expectations, the study found that, after controlling for clinical differences in the mix of cases, there were still statistically significant differences between the three major ethnicity groupings.

In conclusion, the performance of this classification is satisfactory as a first version national classification. In total there are 42 classes, 20 for inpatient episodes and 22 for community episodes. Significant differences in episode costs for adult inpatient episodes are noted when ethnicity is taken into consideration. Diagnosis is not an important variable for adult inpatient episodes, but it is for child and youth inpatient episodes. There are significant differences in the case complexity between DHBs. The classification is not suitable to be used as a funding model, but it is sufficient to inform management and funding decisions. The CAOS dataset offers a rich source of data that DHBs could continue to use to further inform costing and clinical assurance initiatives.

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