*ACE*MA
AGED CARE EVALUATION AND MANAGEMENT ADVISORS

AHMAC WORKING GROUP ON THE
CARE OF OLDER AUSTRALIANS

Examination of Length of Stay for Older Persons in Acute and Sub-Acute Sectors

SUPPLEMENTARY STATISTICAL ANALYSIS

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1

Introduction

This report presents supplementary statistical analysis of the hospital survey data derived from the project carried out by Aged Care Evaluation and Management Advisors (***ACE*MA**) to "*examine the length of stay for older persons in the acute and sub-acute sectors".* In November, 2002 the NSW Department of Health (acting on behalf of the Australian Health Ministers' Advisory Council (AHMAC) Working Group on the Care of Older Australians (the "Working Group")) extended the contract with ***ACE*MA** to enable the production of additional statistical analysis to examine in more detail the relationship of patient characteristics to their length of stay. This report presents the requested analysis, which should be read as supplementary information to the main project report (the "main report").

Specifically, the supplementary statistical analysis was carried out as two major components as follows:

(1) Regression analysis on the proportion of patients recommended for another form of care on length of stay sub-groups to determine if there are different explanatory variables (to the population considered as a whole) in these sub-groups.

(2) Regression analysis with length of stay as the dependent variable to determine to what extent the characteristics of the patients collected by the survey can predict the patient's length of stay.

The balance of this document presents the findings of these analyses, making some comparisons, where appropriate, with the statistical analysis in the main report.

2

Analysis using Length of Stay Subgroups

This Chapter repeats the statistical analysis in the main report that sought to determine the characteristics of patients who had been recommended for another type of care (see Section 4.5 in the main report) for three sub groups of accumulated length of stay as follows:

- length of stay less than four weeks;
- length of stay between one and four months; and
- length of stay greater than four months.

Table 1 presents the distribution of the 16,104 records in the surveyed population into the three length of stay subgroups.

Table 1: Number of records in each length of stay subgroup

Records where	Number of Records	% of Records
Length of stay less than four weeks	12,054	74.85
Length of stay between one and four months	2,642	16.41
Length of stay greater than four months	1,008	6.26
Invalid dates/Unanswered	400	2.48
Total	***16,104***	***100.00***

This Chapter analyses each subgroup separately to determine if there are different characteristics within each group that predict whether a patient is more likely to be recommended for another type of care.

2.1 LENGTH OF STAY LESS THAN FOUR WEEKS

Table 2 shows the number of records in the length of stay less than four weeks subgroup where another form of care is considered more appropriate (Q11a) and another form of care has been recommended (Q12a).

Table 2: Number of records where length of stay is less than four weeks

Records where	Number of Records	% Records Subgroup	% Records Survey Population
Length of stay less than four weeks	12,054		
Another form of care is considered more appropriate (Yes to Q11a)	1,839	15.3	19.1
Another form of care has been recommended (Yes to Q12a)	1,277	10.6	14.1

Review of Table 2 demonstrates, as might be expected, that the proportion of patients where another form of care was considered more appropriate (15.3%) and the proportion of patients for whom another form of care was recommended on census night (10.6%) were lower for the length of stay less than four week subgroup than for the survey population taken as a whole (19.1% and 14.1% respectively). The balance of this analysis examines the characteristics of the population subgroup to seen if there are differences in the variables that predict ‘yes’ answers to Q12a than for the total survey population.

2.1.1 *Univariate analysis*

By examining each of the potential independent variables individually, it has been determined that at least one category in each variable produces a statistically significant difference in the proportion of patients recommended for another type of care for all variables. However, due to the small numbers in some of the categories and the wide variation in other categories, the majority of the variables account for a fairly small amount of the variance in the proportion of patients recommended for another type of care.

Table 3: Univariate analysis summary of results – LOS less than four weeks

Independent variable	p value	Significance	R squared
Length of Stay	0.000	Yes	9.0%
Top ten admission diagnosis	0.000	Yes	1.9%
Patient age	0.000	Yes	3.3%
Patient residence – State	0.068	Yes	0.2%
Patient residence – ARIA	0.025	Yes	0.2%
Patient gender	0.017	Yes	0.1%
Indigenous status	0.050	Yes	0.1%
Patient main language	0.024	Yes	0.1%
Patient usual residence	0.000	Yes	0.8%
Source of referral	0.000	Yes	2.2%
Care currently received	0.000	Yes	16.9%
Location of hospital	0.006	Yes	0.1%

The simplest way to interpret the results of the univariate analysis is to examine the R squared column. Table 3 shows that the most important variables (in terms of explaining the variance in the proportion of patients recommended for another form of care) are care currently received, length of stay, patient age, source of referral and presence of a top ten admission diagnosis. These five variables are the same as the five that were important in the analysis from the main report which considered the survey population as a whole. This finding is not surprising given that the less than four weeks subgroup contains well over half the survey population records.

Table 3 also shows that the p-value for all variables are considered significant in this analysis whereas in the main report a patient's Indigenous status and the location of the hospital were not found to be significant. This finding suggests that hospital location has some impact once the length of stay is trimmed (ie patients with accumulated length of stay greater than four weeks are removed). The charts that illustrate the differences in the means for each of the categories of the independent variables can be found in Appendix B.

2.1.2 *Multivariate analysis using all univariate significant variables*

The statistical analyses were extended by taking the independent variables that were found to be significant in the univariate analysis (ie all variables in this case) and putting them into a multivariate logistic regression model. Through this process some variables that have significant interactive effects with other variables may become more or less significant than in the univariate analyses. Table 4 shows that in the twelve variable multi-variate model all variables except indigenous status and hospital location remain significant.

Table 4: Multivariate analysis summary of results – twelve variable model- LOS less than four weeks

Independent variable	p value	Significance	R squared
Top ten admission diagnosis	0.000	Yes	
Length of Stay	0.000	Yes	
Patient age	0.000	Yes	
Patient residence – State	0.000	Yes	
Patient residence – ARIA	0.008	Yes	
Patient gender	0.062	Yes	
Indigenous status	0.264	No	
Patient main language	0.002	Yes	
Patient usual residence	0.000	Yes	
Source of referral	0.000	Yes	
Care currently received	0.000	Yes	
Location of hospital	0.160	No	
Overall model			25.5%

It is not possible to report the R^2 explained by each independent variable in the multivariate analysis because the R^2 is a measure of how well the *overall* multivariate model fits the data. It is, however, possible to say that all these variables together account for 25.5% of the variance in the proportion of patients recommended for another type of care while in hospital. This number is lower than the R^2 result in the main report (32.0%). By adding two-way interactive variables the R^2 for the subgroup would increase to 35.5%.

2.1.3 Multivariate analysis using most important variables

The final part of the statistical analysis used logistic regression analysis to explore the difference in probabilities of a patient being recommended for another type of care while in a public hospital for the different values of the categorical variables. After some modelling a multivariate model with eight variables was produced that accounted for 25.2% of the variance. This model uses 34 categories (effectively the number of possible answers to the eight variables). The eight variables found to be most important were care currently received, length of stay, age, top ten diagnosis, source of referral, place of residence, language spoken and hospital location. Using only the value of these variables a model can be developed without interactive terms that accounts for 25.2% of the variance in the proportion recommended for another type of care.

Table 5 presents the results of the eight variable logistic regression model. As previously explained in the main report logistic regression relies on the selection of a reference category. As can be seen from Table 5, the reference category chosen had the values acute care, up to one week, 75-79 years, not top ten diagnosis, Emergency Department, private residence, other language and metro for the eight variables in turn.

Table 5: Multivariate analysis – regression coefficients for eight variable model – LOS less than four weeks

Variable	Reference category	Exp(B)	P	p_k	p multiplier	R squared
Length of stay	*Up to 1 week*		0.056			
1-2 weeks		2.352		0.122	4.0811	
2-3 weeks		3.340		0.165	5.5125	
3-4 weeks		4.213		0.200	6.6648	
Language	*English*		0.107			
Other		1.332		0.138	1.2861	
Top 10 Diagnosis	*No*		0.092			
Yes		1.539		0.135	1.4660	
Hospital Location	*Metro*		0.116			
Rural		0.960		0.112	0.9642	
Place of residence	*Private residence*		0.104			
Aged care		0.876		0.092	0.8876	
Dom. supported living		1.555		0.153	1.4701	
Boarding/hostel		1.503		0.149	1.4283	
Other supported accommodation		2.810		0.246	2.3647	
Other accommodation		0.842		0.089	0.8557	
Source of referral	*Emergency department*		0.128			
Community health		0.690		0.092	0.7187	
Outpatients		0.490		0.067	0.5243	
Other hospital/day procedure centre		0.554		0.075	0.5875	
Aged care facility		0.992		0.127	0.9931	
Medical practitioner		0.564		0.076	0.5972	
Other agency		1.235		0.153	1.1989	
Extended care/rehab facility		1.267		0.157	1.2249	
Private psychiatric practice		1.309		0.161	1.2590	
Relative		0.754		0.100	0.7781	
Self		0.694		0.092	0.7226	
Care currently received	*Acute*		0.066			
Rehabilitation		0.980		0.065	0.9809	
Palliative		1.598		0.101	1.5370	
Maintenance		11.360		0.445	6.7467	
Respite		6.802		0.325	4.9186	
Geriatric evaluation & management		3.007		0.175	2.6550	
Psychogeriatric		2.140		0.131	1.9906	
Hospital boarder		8.064		0.363	5.4999	
Age	*75-79 years*		0.030			
65-69		2.027		0.059	1.9668	
70-74		2.143		0.062	2.0718	
45-64		2.901		0.082	2.7441	
80-84		3.246		0.091	3.0409	
85-89		3.996		0.110	3.6667	
90+		3.991		0.110	3.6621	
Constant		0.430				
						25.2%

The simplest way to interpret the model is to examine the p multiplier column. The p multiplier is the ratio of the probability of a patient with the given value of the categorical variable being recommended for another type of care relative to a patient with the reference value of the categorical variable. For example, the logistic regression predicts that a patient whose place of residence is 'other supported accommodation' is 2.3647 times more likely (24.5%) to be recommended for another type of care than those who live in a private residence (10.4%).

The data show how the care currently received by the patient can have an effect on the need for another form of care. Those patients who were receiving acute care had 6.6% chance of being recommended for another form of care. Patients receiving all other types of care were more likely to be recommended for another form of care (except rehabilitation) ranging from palliative care at 1.537 times more likely (10.1%) to maintenance care at 6.7467 times more likely (44.5%). Patients receiving rehabilitation care were marginally less likely to be recommended for another form of care (6.5%) than patients receiving acute care (6.6%).

2.2 LENGTH OF STAY ONE MONTH TO FOUR MONTHS

Table 6 shows the number of records in the length of stay more than one month and less than four months subgroup where another form of care is considered more appropriate (Q11a) and another form of care has been recommended (Q12a).

Table 6: Number of records where length of stay is between one and four months subgroup

Records where	Number of Records	% Records Subgroup	% Records Survey Population
Length of stay between one and four months	2,642		
Another form of care is considered more appropriate (Yes to Q11a)	1,097	41.5	19.1
Another form of care has been recommended (Yes to Q12a)	899	34.0	14.1

Review of Table 6 demonstrates that the proportion of patients where another form of care was considered more appropriate (41.5%) and the proportion of patients for whom another form of care was recommended on census night (34.0%) were higher for the length of stay between one and four months subgroup than for the survey population taken as a whole (19.1% and 14.1% respectively). Again, not surprisingly in this relatively long stay subgroup, the proportion of patients recommended for another form of care (34.0%) is more than three times the proportion for the short stay (less than four weeks) subgroup (10.6%). The balance of this analysis examines the characteristics of the population subgroup to see if there are differences in the variables that predict 'yes' answers to Q12a for the subgroup and the survey population.

2.2.1 Univariate analysis – summary

Table 7 summarises the univariate results for those records where the accumulated length of length of stay at the Part I census date was between one and four months.

Table 7: Univariate analysis summary of results – LOS between one and four months

Independent variable	p value	Significance	R squared
Top ten admission diagnosis	0.000	Yes	0.5%
Length of Stay	0.000	Yes	1.9%
Patient age	0.000	Yes	2.5%
Patient residence – State	0.000	Yes	2.0%
Patient residence – ARIA	0.061	Yes	1.6%
Patient gender	0.119	No	0.1%
Indigenous status	0.938	No	0.0%
Patient main language	0.150	No	0.1%
Patient usual residence	0.003	Yes	1.0%
Source of referral	0.000	Yes	4.9%
Care currently received	0.000	Yes	24.9%
Location of hospital	0.000	Yes	0.8%

Table 7 shows that the most important variables (in terms of explaining the variance in the proportion of patients recommended for another form of care) are care currently received, source of referral, patient age, State, length of stay and ARIA,. This result is similar to that obtained for patients who were in hospital for less than four weeks except that the presence of a top ten diagnosis no longer accounts for more than 1% of the variance in the proportion of patients recommended for another type of care whereas the State and ARIA of patient residence now do account for more than 1% of variance.

Table 7 also shows that the patient's gender, indigenous status, and main language are no longer significant predictors of whether a patient is likely to be recommended for another form of care. The charts that illustrate the differences in means for each of the categories of the independent variables can be found in Appendix C.

2.2.2 Multivariate analysis using all univariate significant variables

The statistical analyses were extended by taking the independent variables that were found to be significant in the univariate analysis (ie eliminating patient gender, indigenous status and language spoken) and putting them into a multivariate logistic regression model. Table 8 shows that in the nine variable multivariate model all variables except length of stay, age and location of hospital remain significant.

Table 8: Multivariate analysis summary of results – nine variable model – LOS between one and four months

Independent variable	p value	Significance	R squared
Top ten admission diagnosis	0.034	Yes	
Length of Stay	0.181	No	
Patient age	0.785	No	
Patient residence – State	0.003	Yes	
Patient residence – ARIA	0.000	Yes	
Patient usual residence	0.000	Yes	
Source of referral	0.000	Yes	
Care currently received	0.000	Yes	
Location of hospital	0.446	No	
Overall model			30.9%

These variables together account for 30.9% of the variance in the proportion of patients recommended for another type of care while in hospital. This value is over 5% higher than

that for the less than four weeks subgroup (25.5%) and just lower than the value in the main report (32.0%). If a multivariate model including two-way interaction terms were used then R^2 would increase to 49.9%.

2.2.3 Multivariate analysis using most important variables

The logistic regression analysis was then used to explore the difference in probabilities of a patient being recommended for another type of care while in a public hospital for the different values of the categorical variables. After some modelling a multivariate model with six variables was produced that accounted for 30.7% of the variance. This model uses 32 categories (effectively the number of possible answers to the six variables). The six variables found to be most important were (not in order of priority) length of stay, place of residence, source of referral, care currently received, top ten diagnosis and State. Using only the value of these variables a model can be developed without interactive terms that accounts for 30.7% of the variance in the proportion of patients recommended for another type of care.

Table 9 presents the results of the six variable logistic regression model. As can be seen from Table 9, the reference category chosen for the logistic regression has the values one to two months, private residence, Emergency Department, acute care, not top ten diagnosis and New South Wales for the six variables in turn.

Table 9: Multivariate analysis – regression coefficients for six variable model – LOS between 1 and 4 months

Variable	Reference category	Exp(B)	P	Pk	p multiplier	R squared
Length of stay	*1-2 months*		0.316			
2-3 months		1.133		0.344	1.2185	
3-4 months		1.425		0.397	1.4077	
Place of residence	*Private residence*		0.345			
Aged care		0.905		0.323	0.9355	
Dom. supported living		1.134		0.374	1.0838	
Boarding/hostel		0.885		0.318	0.9215	
Other supported accom		2.202		0.537	1.5565	
Other accom.		0.213		0.101	0.2928	
Source of referral	*Emergency department*		0.405			
Community health		0.594		0.288	0.7110	
Outpatients		0.256		0.148	0.3666	
Other hospital/day procedure centre		0.566		0.278	0.6868	
Aged care facility		0.882		0.375	0.9263	
Medical practitioner		0.914		0.383	0.9467	
Other agency		1.823		0.554	1.3674	
Extended care/rehab facility		3.423		0.700	1.7277	
Private psychiatric practice		0.558		0.275	0.6798	
Relative		1.073		0.422	1.0421	
Self		0.297		0.168	0.4150	
Care currently received	*Acute*		0.210			
Rehabilitation		0.726		0.162	0.7703	
Palliative		0.905		0.194	0.9231	
Maintenance		8.311		0.688	3.2781	
Respite		13.672		0.784	3.7344	
Geriatric evaluation & management		2.341		0.384	1.8266	
Psychogeriatric		0.705		0.158	0.7512	
Hospital boarder		4.687		0.555	2.6417	

Variable	Reference category	Exp(B)	P	Pk	p multiplier	R squared
Top 10	*No*		0.313			
Yes		1.269		0.366	1.1704	
State	*New South Wales*		0.282			
Victoria		1.525		0.375	1.3281	
Queensland		1.052		0.292	1.0371	
South Australia		1.308		0.339	1.2037	
Western Australia		1.317		0.341	1.2088	
Tasmania		1.972		0.437	1.5479	
Northern Territory		1.471		0.366	1.2986	
ACT		1.030		0.288	1.0216	
Constant		0.635				
						30.7%

Table 9 shows that in this subgroup (length of stay between one and four months) only six of the 32 categories had less than one in five (20%) of the patients recommended for another form of care. These were other accommodation as the place of residence (10.1%), outpatients (14.8%) and self (16.8%) as the source of referral and rehabilitation (16.2%), palliative (19.4%) and psychogeriatric (15.8%) as the type of care.

As with the less than four weeks length of stay subgroup, the care currently received by the patient makes a difference as to whether the patient is likely to be recommended for another form of care. Acute patients have 21.0% of patients being recommended for another type of care. There are four categories that have higher proportions than this with GEM being 1.8266 times greater (38.4%), hospital boarder 2.6417 times (55.5%), maintenance 3.2781 times (68.8%) and respite 3.7344 times (78.4%).

2.3 LENGTH OF STAY GREATER THAN FOUR MONTHS

Table 10 shows the number of records in the length of stay greater than four months subgroup where another form of care is considered more appropriate (Q11a) and another form of care has been recommended (Q12a).

Table 10: Number of records where length of stay is greater than four months subgroup

	Number of Records	% Records Subgroup	% Records Survey Population
Length of stay greater than four months	1,008		
Another form of care is considered more appropriate (Yes to Q11a)	376	37.3	19.1
Another form of care has been recommended (Yes to Q12a)	274	27.2	14.1

Review of Table 10 demonstrates that the proportion of patients where another form of care was considered more appropriate (37.3%) and the proportion of patients for whom another form of care was recommended on census night (27.2%) were higher for the length of stay greater than four months subgroup than for the survey population taken as a whole (19.1% and 14.1% respectively). Interestingly, the proportions are slightly lower than the corresponding numbers for the between one and four month length of stay subgroup (41.5% and 34.0% respectively). Again, the balance of this analysis examines the characteristics of the population subgroup to see if there are differences in the variables that predict "yes" answers to Q12a for the subgroup and the survey population.

2.3.1 Univariate analysis – summary

Table 11 summarises the univariate results for those records where the accumulated length of length of stay at the Part I census date was greater than four months.

Table 11: Univariate analysis summary of results – LOS greater than four months

Independent variable	p value	Significance	R squared
Top ten admission diagnosis	0.720	No	0.0%
Length of Stay	0.000	Yes	11.5%
Patient age	0.486	No	1.1%
Patient residence – State	0.000	Yes	28.2%
Patient residence – ARIA	0.000	Yes	13.2%
Patient gender	0.018	Yes	1.0%
Indigenous status	0.493	No	0.1%
Patient main language	0.322	No	0.2%
Patient usual residence	0.000	Yes	6.5%
Source of referral	0.000	Yes	10.7%
Care currently received	0.034	Yes	2.8%
Location of hospital	0.000	Yes	5.7%

Table 11 shows that the most important variables (in terms of explaining the variance in the proportion of patients recommended for another form of care) are State, ARIA, length of stay, source of referral, place of residence, location of the hospital and care currently received. Thus only three variables (top 10 diagnosis, Indigenous status and main language) account for less than 1% of the variance in the proportion of patients recommended for another type of care. When comparing the five most important variables (in terms of explaining variance) the one noticeable difference is that care currently being received is not present for this long stay subgroup. In fact the R^2 proportion explained by care currently received has decreased significantly when compared to the other two subgroups. For the length of stay greater than four months subgroup the patient's state and ARIA of residence are now the most important variables with the length of stay and source of referral being next ranked.

In terms of the p-values the patient's Indigenous status and main language are still not significant (compared to those waiting between one and four months) but the gender becomes significant again (having dropped out for the length of stay between one and four months subgroup). The other variables not significant for this subgroup are the presence of a top ten diagnosis and the patient's age. The charts that illustrate the differences in means for each of the categories of the independent variables can be found in Appendix D.

2.3.2 Multivariate analysis using all univariate significant variables

The statistical analysis was extended by taking the independent variables that were found to be significant in the univariate analysis (ie eliminating top ten diagnosis, patient age, language spoken and indigenous status) and putting them into a multivariate logistic regression model. Table 12 shows that in the eight variable multi-variate model all variables except place of residence and location of hospital remain significant.

Table 12: Multivariate analysis summary of results – eight variable model – LOS greater than four months

Independent variable	p value	Significance	R squared
Length of Stay	0.034	Yes	
Patient residence – State	0.000	Yes	
Patient residence – ARIA	0.000	Yes	
Patient gender	0.038	Yes	
Patient usual residence	0.759	No	
Source of referral	0.000	Yes	
Care currently received	0.002	Yes	
Location of hospital	0.518	No	
Overall model			50.4%

These variables together account for 50.4% of the variance in the proportion of patients recommended for another type of care while in hospital. There is almost a 20% increase in the R^2 proportion compared to the between one and four months subgroup (30.5%), and this value is now also larger than that obtained in the main report for the total population (32.0%). If a multivariate model including two-way interaction terms were used then R^2 would increase to 86.2%.

2.3.3 Multivariate analysis using most important variables

The final part of the statistical analysis used logistic regression analysis to explore the difference in probabilities of a patient being recommended for another type of care while in a public hospital for the different values of the categorical variables. After some modelling a multivariate model with six variables was produced that accounted for 43.4% of the variance. This model uses 35 categories (effectively the number of possible answers to the six variables). The six variables found to be most important were (not in order of priority) length of stay, gender, source of referral, care currently received, ARIA and State. Using only the value of these variables a model can be developed without interactive terms that accounts for 43.4% of the variance in the proportion recommended for another type of care.

Table 13 presents the results of the six variable logistic regression model. As can be seen from Table 13, the reference category chosen had the values four to five months, male, Emergency Department, acute care, highly accessible and New South Wales for the six variables in turn.

Table 13: Multivariate analysis – regression coefficients for six variable model – LOS greater than four months

Variable	Reference category	Exp(B)	p	pk	p multiplier	R squared
Length of stay	*4-5 months*		0.405			
5-6 months		1.358		0.480	1.1861	
6-12 months		1.219		0.454	1.1199	
1-2 years		0.610		0.293	0.7245	
2-3 years		0.488		0.249	0.6154	
3-4 years		0.686		0.318	0.7862	
4-5 years		0.001		0.001	0.0025	
Gender	*Male*		0.227			
Female		0.735		0.177	0.7818	

Variable	Reference category	Exp(B)	p	pk	p multiplier	R squared
Source of referral	*Emergency department*		0.443			
Community health		1.071		0.460	1.0382	
Outpatients		6.142		0.830	1.8738	
Other hospital/day procedure centre		0.609		0.326	0.7362	
Aged care facility		0.464		0.270	0.6089	
Medical practitioner		0.573		0.313	0.7070	
Other agency		0.199		0.137	0.3084	
Extended care/rehab facility		0.668		0.347	0.7828	
Private psychiatric practice		0.056		0.043	0.0965	
Relative		2.553		0.670	1.5125	
Self		0.181		0.126	0.2846	
Care currently received	*Acute*		0.36			
Rehabilitation		0.172		0.088	0.2447	
Palliative		0.853		0.324	0.9005	
Maintenance		2.704		0.603	1.6760	
Respite		6.339		0.781	2.1693	
Geriatric evaluation & management		3.894		0.687	1.9070	
Psychogeriatric		4.094		0.697	1.9368	
Hospital boarder		3.435		0.659	1.8305	
ARIA	*Highly Accessible*		0.488			
Accessible		0.377		0.264	0.5412	
Moderately Accessible		1.013		0.491	1.0065	
Remote		0.267		0.203	0.4158	
Very Remote		0.888		0.458	0.9395	
State	*New South Wales*		0.159			
Victoria		8.197		0.608	3.8226	
Queensland		2.363		0.309	1.9421	
South Australia		0.162		0.030	0.1871	
Western Australia		0.636		0.107	0.6746	
Tasmania		137.740		0.963	6.0567	
Northern Territory		190397.942		1.000	6.2891	
ACT		21.755		0.804	5.0592	
Constant		0.905				
						43.40%

Table 13 needs to be interpreted cautiously because there were only 1,008 patients in this length of stay subgroup (and hence very small numbers in the smaller States). The most striking feature of Table 13 is the very different results obtained across States (consistent with the univariate analysis finding that State of patient residence accounts for nearly 30% of the variance of the proportion recommended for another type of care for this length of stay subgroup). Three of the categories in the State variable (Tasmania, Northern Territory and ACT) have a p multiplier value greater than five with Tasmania and Northern Territory being over six times more likely to be recommended for other care. Again readers are reminded of the relatively small numbers of records supporting this analysis, nevertheless it would seem that where very long stay patients exist, there is a different view as to the appropriateness (in some States almost all of them were recommended for another form of care, whereas in other States, the proportion recommended for another form of care was below average).

2.4 CONCLUSIONS

The principal result of this analysis is that for patients that have been in hospital for over four months the predictors of whether they are likely to be recommended for another form of care change. This result is clear from Table 14, which summarises the univariate analysis for all four groups (the survey population as a whole and the three length of stay based subgroups).

Table 14: Univariate analysis summary across population groups

Independent variable	Survey Population		Less than four weeks		Between one and four months		Greater than four months	
	R^2	P value signif.	R^2	p value signif.	R^2	p value signif.	R^2	p value signif.
Top ten admission diagnosis	2.6%	✓	1.9%	✓	0.5%	✓	0.0%	×
Length of Stay	16.5%	✓	9.0%	✓	1.9%	✓	11.5%	✓
Patient age	3.1%	✓	3.3%	✓	2.5%	✓	1.1%	×
Patient residence – State	0.8%	✓	0.2%	✓	2.0%	✓	28.2%	✓
Patient residence – ARIA	0.3%	✓	0.2%	✓	1.6%	✓	13.2%	✓
Patient gender	0.02%	×	0.1%	✓	0.1%	×	1.0%	✓
Indigenous status	0.03%	✓	0.1%	✓	0.0%	×	0.1%	×
Patient main language	0.1%	✓	0.1%	✓	0.1%	×	0.2%	×
Patient usual residence	0.9%	✓	0.8%	✓	1.0%	✓	6.5%	✓
Source of referral	1.5%	✓	2.2%	✓	4.9%	✓	10.7%	✓
Care currently received	21.0%	✓	16.9%	✓	24.9%	✓	2.8%	✓
Location of hospital	0.0%	×	0.1%	✓	0.8%	✓	5.7%	✓

Table 14 shows that for the survey population, the most important variables in explaining the variance in the proportion recommended for another type of care are care currently received (21.0%) and length of stay (16.5%). As expected, given the most of the survey population is contained in the first two subgroups, these variables remain the most important for the short length of stay subgroup and care currently received remains the most important for the middle length of stay subgroup (between one and four months). For the long stay subgroup (less than 7% of the survey population) care currently received becomes less relevant and the State and ARIA of patient residence become the most important variables.

Table 15: Significant variables in the multivariate analysis across population subgroups

Independent variable	Survey Population	Less than four weeks	Between one and four months	Greater than four months
Top ten admission diagnosis	✓	✓	✓	N/A
Length of Stay	✓	✓	×	✓
Patient age	✓	✓	×	N/A
Patient residence – State	✓	✓	✓	✓
Patient residence – ARIA	✓	✓	✓	✓
Patient gender	N/A	✓	N/A	✓
Indigenous status	×	×	N/A	N/A
Patient main language	✓	✓	N/A	N/A
Patient usual residence	✓	✓	✓	×
Source of referral	✓	✓	✓	✓
Care currently received	✓	✓	✓	✓
Location of hospital	N/A	×	×	×

N/A – means the variable was not used in the multivariate analysis due to it being insignificant in the univariate analysis

Table 15 summarises the results for the multivariate analysis showing that there is little change in the significant (in terms of predicting the likelihood of being recommended for another form of care) variables across the subgroups. As might be expected the significant variables are effectively identical for the whole survey population and the short stay subgroup (it contains nearly 75% of the data). For the longer stay subgroups most variables remain significant in the multivariate analysis although patient age drops out for both groups and patient usual residence drops out for the longest length of stay subgroup.

The multivariate analysis also demonstrated that as the length of stay increases it is possible to predict a very significant amount of the variance in the proportion recommended for another type of care (from 25.5% of the variance for the short stay subgroup to 50.4% of the variance for the long stay subgroup).

3

Analysis using Length of Stay as Dependent Variable

This Chapter changes the basis of the statistical analysis completely so as to use the accumulated length of stay (at the time of the part 1 census) as the dependent variable. That is rather than using length of stay to attempt to predict the probability that a patient will be recommended for another type of care, the fact that a patient was recommended for another type of care (along with other patient characteristics as collected through questions 1 to 10 on the survey form) is used to attempt to predict the length of stay.

The linear nature this multivariate analysis is that extreme values have a large impact on the results. For this application there were, across a large number of hospitals, patients with accumulated lengths of stay of one year or more. To eliminate the distortion in the statistical analysis caused by these patients, it was decided that any patient with a length of stay over one year (1,326 records or 8.2% of those surveyed) would be excluded from analysis. Table 16 shows the numbers of records remaining for the statistical analysis using accumulated length of stay as the dependent variable.

Table 16: Number of records used in the analysis

Total records where:	Number of Records	% Records Subgroup	% Records Survey Population
Length of stay is < = 365 days	15,115		
Another form of care is considered more appropriate (Yes to Q11a)	3,163	20.9	19.1
Another form of care has been recommended (Yes to Q12a)	2,352	15.6	14.1

Review of Table 16 demonstrates that the proportion of patients where another form of care was considered more appropriate (20.9%) and the proportion of patients for whom another form of care was recommended on census night (15.6%) were slightly higher for the length of stay less than 365 days (a year) subgroup than for the survey population taken as a whole (19.1% and 14.1% respectively). This observation is consistent with the fact that the proportion of patients recommended for another type of care decreases once length of stay exceeds six months (see Figure 29 in main report). The balance of this analysis examines the characteristics of the population to see if there are differences in the variables that predict a patient's length of stay.

3.1 UNIVARIATE ANALYSIS

In this section each of the potential independent variables are examined individually. With the individual analysis of each of the variables a table is presented containing the number of patients in the category, a prediction of the average length of stay, the p value for the category and R squared for the variable.

3.1.1 Analysis by admission diagnosis

Consistent with the previous analysis, it was decided to create a binary variable indicating whether or not a patient had a diagnosis in the top ten by volume. Table 17 presents average length of stay for the two categories.

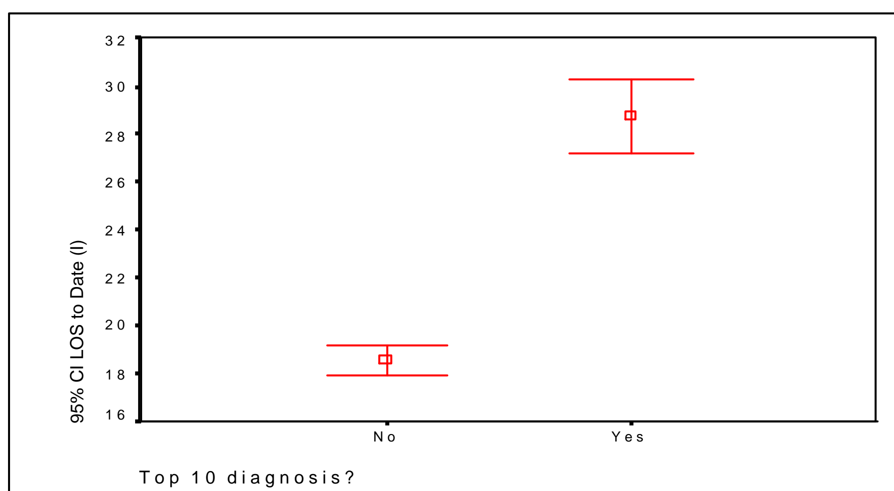
Table 17: Distribution and statistics of patients by admission diagnosis (top ten)

Top 10 diagnosis (Reference = No)	N	B	p value	R squared
Not a Top 10 Diagnosis (Constant)	*11,208*	*18.556*	*0.000*	
Top 10 Diagnosis	3,907	10.203	0.000	
Total	***15,115***			***1.36%***

In Table 17 the 'B' column is additive so that to calculate the average length of stay for a category the B value for that category is added to the Constant's B value. For example, in this model the constant term (in this case patients who do not have a Top 10 Diagnosis) has an average length of stay of 18.556 days, whereas those patients who did have a top ten diagnosis have an average length of stay of 18.556 + 10.203, or 28.759 days. The regression analysis shows that the top ten diagnosis variable accounts for 1.36% of the variance in length of stay.

Figure 1 shows that the confidence intervals for the mean length of stay of the two patient groups do not overlap, and the regression analysis confirms the statistical significance of this variable (p = 0.000).

Figure 1: Average length of stay of patients by admission diagnosis (top ten)



3.1.2 *Analysis by patient age*

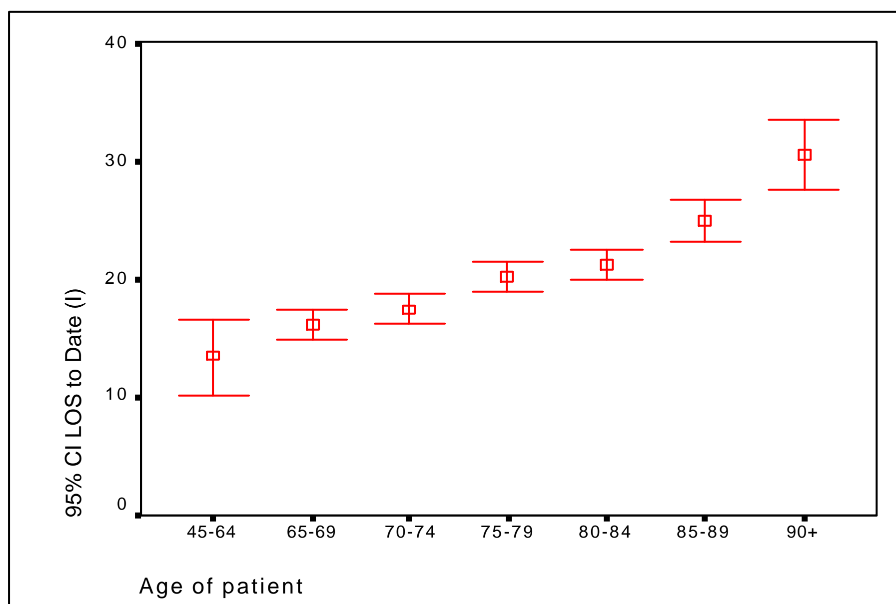
Respondents were asked to specify the age of the patient in years. Age groups of less than 65 years related only to the indigenous patients and due to low numbers they were consolidated into one age group 45-64. Table 18 presents the univariate analysis of length of stay by age group.

Table 18: Distribution and statistics of patients by age group

Age (Reference = 65-69 yr olds)	N	B	p value	R squared
65-69 (Constant)	*1,830*	*16.241*	*0.000*	
45-64	217	-2.746	0.343	
70-74	2,731	1.266	0.281	
75-79	3,203	4.047	0.000	
80-84	3,095	5.047	0.000	
85-89	2,529	8.763	0.000	
90+	1,431	14.355	0.000	
Unanswered	79			
Total	***15,115***			***1.18%***

Table 18 demonstrates that the average length of stay of patients increases continuously with age from 45 years onwards. The means for all categories apart from 45-64 and 70-74 are considered to be statistically significantly different from the reference category. Figure 2 presents the 95% confidence intervals for all age groups, and highlights the existence of a positive, linear relationship between age and the amount of time a patient spends in hospital.

Figure 2: Average lengths of stay of patients by age group



A number of the 95% confidence intervals do not overlap, and the logistic regression analysis reveals that this relationship is statistically significant (p = .000). The logistic regression model using age as the predictor accounts for 1.18% of the variance in the amount of time spent in hospital.

3.1.3 Analysis by patient residence

Respondents were asked to specify the postcode of the patient's residence, as part of the data processing work, postcode was mapped to both State of residence and ARIA (Accessibility and Remoteness Index of Australia) of residence. These derived variables were analysed separately. Table 19 presents the data by State of residence.

Table 19: Distribution and statistics of patients by State of residence

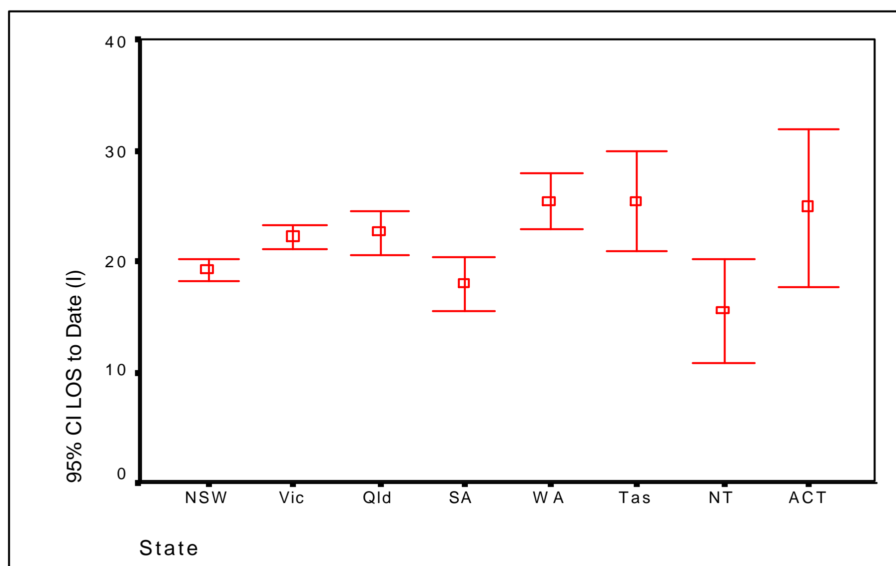
State (Reference = NSW)	N	B	p value	R squared
New South Wales (Constant)	*5,567*	*19.270*	*0.000*	
Victoria	4,203	2.930	0.000	
Queensland	2,174	3.361	0.001	
South Australia	1,124	-1.311	0.303	
Western Australia	1,319	6.164	0.000	
Tasmania	333	6.196	0.004	
Northern Territory	92	-3.746	0.373	
ACT	119	5.582	0.121	
Unanswered	184			
Total	***15,115***			***0.34%***

Table 19 shows some variability in the average length of stay by state of residence. It also shows that the regression analysis predicts that state of residence alone accounts for only 0.34% of the variance in the accumulated length of stay. The p values show that the lengths

of stay in the States of Victoria (longer), Queensland (longer), Western Australia (longer) and Tasmania (longer) are statistically significantly different to New South Wales.

In Figure 3 it can be seen that of the larger states (ie. ignoring Tasmania, the Northern Territory and the Australian Capital Territory which both had particularly large variances), the average length of stay seems to be much higher in Western Australia than in New South Wales or Victoria. The graph also suggests that these differences might be statistically significant due to the 95% confidence intervals for the proportions not overlapping for a number of states. The regression analysis confirms that state of residence is a significant variable (p = .000).

Figure 3: Average length of stay of patients by State of residence



Another way of examining the impact of patient residence on the proportion recommended for another type of care is to use ARIA. Table 20 demonstrates the somewhat surprising result that patients from moderately accessible and remote locations have the highest average length of stay (36.467 and 36.663 days respectively).

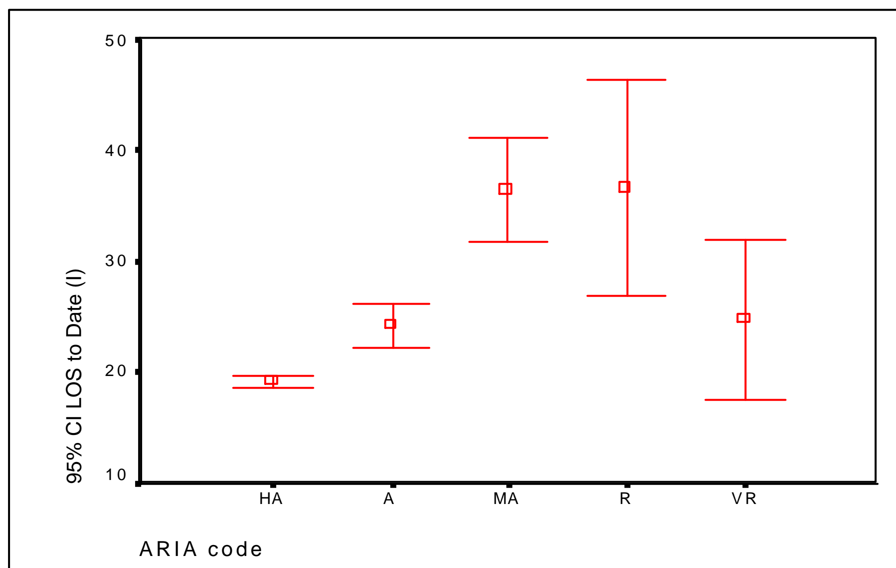
Table 20: Distribution and statistics of patients by ARIA of residence

ARIA (Reference = Highly Accessible)	N	B	p value	R squared
Highly Accessible (Constant)	*11,097*	*19.009*	*0.000*	
Accessible	2,378	5.106	0.000	
Moderately accessible	849	17.458	0.000	
Remote	235	17.654	0.000	
Very remote	218	5.729	0.032	
Unknown	338			
Total	***15,115***			***1.15%***

Table 20 shows that patients in all categories of ARIA have an average length of stay that is longer than, and statistically significantly different from, the constant term (patients residing in Highly Accessible locations). The regression analysis finds that overall ARIA of residence is a statistically significant predictor variable of length of stay (p = .000). Table 20 also presents the regression analysis result for ARIA of residence showing that it accounts for 1.15% of the variance in average of length of stay.

Figure 4 presents the average length of stay for each ARIA category with the associated confidence interval.

Figure 4: Average length of stay of patients by ARIA of residence



3.1.4 Analysis by patient gender

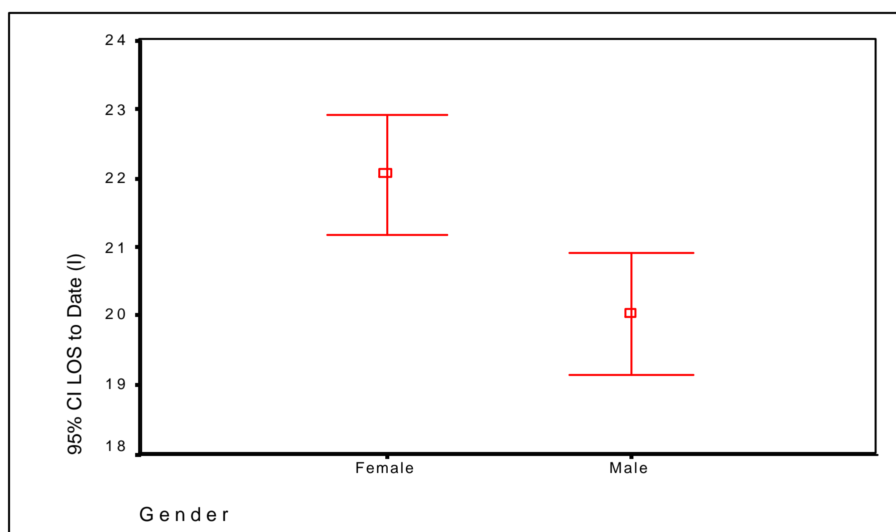
Table 21 presents the average length of stay by the patient's gender showing that females have a longer average length of stay. The regression analysis however shows that patient gender accounts for only 0.06% of the variance in the accumulated length of stay.

Table 21: Distribution and statistics of patients by gender

Gender (Reference = Male)	N	B	p value	R squared
Male (Constant)	*6,695*	*20.033*	*0.000*	
Female	8,270	2.020	0.002	
Unanswered	150			
Total	***15,115***			***0.06%***

Figure 5 shows that the 95% confidence intervals for the average length of stay of males and females do not overlap and the regression results confirm that the difference is statistically significant (p = .002).

Figure 5: Average length of stay of patients by gender



3.1.5 Analysis by patient indigenous status

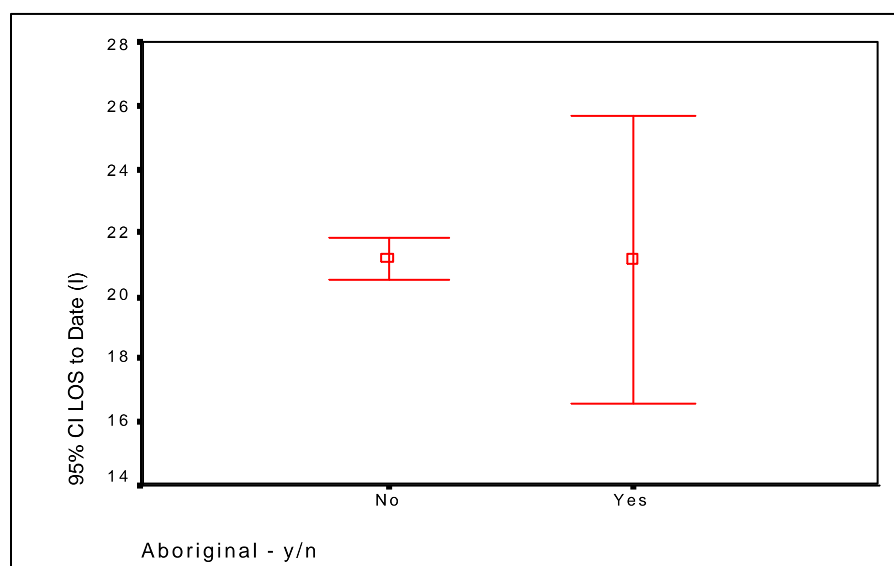
For the purposes of the statistical analysis a binary variable was created that grouped patients into indigenous and non-indigenous origin. Table 22 presents the average length of stay for each indigenous status category.

Table 22: Distribution and statistics of patients by indigenous status

Indigenous Status (Reference = No)	N	B	p value	R squared
Not Indigenous (Constant)	*13,332*	*21.185*	*0.000*	
Indigenous	378	-0.060	0.977	
Not Stated/Unanswered	1,405			
Total	***15,115***			***0.0%***

Table 22 highlights that the difference in average length of stay between indigenous and non-indigenous patients is much less than one day with the p value showing that the two numbers are not statistically significantly different (p = 0.977). Figure 6 illustrates the result.

Figure 6: Average length of stay of patients by indigenous status



Review of Figure 6 shows that not only do the two confidence intervals overlap but that the non-indigenous interval is completely contained within the indigenous one. Not surprisingly, the regression analysis also shows that indigenous status accounts for 0.00% of the variance in the average length of stay.

3.1.6 Analysis by main language spoken at home

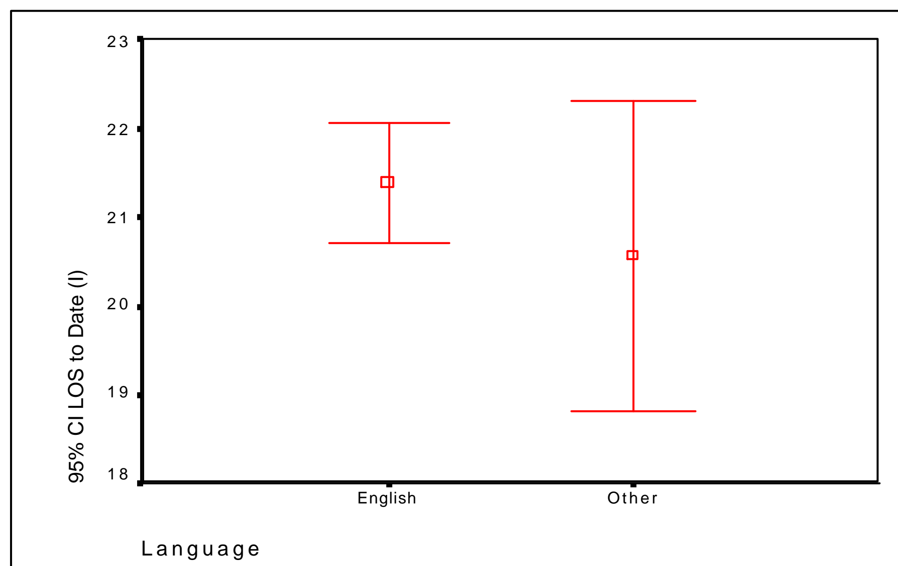
Table 23 presents the average length of stay for the main language spoken at home, again showing less than one days difference in the categories.

Table 23: Distribution and statistics of patients by main language spoken at home

Language (Reference = English)	N	B	p value	R squared
English speaking (Constant)	*13,373*	*21.386*	*0.000*	
Non-English speaking	1,330	-0.827	0.464	
Not known/Unanswered	412			
Total	***15,115***			***0.0%***

Figure 7 presents the 95% confidence intervals for length of stay by main language showing, as with indigenous status, that the 95% confidence interval for one category is wholly contained within the other. The regression analysis reveals, as expected that there is no statistically significant difference between the two average lengths of stay (p = .464).

Figure 7: Average lengths of stay patients by main language



Again not surprisingly, the regression analysis shows that main language spoken at home accounts for 0.00% of the variance in average length of stay.

3.1.7 Analysis by usual place of residence

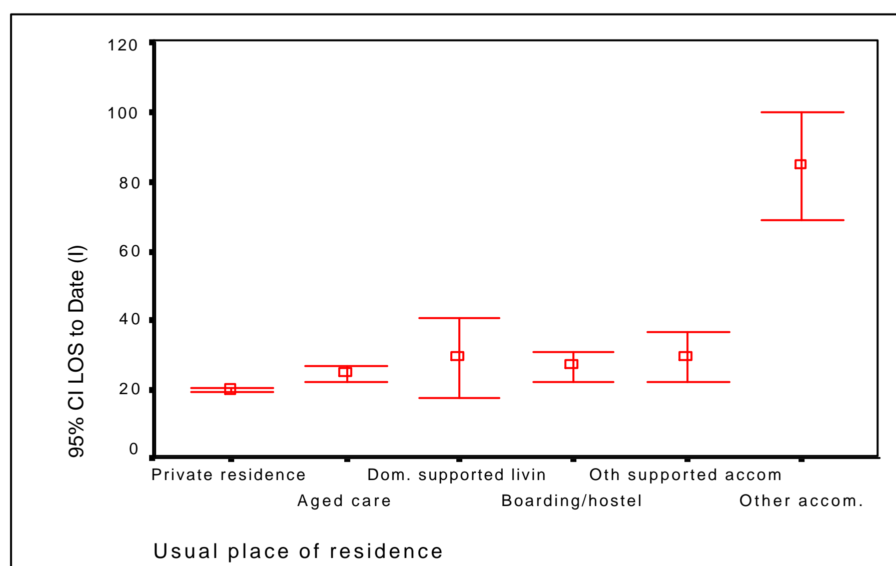
Respondents were asked to specify the patient's usual place of residence prior to admission. Some of the lower volume categories have been combined for the purposes of analysis. Table 24 presents average length of stay by the patient's usual place of residence. It shows that the average length of stay is longer for all patients who do not reside in a private dwelling, with those residing in accommodation classified as other predicted to have an average length of stay 65.060 days greater than those in a private residence.

Table 24: Distribution and statistics of patients by usual place of residence

Place of residence (Reference = Private Residence)	N	B	p value	R squared
Private Residence (Constant)	*12,518*	*19.633*	*0.000*	
Aged care	1,737	4.673	0.000	
Dom. supported living	77	9.340	0.031	
Boarding/hostel	358	6.875	0.001	
Other supported accom	106	9.480	0.013	
Other accommodation	222	65.060	0.000	
Unknown/Unanswered	97			
Total	***15,115***			***3.42%***

Figure 8 presents the 95% confidence intervals for length of stay by the patient's usual place of residence. It shows that the confidence intervals for all but one of the categories overlap, with other accommodation sitting above the rest with the largest variance. As a result, as expected the regression analysis confirms that place has a statistically significant impact on average length of stay (p = .000).

Figure 8: Length of stay of patients by usual place of residence



The regression analysis also shows that usual place of residence accounts for 3.42% of the variance in the patient's average length of stay in hospital.

3.1.8 Analysis by source of referral

Table 25 shows that there is considerable variation in the average length of stay for patients by source of referral categories.

Table 25: Distribution and statistics of patients by source of referral

Source of referral (Reference = Medical Practitioner)	N	B	p value	R squared
Medical Practitioner (Constant)	*3,063*	*22.156*	*0.000*	
Emergency department	6,494	-5.961	0.000	
Community health	316	9.720	0.000	
Outpatients	710	-10.192	0.000	
Other hosp	3,026	6.694	0.000	
Aged care	459	10.963	0.000	
Other agency	123	3.670	0.307	
Extended care	118	13.462	0.000	
Relative	258	10.189	0.000	
Self	178	-12.235	0.000	
Other	206	6.357	0.043	
Unknown/Unanswered	164			
Total	***15,115***			***2.71%***

Review of the data shows that those patients who referred themselves for care had the shortest average length of stay (9.921 days), whereas those referred by extended care had the longest average length of stay (35.618 days). The p values show that all the differences in average length of stay from the constant (referral by medical practitioner) are statistically significant, with the exception of referral from 'Other agency'.

Figure 9: Length of stay of patients by source of referral

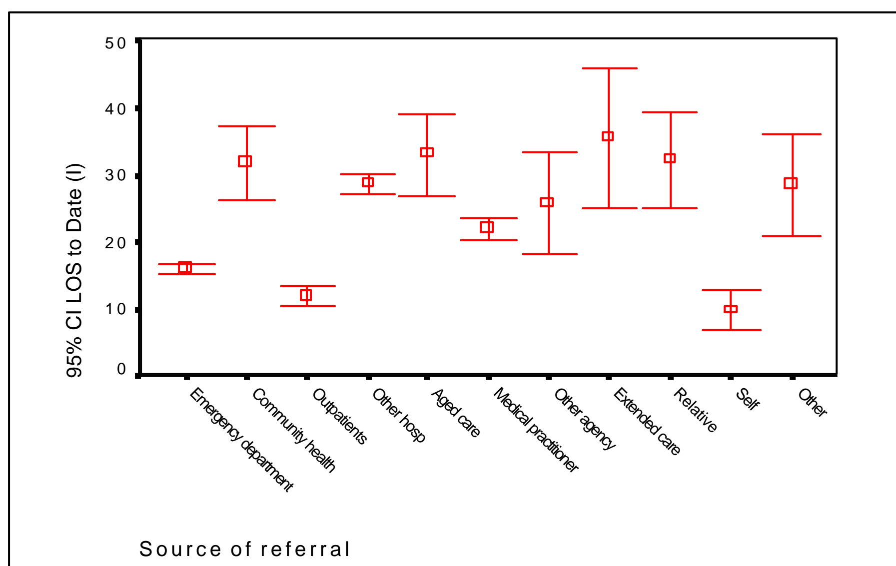


Figure 9 shows that a number of the 95% confidence intervals for source of referral categories do not overlap. The regression analysis results confirms that source of referral is a statistically significant (p = 0.000) predictor of length of stay and that it accounts for 2.71% of the variance.

3.1.9 Analysis by care currently received

Table 26 presents the average length of stay for each type of care being received by the patient at the time of the first census.

Table 26: Distribution and statistics of patients by care being received

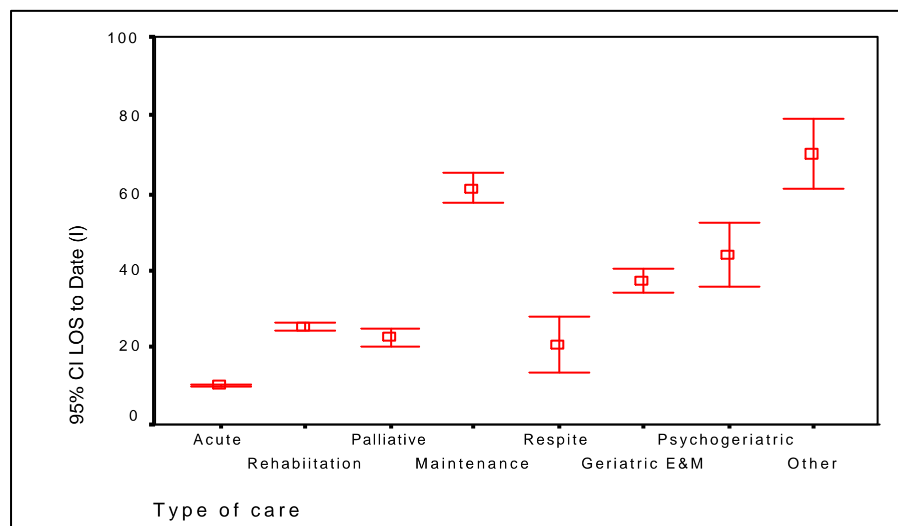
Care currently received (Reference = Acute)	N	B	p value	R squared
Acute (Constant)	*9,165*	*10.122*	*0.000*	
Rehabilitation	2,075	15.282	0.000	
Palliative	632	12.369	0.000	
Maintenance	1,530	51.230	0.000	
Respite	136	10.613	0.000	
GEM	1,030	27.512	0.000	
Psychogeriatric	204	34.287	0.000	
Other	224	60.110	0.000	
Unanswered	119			
Total	***15,115***			***20.4%***

Table 26 highlights very significant differences in the average length of stays across the care currently received categories. For a patient receiving acute care, their average accumulated length of stay at the time of the first census was 10.122 days. At the other extreme (excluding the 'Other' category) the average accumulated length of stay for a patient receiving maintenance care at the time of the first census was 61.352 days for maintenance. For a patient receiving rehabilitation or GEM, their average accumulated length of stay at the time of the first census was 25.404 or 37.634 days respectively. The p values show that the average accumulated length of stay for each category is statistically significantly different from acute care.

Figure 10 presents the 95% confidence intervals for the average accumulated length of stay for the care currently received categories. Review of the graph suggests that care currently

received has a statistically significant impact on length of stay as very few of the 95% confidence intervals overlap.

Figure 10: Average length of stay of patients by care currently received



The regression analysis confirms that care currently received is a statistically significant variable (p = .000). In fact care currently received is the most important univariate predictor variable, accounting for 20.4% of the variance in the patient's average length of stay.

3.1.10 Analysis by location of hospital

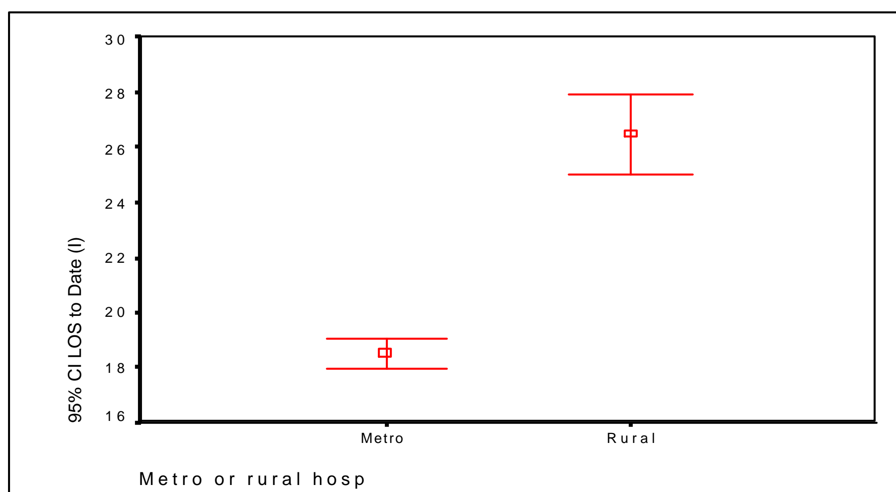
Table 27 presents the average length of stay for metropolitan and rural hospital locations. It shows that patients in rural hospital had an average length of stay 7.977 days longer than those in metropolitan hospitals (18.491 days compared with 26.468 days).

Table 27: Distribution and statistics of patients by location of hospital

Location of hospital (Reference = Metropolitan)	N	B	p value	R squared
Metropolitan Hospital (Constant)	*10,062*	*18.491*	*0.000*	
Rural Hospital	5,053	7.977	0.000	
Total	***15,115***			***1.0%***

Figure 11 presents the 95% confidence intervals for the average accumulated length of stay by location of hospital.

Figure 11: Average length of stay of patients by location of hospital



Review of Figure 11 suggests that the location of hospital variable is statistically significant as the confidence intervals for each category do not overlap. This observation is confirmed by the regression analysis (p = .000). The regression analysis also shows that location of hospital accounts for 0.97% of the variance in the average length of stay of the patient.

3.1.11 Analysis by another form of care recommended

Table 28 presents the average length of stay for the two responses to the question 12a as to whether another form of had been recommended on census night.

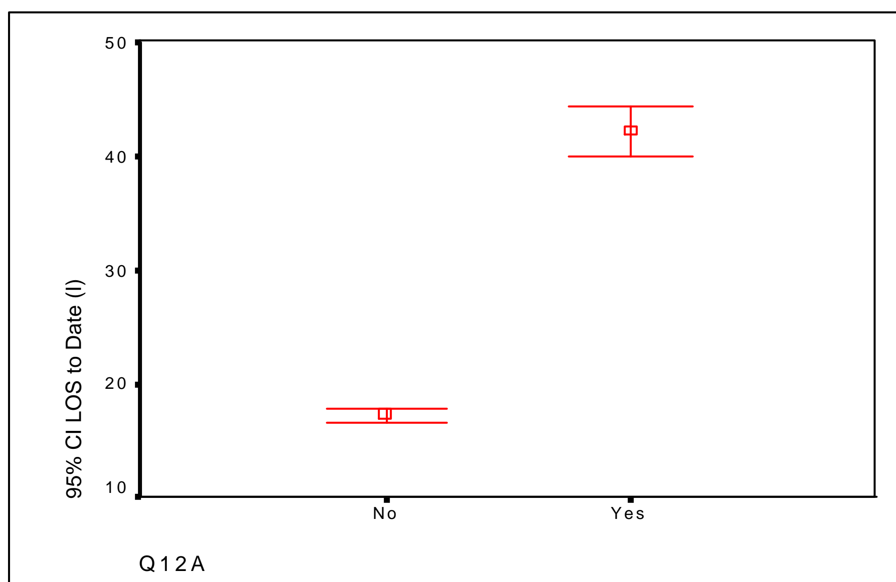
Table 28: Distribution and statistics of patients by another form of care recommended

Q12a (Reference = Yes)	N	B	p value	R squared
Another form of care recommended (Constant)	*2,352*	*42.145*	*0.000*	
No other care recommended	12,475	-24.905	0.000	
Unanswered	288			
Total	***15,115***			***5.6%***

Table 28 shows that patients who had been recommended for another form of care had an accumulated length of stay that was nearly 25 days (24.905 days) longer than those who had no recommendation (42.145 days compared with 17.240 days). This finding is consistent with the statistical analysis that used Q12a as the dependent variable and found that length of stay was an important predictor of the likelihood that a patient would be recommended for another form of care.

Figure 12 presents the 95% confidence intervals for the accumulated average length of stay for whether or not another form of care has been recommended.

Figure 12: Average length of stay of patients with another form of care recommended



Review of Figure 12 clearly suggests that whether or not another form of care has been recommended is statistically significant due to the 95% confidence intervals not overlapping. This observation is confirmed by the regression analysis (p = .000). The regression analysis also shows that the variable indicating whether or not a recommendation for another type of care has been made care accounts for 5.65% of the variance in the patient's average length of stay (the fifth most important variable).

3.1.12 Analysis by type of care recommended

For the 2,352 patients where another type of care had been recommended ('yes' at Q12a), survey respondents were asked to specify the type of care (question 12c). Due to the low volumes in some categories, the responses were consolidated into five categories for the purposes of statistical analysis. Table 29 presents the average length of stay for recommended type of care category.

Table 29: Distribution and statistics of patients by type of care recommended

Q12c (Reference = Facility Based Only – Residential)	N	B	p value	R squared
Facility based only – RAC (Constant)	*1,427*	*53.314*	*0.000*	
Facility based only – other	642	-29.318	0.000	
Comm/home based only	94	-33.763	0.000	
Both facility & comm/home based	128	-33.903	0.000	
NA/Not stated	61	-36.244	0.000	
Total	***2,352***			***8.30%***

Table 29 shows that patients where the recommendation was only for residential aged care had an average accumulated length of stay of 53.314 days. All other categories had a length of stay that is at least 29.318 days shorter than for residential aged care.

Figure 13 presents the 95% confidence intervals for the average accumulated length of stay by type of care recommended.

Figure 13: Average length of stay of patients by type of care recommended

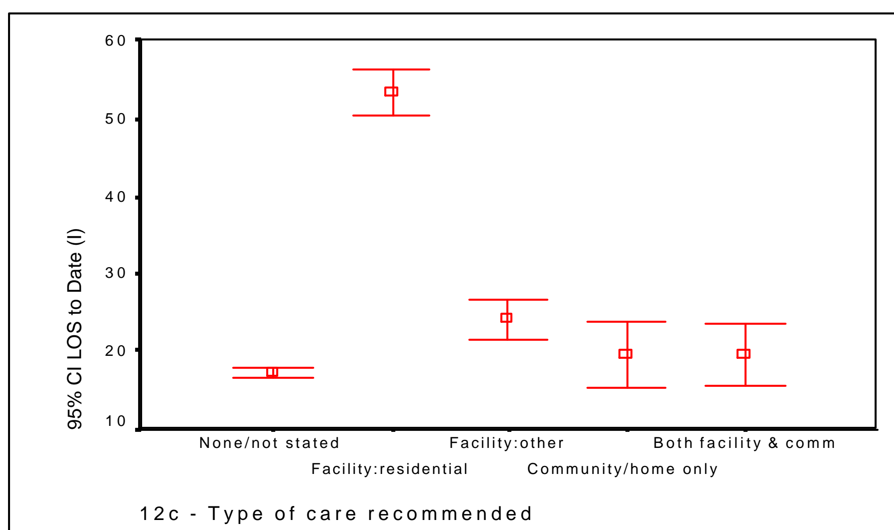


Figure 13 suggests that the type of care recommended is statistically significant as the confidence interval around the accumulated length of stay for residential aged care does not overlap with the confidence interval for any other type of care. This observation is confirmed by the regression analysis (p = .000). The regression analysis also shows that the type of care recommended accounts for 8.30% of the variance in the average length of stay (the fourth most important variable).

3.1.13 Analysis by reason patient has been unable to access appropriate care

For the 3,163 patients where another type of care had been considered more appropriate ('yes' at Q11a), respondents were asked to specify the reason that the patient was not receiving the more appropriate care (question 13). Table 30 shows the average length of stay for each reason.

Table 30: Distribution and statistics of patients by reason patient has been unable to access appropriate care

Q13 (Reference = Waiting For Assessment/Reassessment)	N	B	p value	R squared
Waiting for assessment/reassessment (Constant)	*572*	*18.886*	*0.000*	
Waiting for service - this facility	325	15.816	0.000	
Waiting for service - other facility	1,453	36.854	0.000	
Community services to be arranged	71	0.506	0.908	
Awaiting family decision	212	7.331	0.013	
Other	217	18.678	0.000	
Not stated	313	-2.573	0.096	
Total	***3,163***			***9.9%***

Table 30 shows that patients waiting for services in another facility had the longest length of stay (55.740 days). Excluding patients for whom the reason was not stated, patients awaiting an assessment/reassessment had the shortest accumulated average length of stay at 18.886 days. Patients in all other reason categories had a statistically significant longer length of stay except for patients waiting for community services to be arranged.

Figure 14 presents the 95% confidence intervals for the average accumulated length of stay for each of the reason unable to access care categories.

Figure 14: Average length of stay of patients by reason patient has been unable to access appropriate care

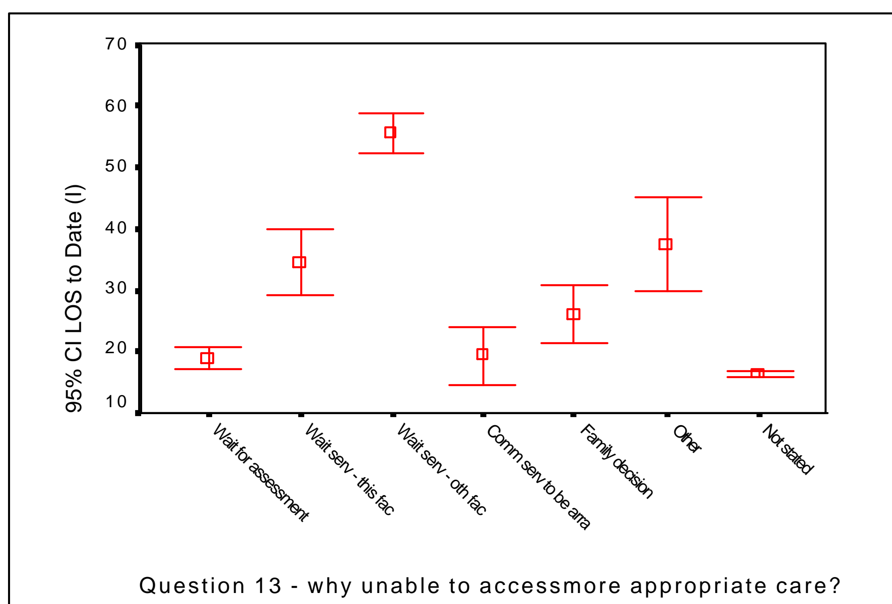


Figure 14 again suggests that the reason a patient has been unable to access more appropriate care is statistically significant due to the 95% confidence intervals for a number of the categories not overlapping. This observation is confirmed by the regression analysis (p = .000). The regression analysis also shows that reason why another form of care has not been accessed accounts for 9.87% of the variance in the patient's average length of stay (the third most important variable).

3.1.14 Analysis by ACAT assessment

For the 3,163 patients where another form of care was considered more appropriate ('yes at Q11a), respondents were asked to specify whether or not the patient had had an ACAT assessment. Table 31 presents the average length of stay for each category of the response to question 14a.

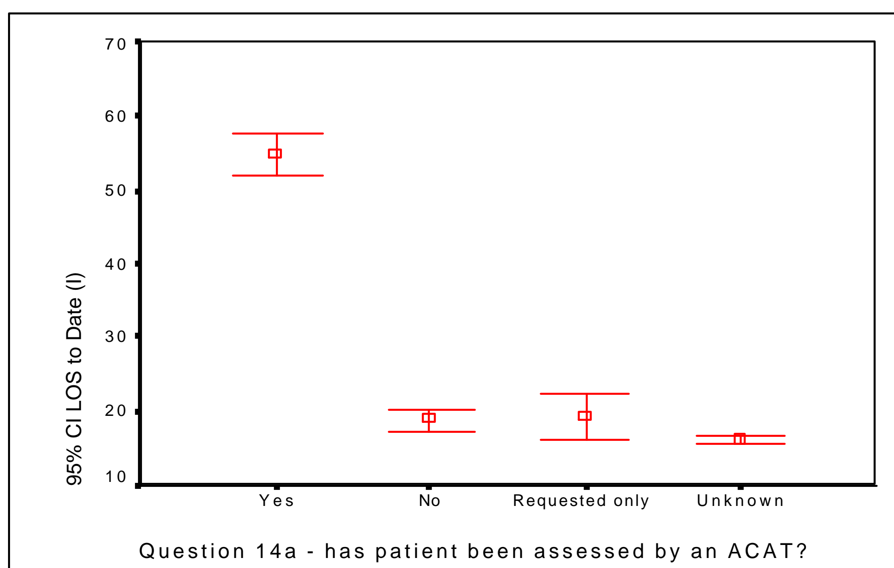
Table 31: Distribution and statistics of patients by ACAT assessment

Q14a (Reference = Yes)	N	B	p value	R squared
ACAT assessed(Constant)	*1,796*	*54.909*	*0.000*	
No ACAT assessment	875	-36.060	0.000	
Requested but not yet undertaken	146	-35.650	0.000	
Unknown	53	-38.676	0.000	
Unanswered	293			
Total	***3,163***			***10.8%***

Table 31 shows that a patient who has had an ACAT assessment had an accumulated average length of stay of 54.909 days, with the next highest category (requested but not yet undertaken) 35.650 days less (19.259 days). These results are consistent with previous analysis, which showed that a patient waiting for residential aged care had an average length of stay of 53.314 days and also those waiting for residential aged care are generally waiting for the care to be delivered in another facility, which had an average length of stay of 55.740 days. These two lengths of stay are very similar to the length of stay for patients who had already been assessed by an ACAT (54.909 days), as an ACAT assessment is generally only done when a patient is felt to need residential age care.

Figure 15 presents the 95% confidence intervals for the accumulated average length of stay for each category of ACAT assessment status.

Figure 15: Average length of stay of patients by ACAT assessment status



Review of Figure 15 suggests that the patient's ACAT assessment status is statistically significant as shown by the large gap in the confidence intervals between the patients that had an ACAT assessment and the others. This observation is confirmed by the regression analysis (p = .000). The regression analysis also shows that ACAT assessment status accounts for 10.85% of the variance in the amount of time the patient spends in hospital (the second most important variable).

3.1.15 Univariate analysis – summary

By examining each of the potential independent variables individually, it has been determined that at least one category in each variable produces a statistically significant difference in the accumulated average length of stay for all variables except patient

indigenous status and patient main language. However, due to the small numbers in some of the categories and the wide variation in other categories the majority of the variables account for a fairly small amount of the variance in the proportion of patients recommended for another type of care. Table 32 shows that the five most important variables (in terms of explaining the variance in accumulated average length of stay) are care currently received, whether an ACAT assessment has been undertaken, reason for not receiving the recommended care, type of care recommended and recommendation for another type of care.

Table 32: Univariate analysis summary of results – LOS as dependent variable

Independent variable	p value	Significance	R squared
Top ten admission diagnosis	0.000	Yes	1.36%
Patient age	0.000	Yes	1.18%
Patient residence – State	0.000	Yes	0.34%
Patient residence – ARIA	0.000	Yes	1.15%
Patient gender	0.002	Yes	0.06%
Indigenous status	0.997	No	0.00%
Patient main language	0.464	No	0.00%
Patient usual residence	0.000	Yes	3.42%
Source of referral	0.000	Yes	2.71%
Care currently received	0.000	Yes	20.37%
Location of hospital	0.000	Yes	0.97%
Another type of care recommended	0.000	Yes	5.65%
Care recommended	0.000	Yes	8.30%
Reason not in recommended care	0.000	Yes	9.87%
ACAT assessment	0.000	Yes	10.85%

Not surprisingly, four of these variables were only collected for patients where another form of care was considered more appropriate and/or had been recommended. That is the patients that the clinical professionals believed should be receiving another form of care were the ones that had the longest accumulated average length of stay and the characteristics of the alternative form of care best account for the variance in the length of stay. The only characteristic of all patients that accounts for a significant proportion of the variance is the care currently received, with the patient’s usual residence and source of referral being of secondary importance.

3.2 MULTIVARIATE ANALYSIS

This section presents the multivariate analysis for the predictors of accumulated average length of stay. Consistent with previous analyses, the variables that were found not to be significant in the univariate analysis are not used in the multivariate analysis. Note that in order to avoid confounding the multivariate analysis and to allow direct comparison with the using Q12a as the independent variable, those variables that were only collected if there was a ‘yes’ response at Q12a are not included in the analysis. This decision allows the model to correctly predict the effect on length of stay of a ‘yes’ response at Q12a. The resultant multivariate model is presented in Table 33.

Table 33: Multivariate analysis summary of results – LOS as dependent variable

Variable	Reference Category	B	p value	R squared
Constant		10.301	0.000	
Age group (ref = 65-69 years)	45-64	-8.634	0.003	
	70-74	0.017	0.987	
	75-79	0.802	0.435	
	80-84	-0.792	0.449	
	85-89	0.861	0.436	
	90+	3.231	0.012	
ARIA (ref = HA)	A	2.946	0.003	
	MA	11.910	0.000	
	R	14.602	0.000	
	VR	7.667	0.005	
Gender (ref = male)	Female	0.042	0.942	
Top 10 (ref = no)	Yes	3.191	0.000	
Metro or rural hosp (ref = metro)	Rural	2.063	0.012	
Q12A (ref = yes)	No	-7.199	0.000	
Source of referral (ref = medical practitioner)	Emergency department	5.984	0.005	
	Community health	0.846	0.551	
	Outpatients	4.109	0.000	
	Other hosp	7.623	0.000	
	Aged care	-0.027	0.993	
	Other agency	3.759	0.000	
	Extended care	3.603	0.291	
	Relative	8.802	0.000	
	Self	-2.005	0.440	
	Other	4.223	0.139	
Usual place of residence (ref = private residence)	Aged care	0.867	0.386	
	Dom. Supported living	3.471	0.376	
	Boarding/hostel	-0.666	0.727	
	Other supported accom	-0.683	0.846	
	Other accom.	45.949	0.000	
Care currently received (ref = acute)	Rehabilitation	13.732	0.000	
	Palliative	11.578	0.000	
	Maintenance	43.255	0.000	
	Respite	3.394	0.258	
	Geriatric E&M	23.627	0.000	
	Psychogeriatric	32.309	0.000	
	Other	50.763	0.000	
State (ref = New South Wales)	Victoria	1.155	0.117	
	Queensland	2.689	0.003	
	South Australia	0.939	0.419	
	Western Australia	3.460	0.002	
	Tasmania	4.765	0.015	
	Northern Territory	-2.237	0.622	
	ACT	9.682	0.003	
				24.32%

The constant term in Table 33 represents the average length of stay for those patients with the reference category responses. This implies that the constant term refers to patients who are 65-69 years old, live in a private residence in a highly accessible area in New South Wales, are male, do not have a top ten diagnosis, are admitted to a metropolitan hospital, have been recommended for another form of care, were referred by a medical practitioner and are receiving acute care. The model then predicts that someone with these characteristics has an average length of stay of 10.301 days. In the same way as the univariate analysis to change a category all that is required is for the B value to be added onto the constant. This allows the user to predict the average length of stay for any combination of these categories.

Table 33 shows that overall the multivariate model accounts for 24.32% of the variance in the accumulated length of stay. The only variable that does not have any response category that remains statistically significant is gender ($p = .942$). All of the categories (except for 'Other Accommodation') become not statistically significant in the source of referral variable (there are other variables that better describe the effect of this variable). Also virtually all of the age group categories (except for 45-64 years and 90+ years) become not statistically significant. As might be expected all categories of care currently received (except for 'Respite') remain statistically significant, as do all of the categories for patient ARIA.

3.3 CONCLUSIONS

The multivariate analysis using length of stay as the dependent variable produces results that are consistent with the previous multivariate analysis which used the proportion of patients recommended for another type of care as the dependent variable. Care currently received emerges as the most important variable in the length of stay analysis as it did in the analysis which modelled the likelihood of being recommended for another form of care. As an example of this relationship, patients in acute care are less likely to be recommended for another form of care and they have a shorter accumulated length of stay than patients receiving any other type of care. At the other extreme, patients in maintenance care are the most likely to be recommended for another form of care and have the longest accumulated length of stay.

Also of note is the fact that a range of variables that were collected to describe the circumstances of a patient that had been recommended for another form of care (questions after 12a on the survey form) can predict relatively significant amounts of the patients' accumulated length of stay in hospital (type of care recommended, reason not in recommended care and ACAT assessment status). The significance of these variables is confirmed through the multivariate model, which predicts that a patient in hospital who has not been recommended for another form of care has an accumulated length of stay some seven days (7.199 days) shorter than a patient who has been recommended for another form of care.

APPENDIX A
PROJECT TEAM AND COMMITTEE MEMBERSHIP

Australian Health Ministers' Advisory Council Care of Older Australians Working Group*

Role	Person	Representing
Co-Chairpersons	Mr Alan Keith	Department of Health and Ageing
	Mr Shane Solomon	Department of Human Services – Victoria
	Mr Peter Broadhead (Former Co-chair)	Department of Health and Ageing
	Mr Andrew Stuart (Former Co-chair)	Department of Health and Ageing
Working Group members and support staff	Ms Jan Bennett	Department of Health and Ageing
	Ms Mary Bent	Department of Health – Tasmania
	Ms Jill Brown	Queensland Health
	Ms Tracey Campbell	Department of Health and Community Services – Northern Territory
	Ms Christine Canning	Department of Health and Ageing
	Ms Gloria Caruso	Department of Human Services – Victoria
	Mr Damien Conley	Department of Health and Community Services – Northern Territory
	Ms Yvette Costmeyer	Department of Health and Ageing
	Ms Alice Creelman	Department of Health and Ageing
	Dr David Cullen	Department of Health and Ageing
	Ms Christine Foran (Project 2 Task Group Chair)	NSW Department of Health
	Ms Libby Gallagher	NSW Department of Health
	Ms Virginia Hart	Department of Health and Ageing
	Ms Margaret Horne	Department of Health and Ageing
	Ms Catherine Katz	NSW Health Department
	Mr Rajan Martin	Department of Health and Ageing
	Ms Sue McKechnie	Health Department of Western Australia
	Mr Chris Overland	Department of Health – South Australia
	Ms Jantze Purton	NSW Health Department
	Ms Jo Root	Queensland Health
	Ms Jenny Upton	Department of Health and Community Services – Northern Territory
	Ms Lucelle Veneros	NSW Health Department
	Ms Michelle Willis	Queensland Health
	Ms Sharon Willcox	NSW Health Department
	Ms Elke Zimmermann	Department of Health and Ageing

* List includes staff that supported but were not formal members of the Working Group

Clinical Reference Group

Role	Person	Organisation
Chairperson	Prof Leon Flicker	University of Western Australia (WA)
CRG Members	Dr Michael Price (Deputy Chair)	Westmead Hospital and Community Health Services (NSW)
	Dr Valda Ahern	Cairns Base Hospital (Qld)
	Dr Gideon Caplan	The Prince of Wales Hospital (NSW)
	Dr Terry Finnegan	Royal North Shore Hospital (NSW)
	Ms Joan Geyle	Baptist Care Services (NSW)
	Ms Wendy Hubbard	Ballarat Health Services (Vic)
	Dr Brendan Kay	Jamieson Street Medical Clinic (Vic)
	Ms Deborah Law	Flinders Medical Centre (SA)
	Ms Margaret Murray	Royal Hobart Hospital (Tas)
	Dr Michael Murray	St George's Health Service (Vic)
	Prof Paddy Phillips	Flinders University (SA)
	Ms Barbara Potter	Surrey Hills (Vic)
	Dr Paul Varghese	Princess Alexandra Hospital (Qld)

Older Person Length of Stay Study Project Team

Role	Person	Firm
Project Director	Mr Joe Scuteri	***ACE*MA**
Project Consultants	Professor Gary Andrews	***ACE*MA**
	Mr Paul Zadow	***ACE*MA**
	Ms Lilian Lazarevic	***ACE*MA**
	Ms Krystyna Parrott	***ACE*MA**
	Mr Stuart Riley	***ACE*MA**
	Ms Angela Cook	***ACE*MA**
	Mrs Amber Cross (Admin)	***ACE*MA**
	Ms Jackie Lukehurst (Admin)	***ACE*MA**
Qualitative Research Team (Case Studies)	Dr Gay Greenwood (Chief Investigator)	B G Greenwood & Associates
	Ms Lorraine Broun	Curtin University – WA
	Ms Rose Chapman	Curtin University – WA
	Dr Ysanne Chapman	Flinders University – SA
	Dr Patricia Farrar	University of Technology Sydney – NSW
	Ms Sally Hudson	Flinders University – SA
	Ms Irene Ikafa	Curtin University – WA
	Ms Jill Mitchell	Flinders University – SA
Statistical Consultants	Dr Nigel Bean	AdStat Solutions
	Ms Susannah Lock	AdStat Solutions

APPENDIX B
LENGTH OF STAY UP TO FOUR WEEKS

Figure B1:Proportion of patients recommended for another type of care by length of stay

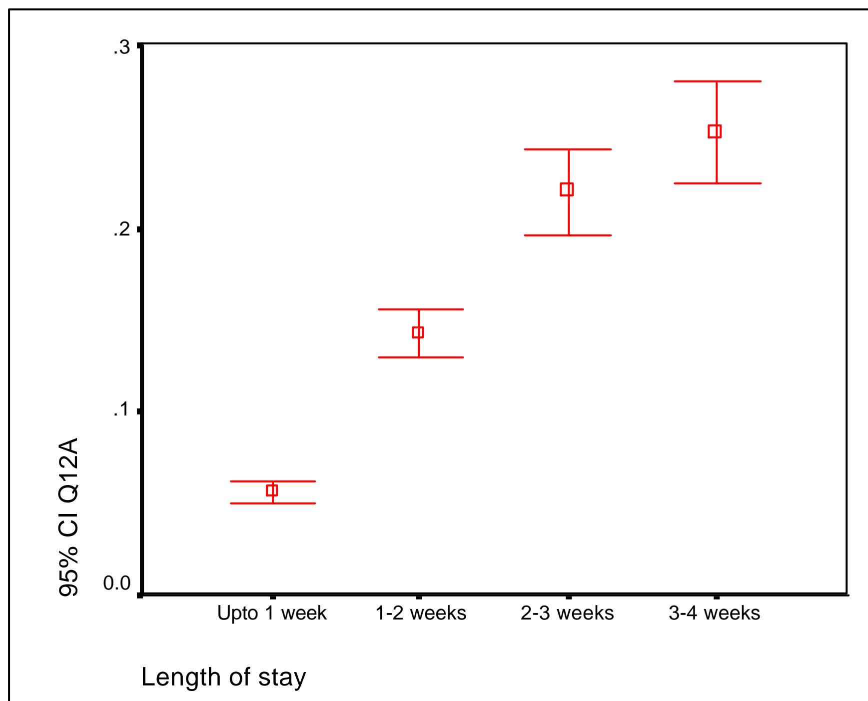


Figure B2: Proportion of patients recommended for another type of care by admission diagnosis (top ten)

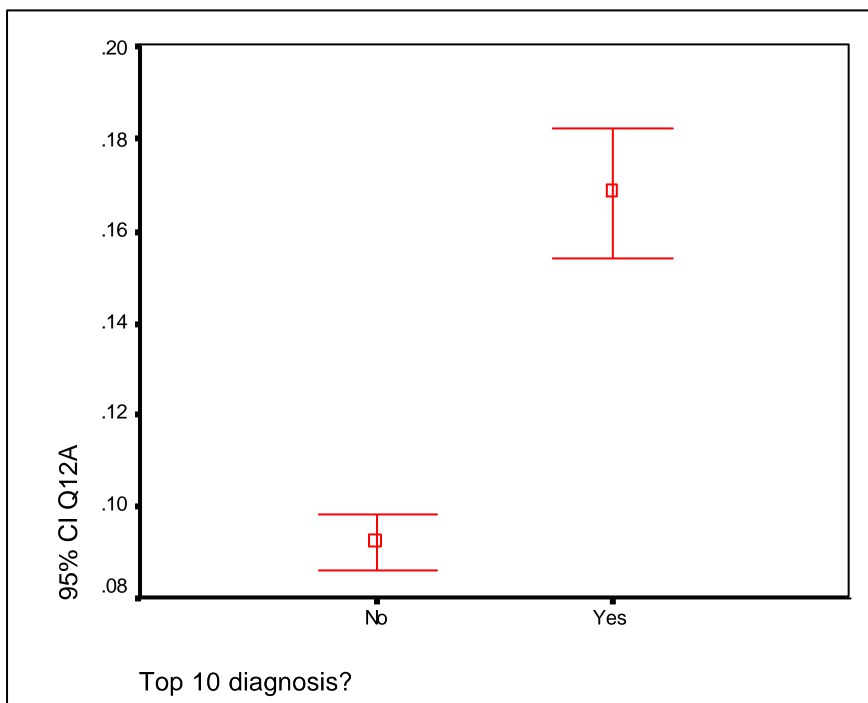


Figure B3: Proportion of patients recommended for another type of care by age group

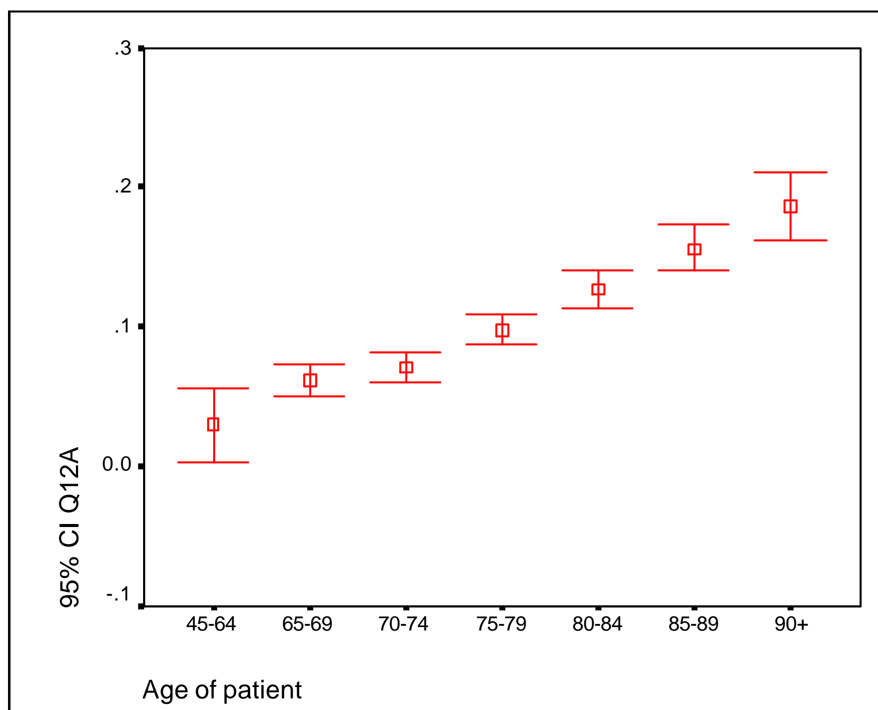


Figure B4: Proportion of patients recommended for another type of care by State

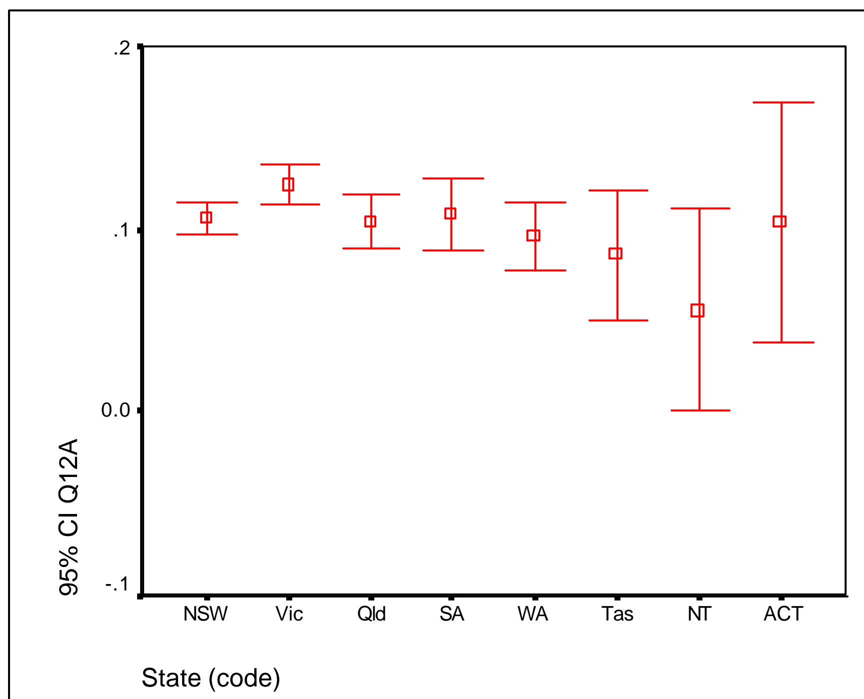


Figure B5: Proportion of patients recommended for another type of care by ARIA of residence

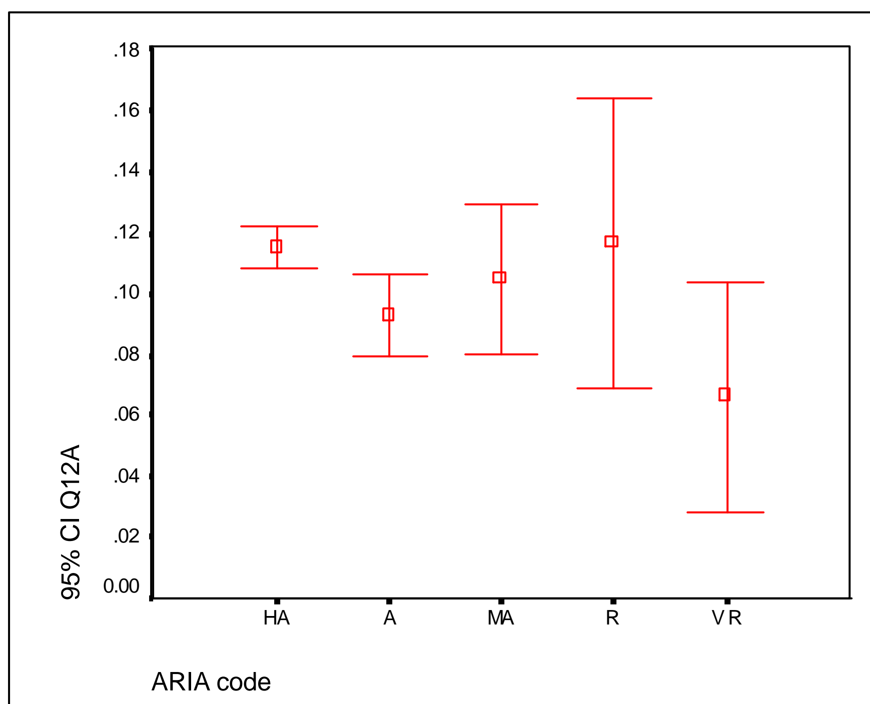


Figure B6: Proportion of patients recommended for another type of care by gender

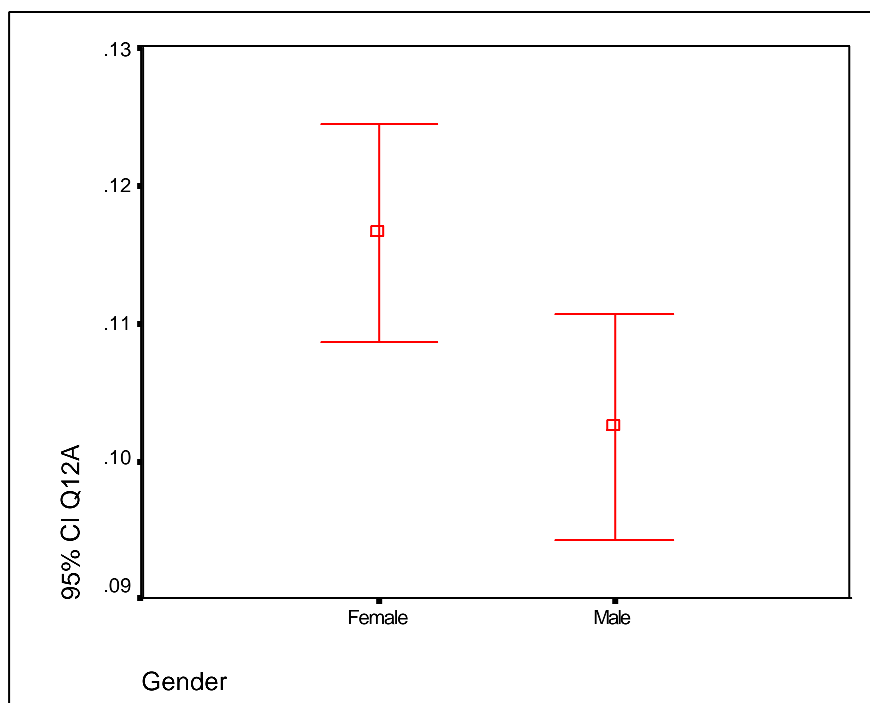


Figure B7: Proportion of patients recommended for another type of care by indigenous status

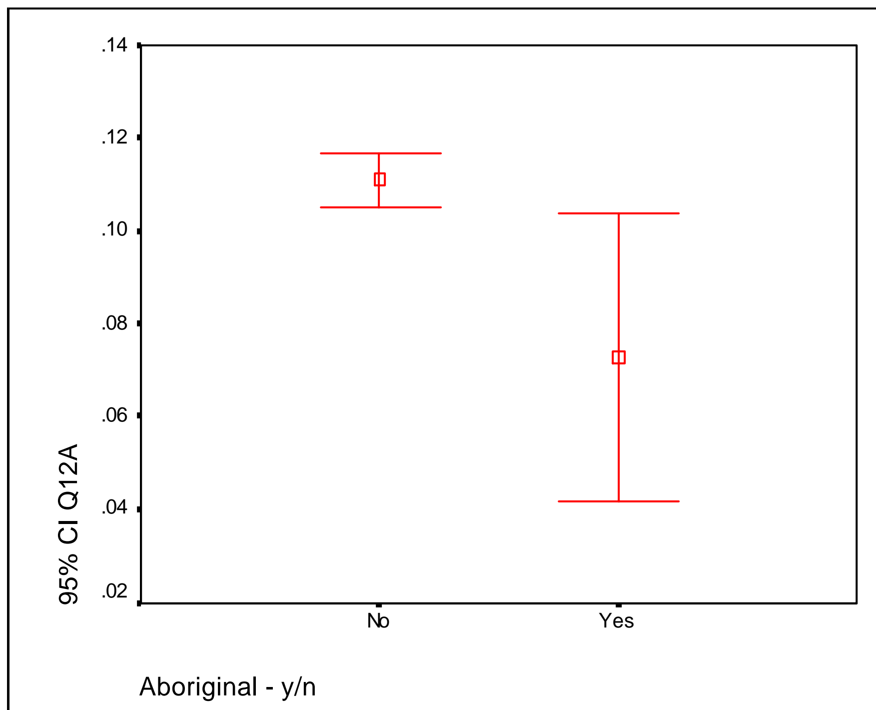


Figure B8: Proportion of patients recommended for another type of care by main language

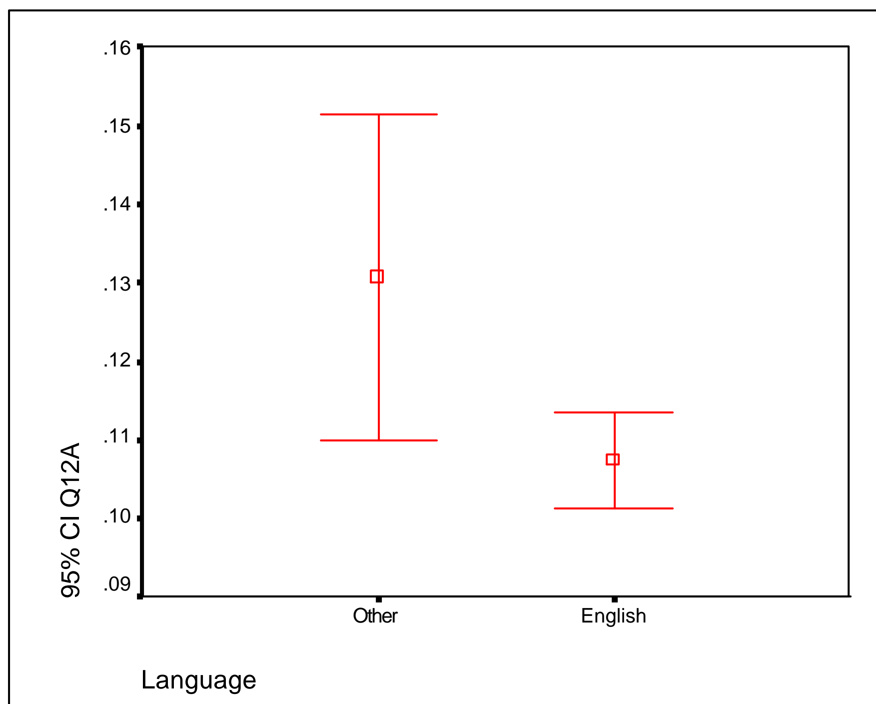


Figure B9: Proportion of patients recommended for another type of care by usual place of residence

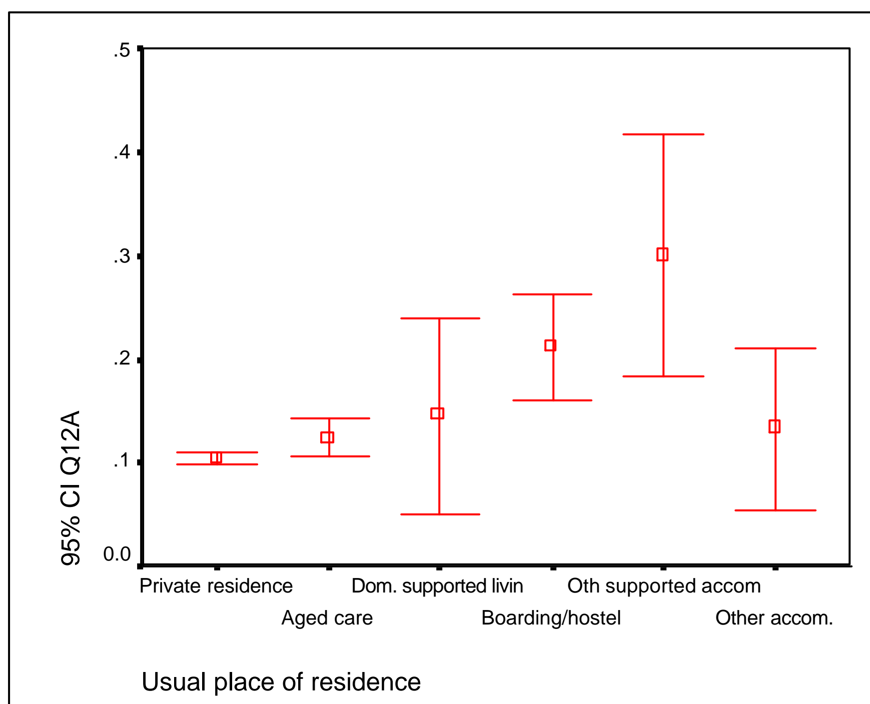


Figure B10: Proportion of patients recommended for another type of care by source of referral

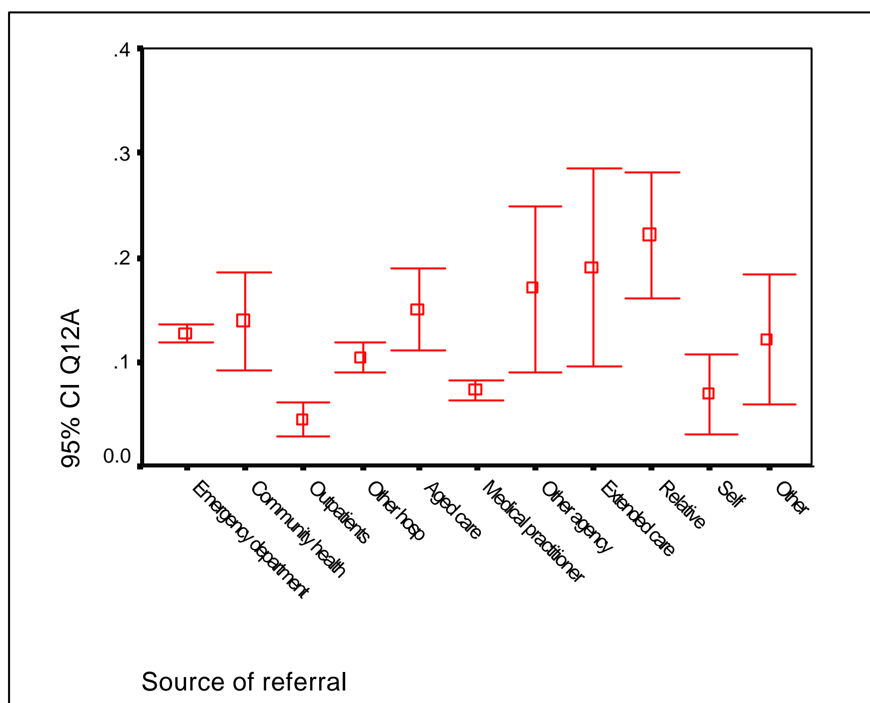


Figure B11: Proportion of patients recommended for another type of care by current type of care

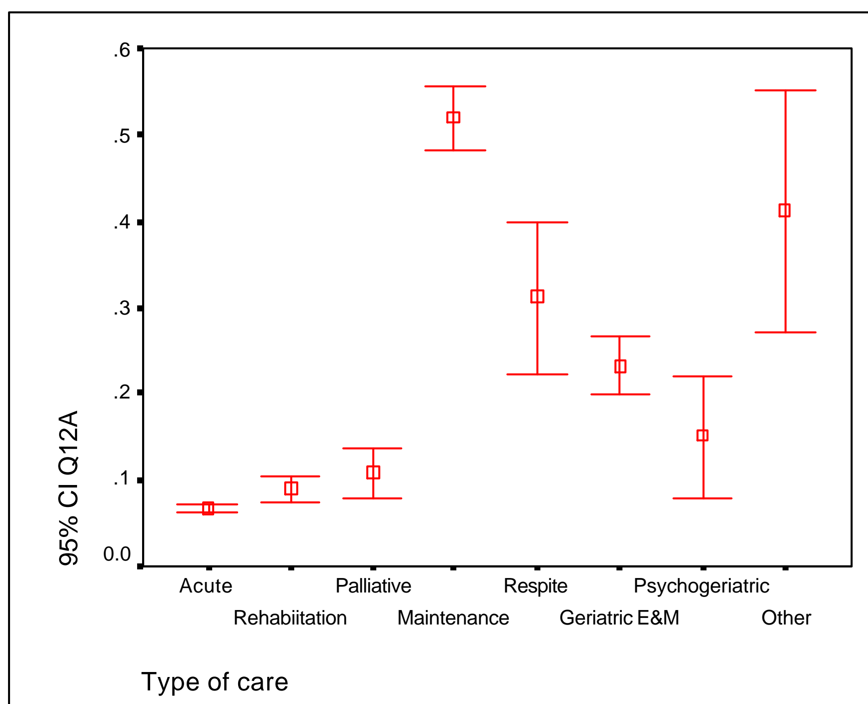
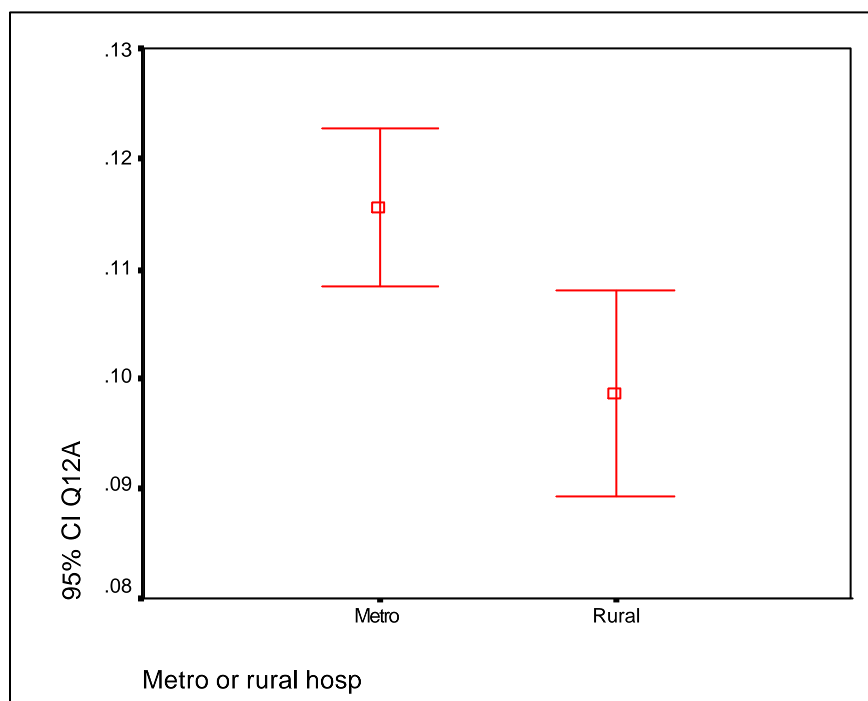


Figure B12: Proportion of patients recommended for another type of care by location of hospital



APPENDIX C
LENGTH OF STAY BETWEEN ONE TO FOUR MONTHS

Figure C1: Proportion of patients recommended for another type of care by length of stay

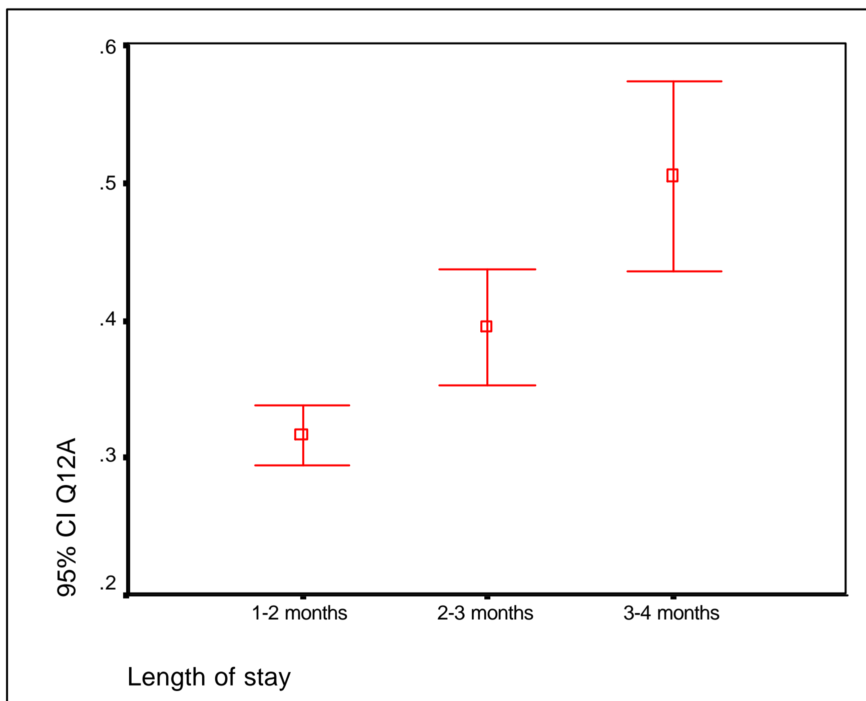


Figure C2: Proportion of patients recommended for another type of care by admission diagnosis (top ten)

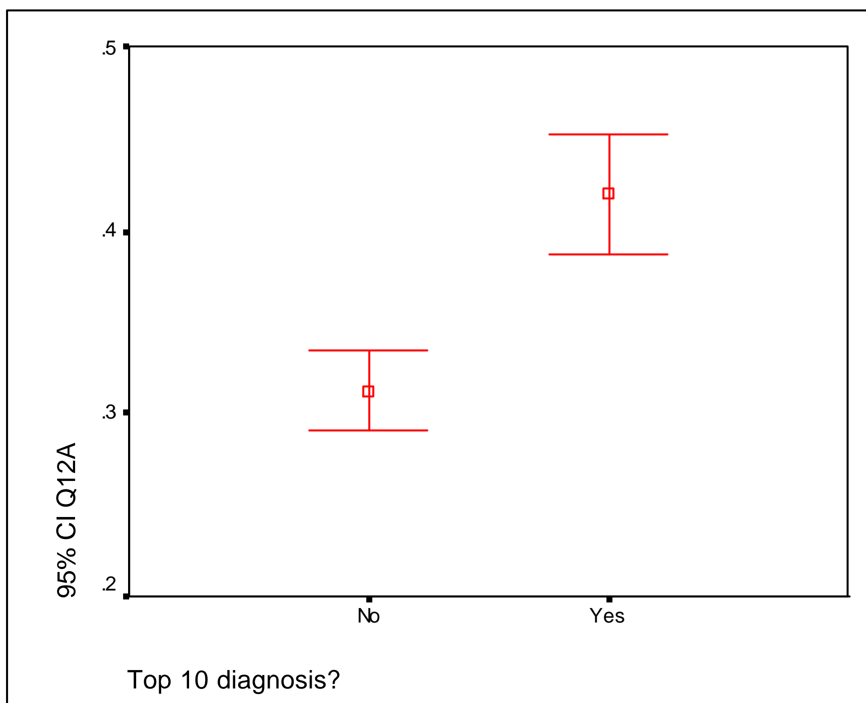


Figure C3: Proportion of patients recommended for another type of care by age group

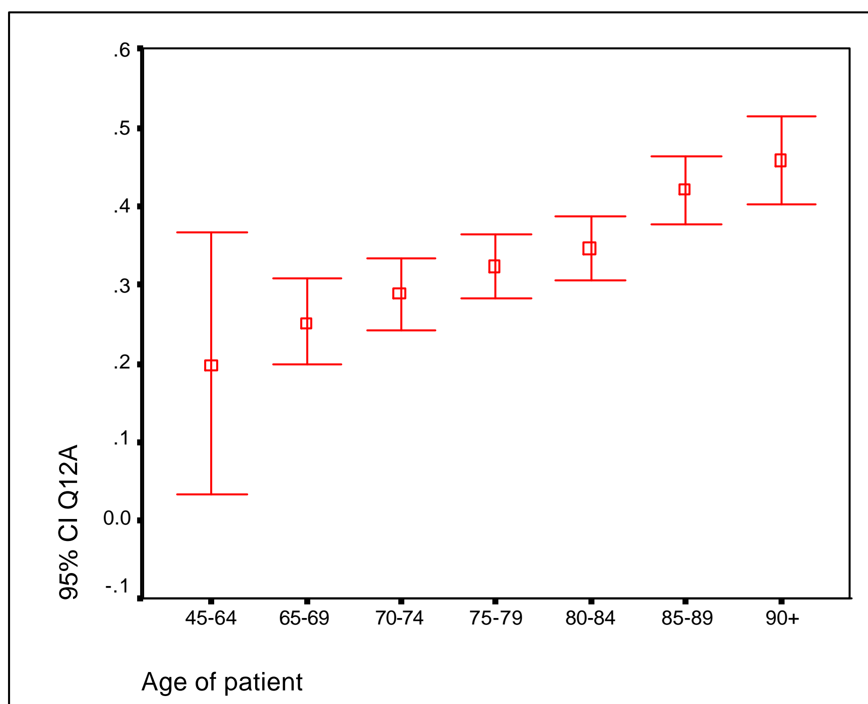


Figure C4: Proportion of patients recommended for another type of care by State

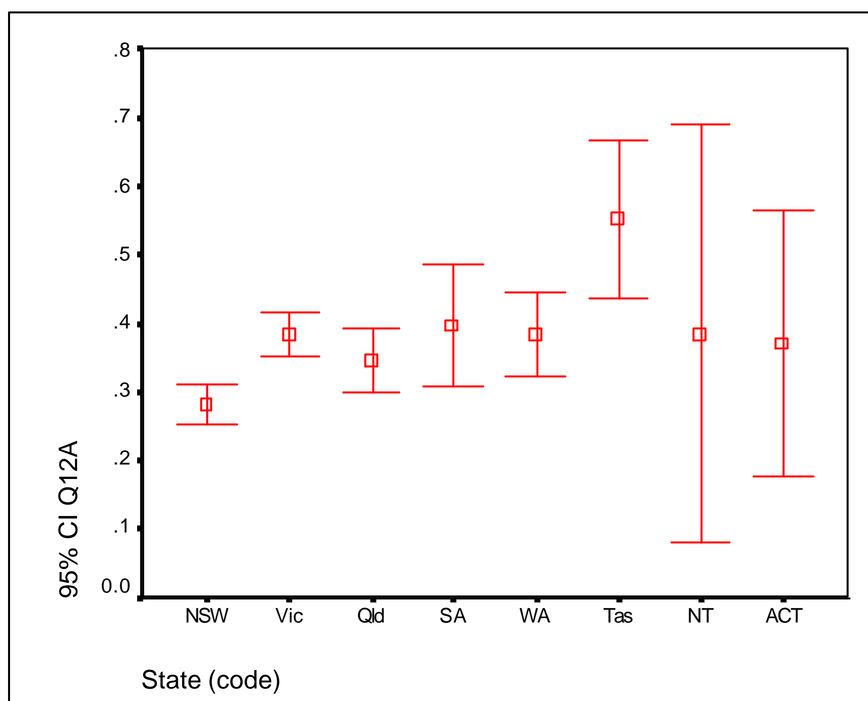


Figure C5: Proportion of patients recommended for another type of care by ARIA of residence

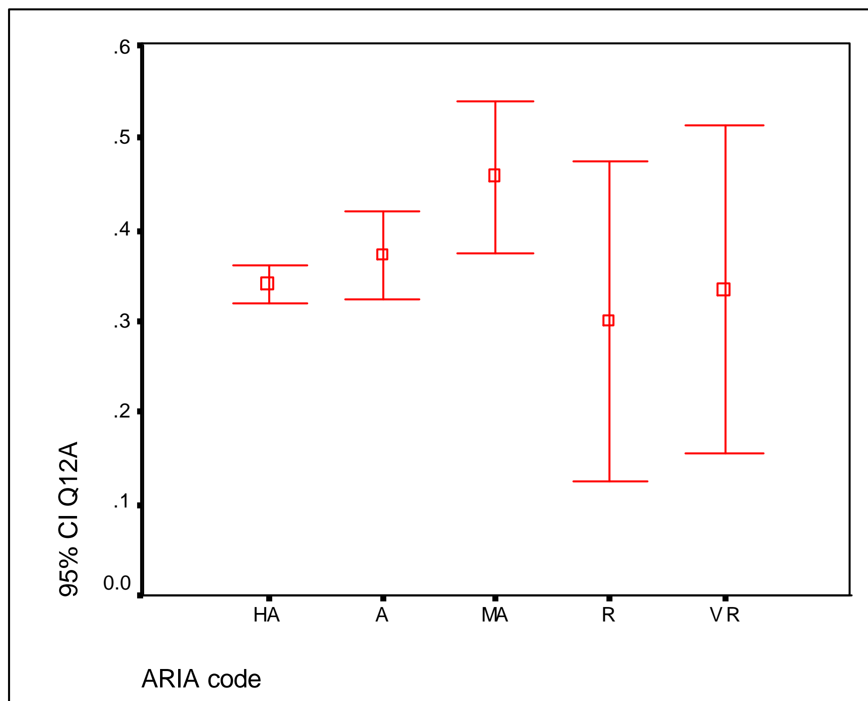


Figure C6: Proportion of patients recommended for another type of care by gender

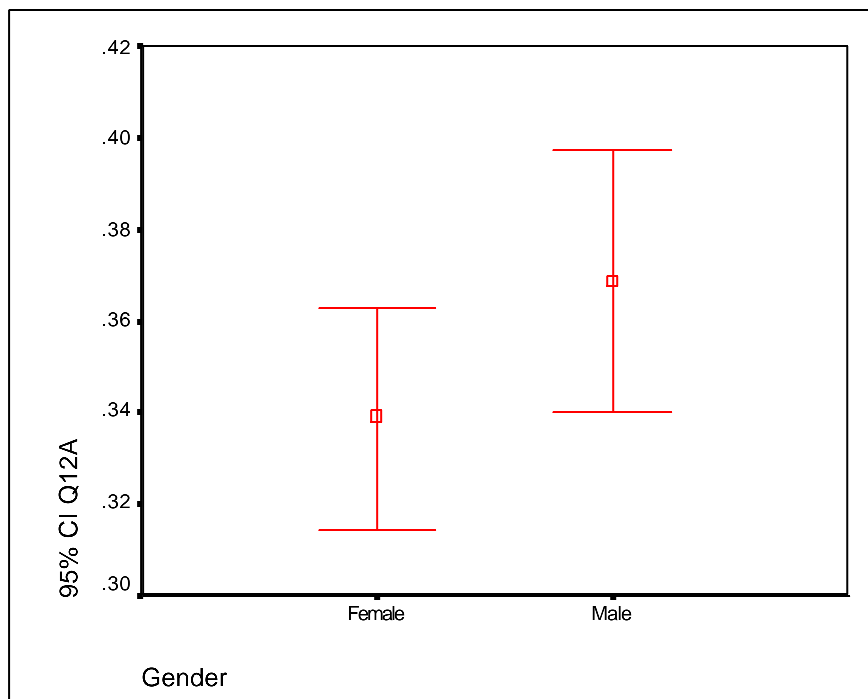


Figure C7: Proportion of patients recommended for another type of care by indigenous status

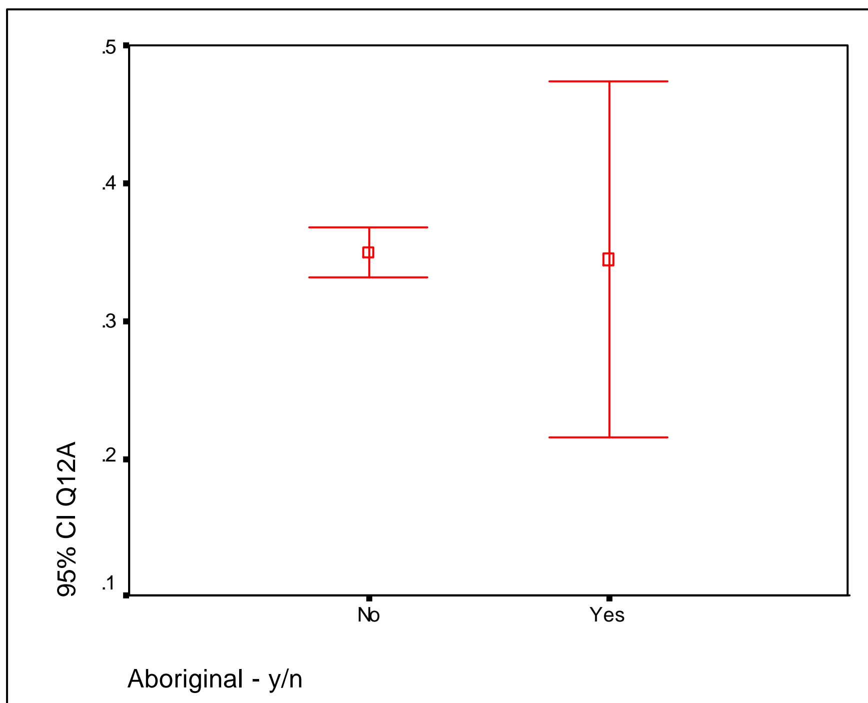


Figure C8: Proportion of patients recommended for another type of care by main language

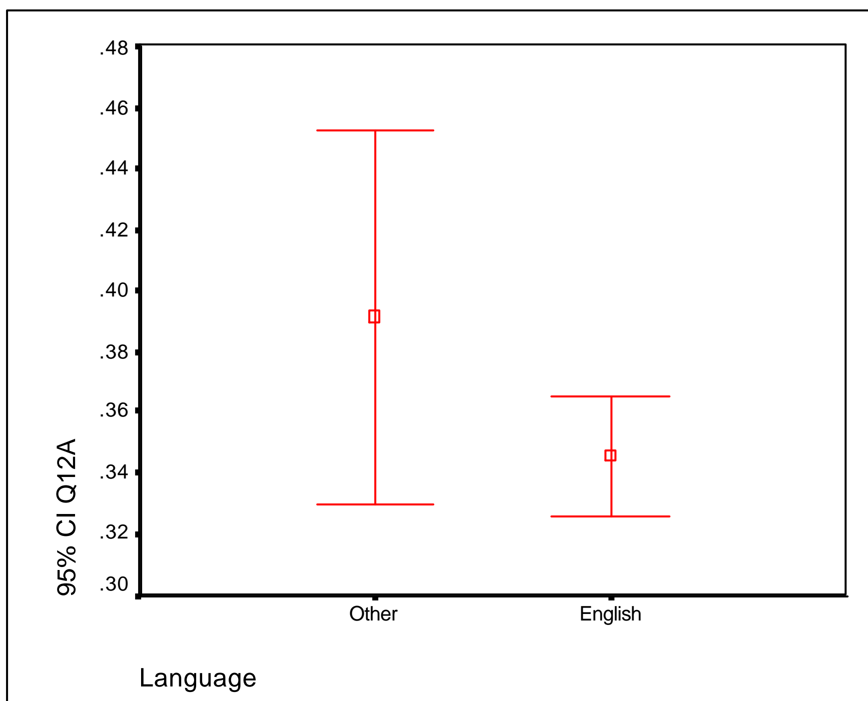


Figure C9: Proportion of patients recommended for another type of care by usual place of residence

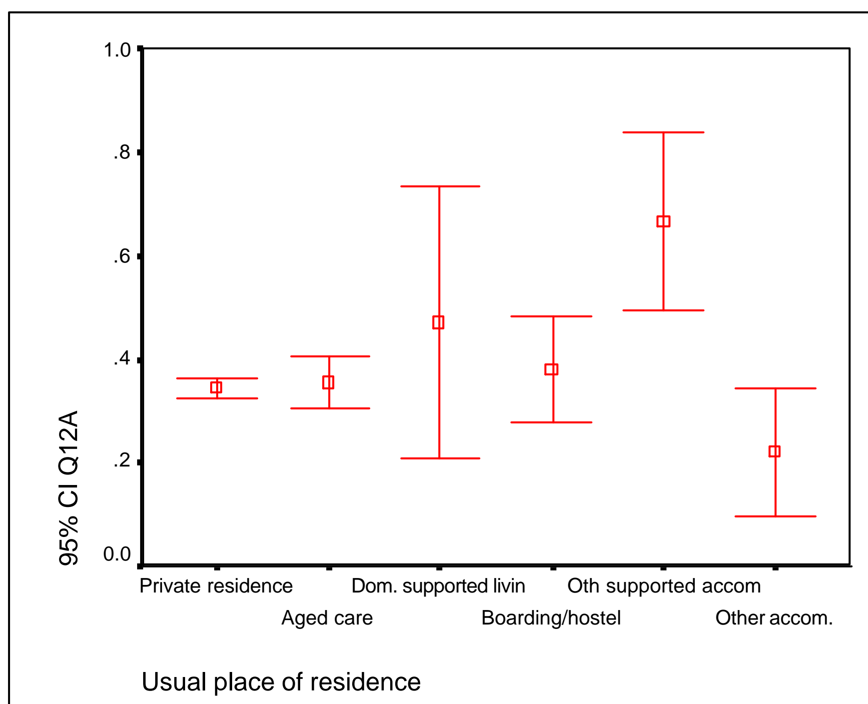


Figure C10: Proportion of patients recommended for another type of care by source of referral

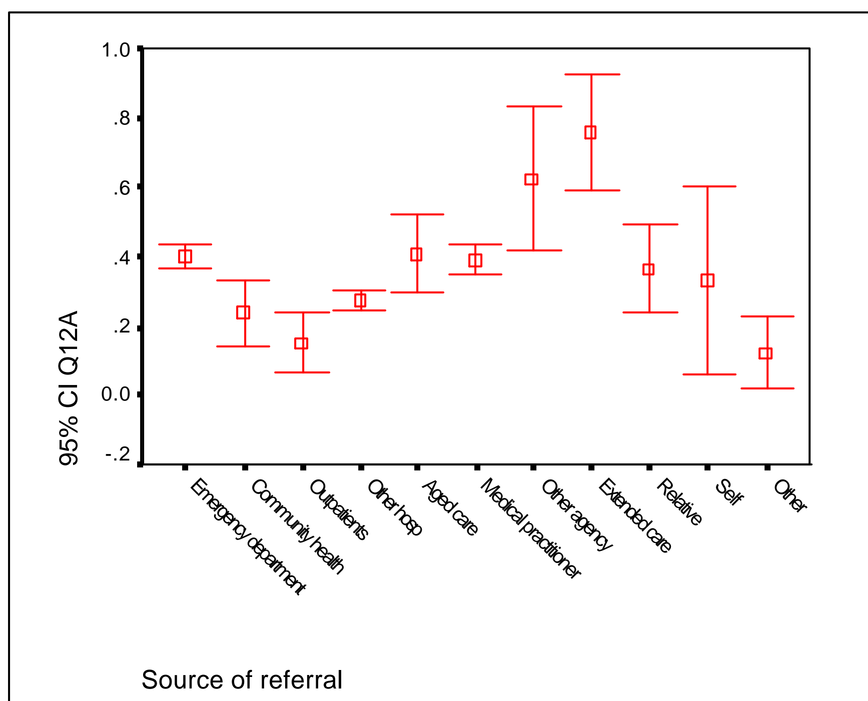


Figure C11: Proportion of patients recommended for another type of care by current type of care

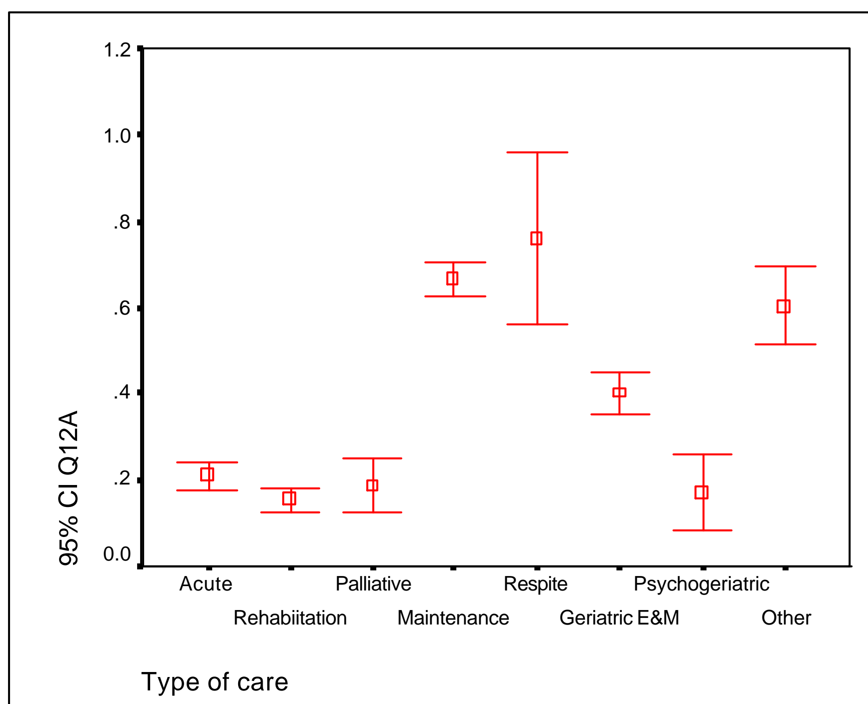
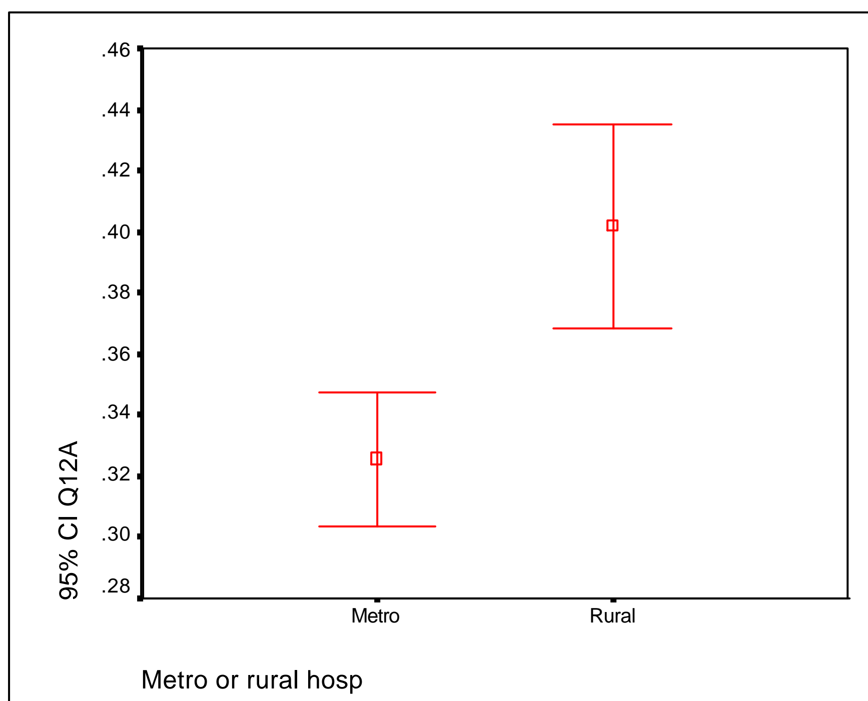


Figure C12: Proportion of patients recommended for another type of care by location of hospital



APPENDIX D
LENGTH OF STAY GREATER THAN FOUR MONTHS

Figure D1:Proportion of patients recommended for another type of care by length of stay

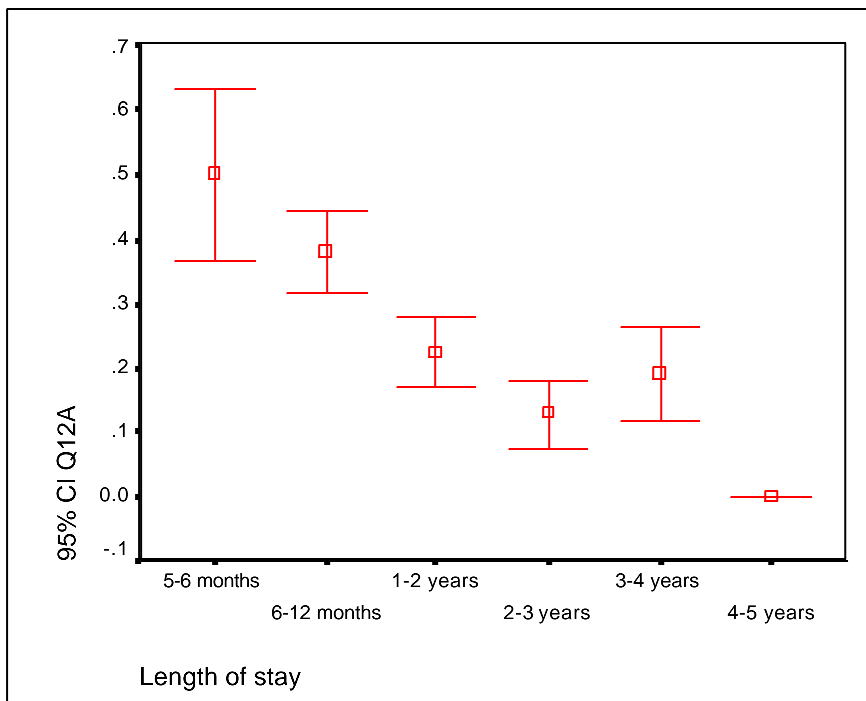


Figure D2: Proportion of patients recommended for another type of care by admission diagnosis (top ten)

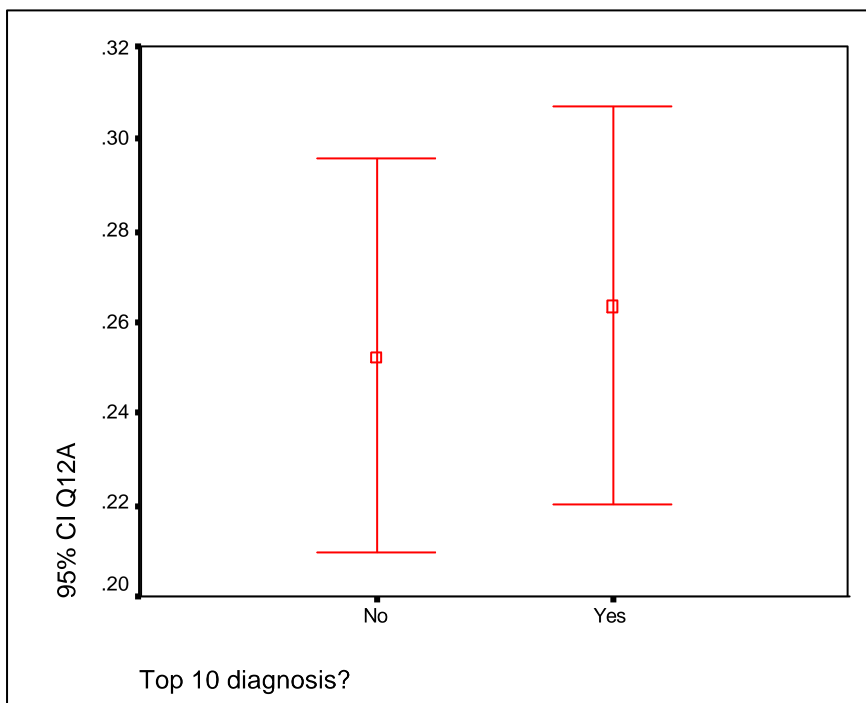


Figure D3: Proportion of patients recommended for another type of care by age group

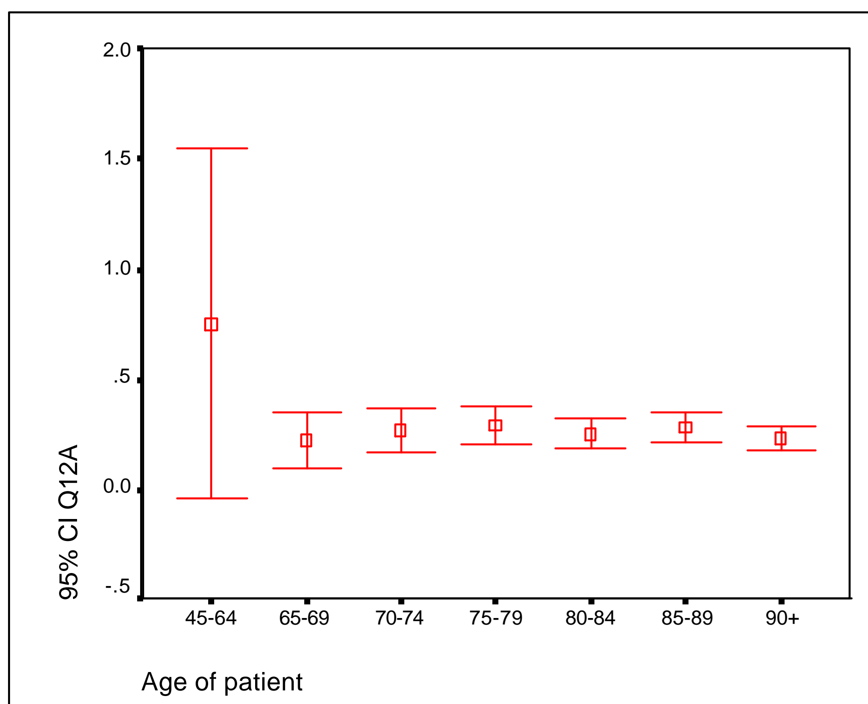


Figure D4: Proportion of patients recommended for another type of care by State

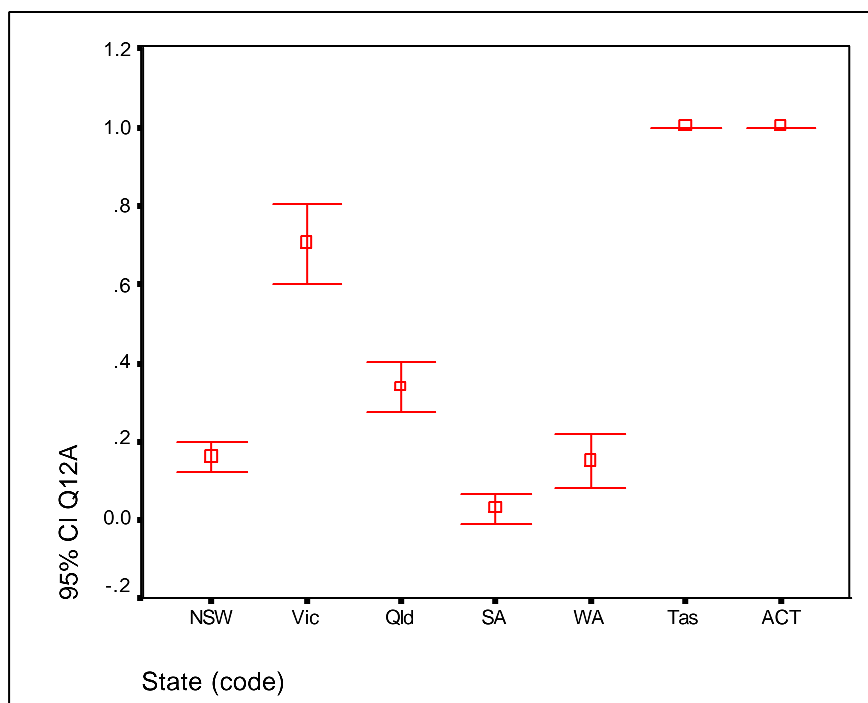


Figure D5: Proportion of patients recommended for another type of care by ARIA of residence

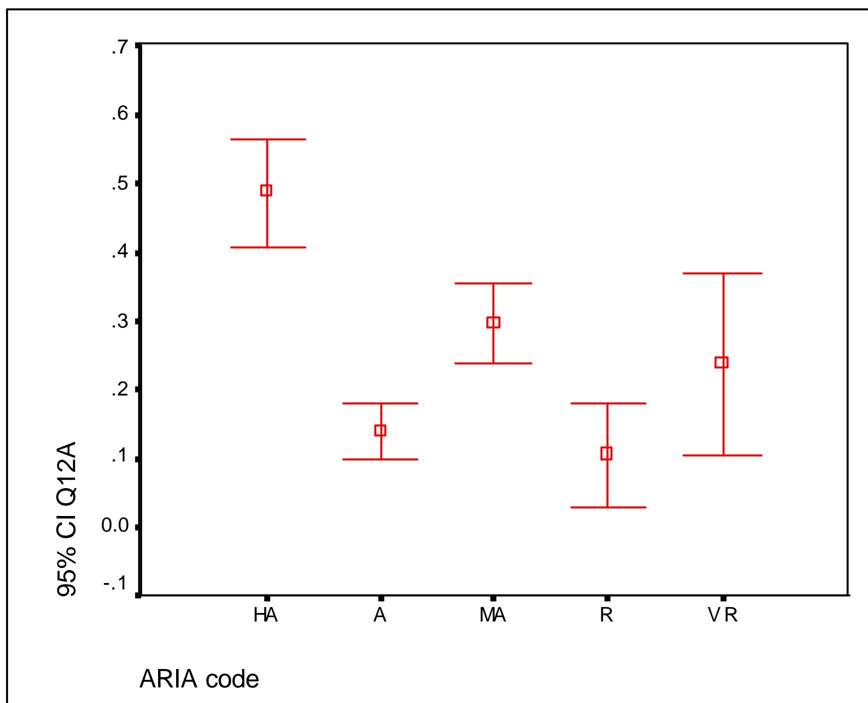


Figure D6: Proportion of patients recommended for another type of care by gender

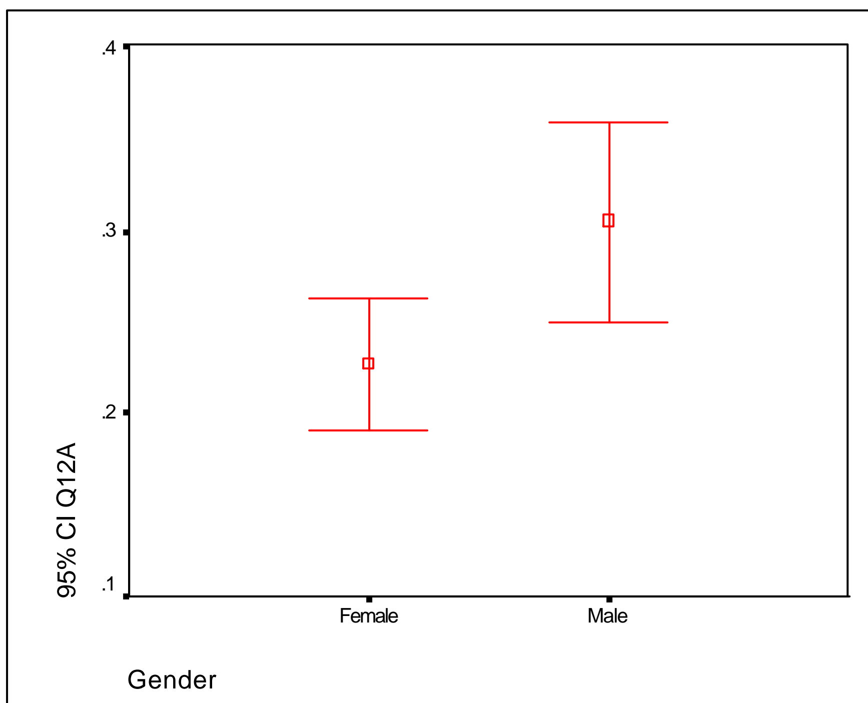


Figure D7: Proportion of patients recommended for another type of care by indigenous status

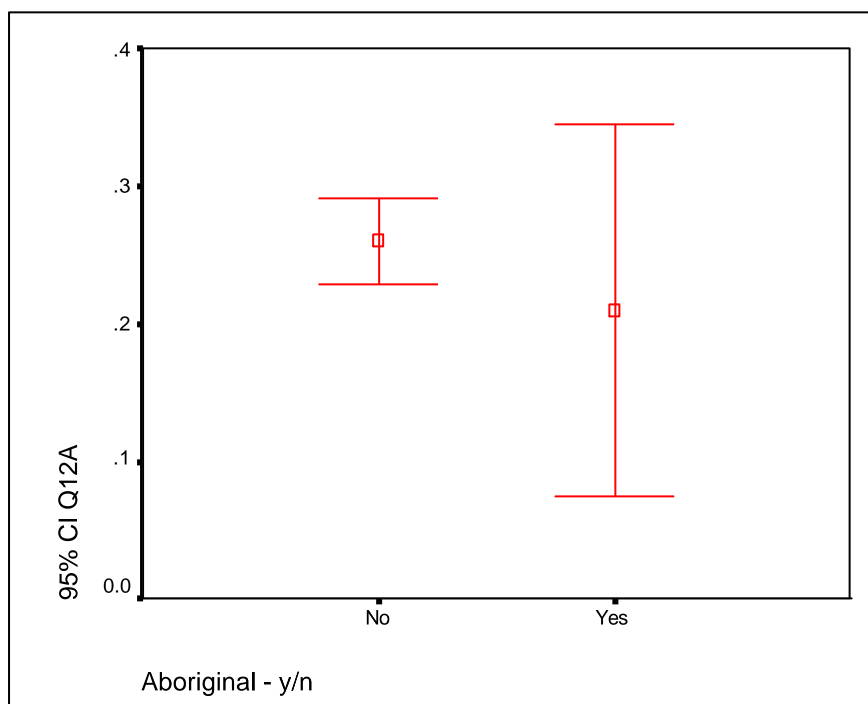


Figure D8: Proportion of patients recommended for another type of care by main language

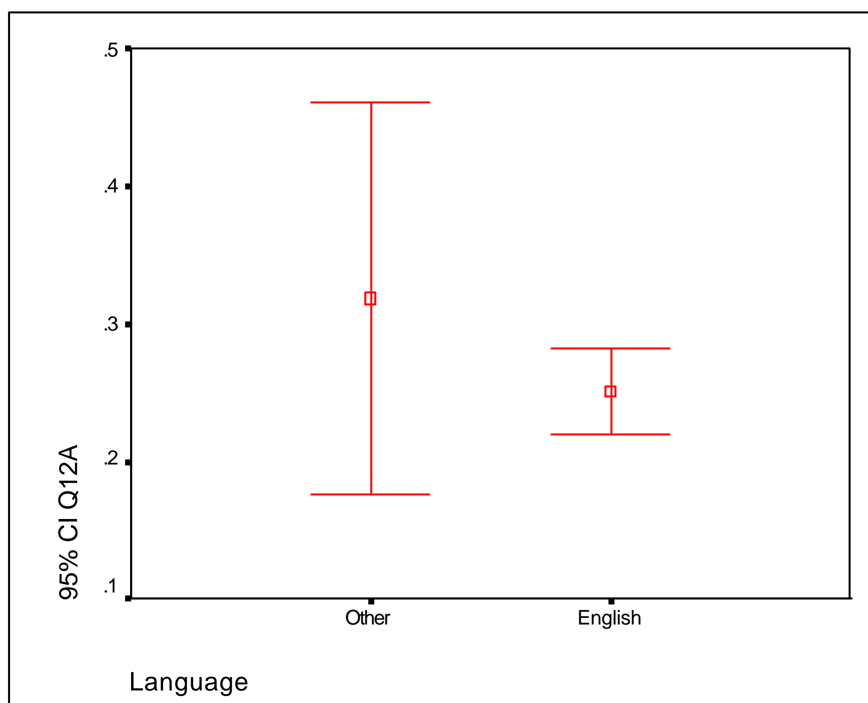


Figure D9: Proportion of patients recommended for another type of care by usual place of residence

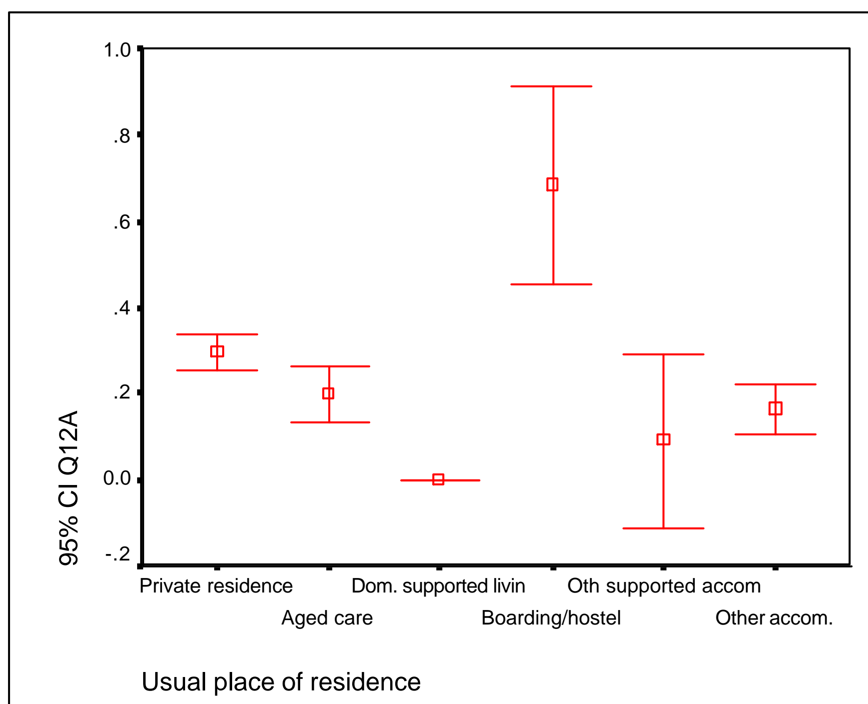


Figure D10: Proportion of patients recommended for another type of care by source of referral

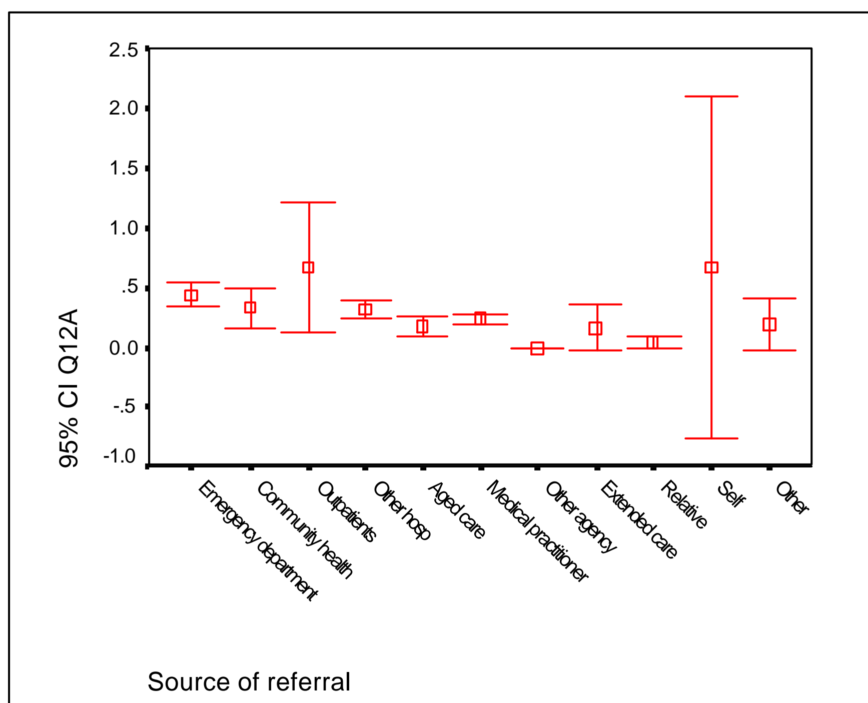


Figure D11: Proportion of patients recommended for another type of care by current type of care

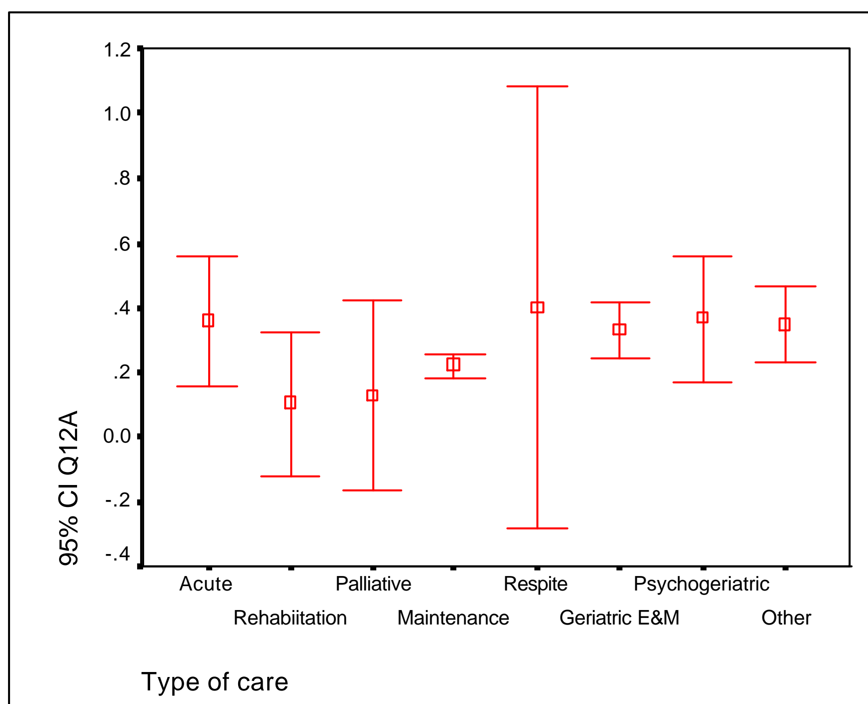
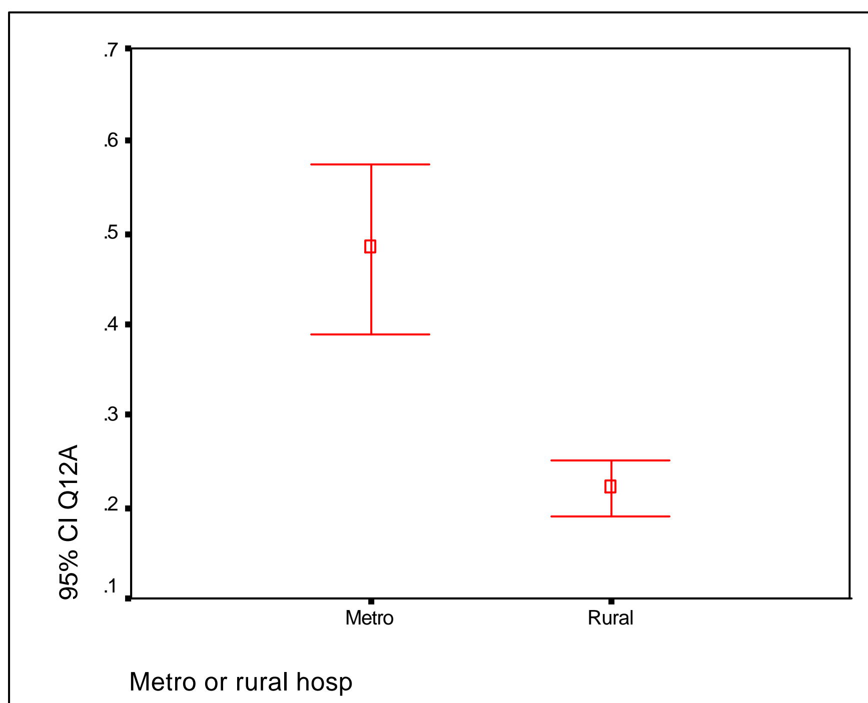


Figure D12: Proportion of patients recommended for another type of care by location of hospital



APPENDIX E
SURVEY FORM

AHMAC WORKING GROUP ON CARE OF OLDER AUSTRALIANS

Survey of Length of Stay for Older Persons in Acute and Sub-Acute Sectors

This survey is being conducted at all recognised public hospitals and Multi Purpose Services in Australia. The following instructions relate to the completion of part 1 of the survey form.

INSTRUCTIONS FOR COMPLETION OF PART 1

a) Part 1 of the Survey Form should be completed for each older person (**aged 65 and over or Aboriginal and Torres Strait Islander aged 45 and over)** who is in hospital at 12 midnight on Wednesday 17 April 2002.

b) Exclude patients who had surgery on Wednesday 17 April 2002, or are currently in ICU/CCU or other high dependency wards.

c) Please refer to the associated Survey Guidelines for information on how to complete this form and definitions of data items.

CHECK LIST ON COMPLETION OF PART 1 SURVEY FORM

After you have completed answering part 1 of the survey form, please check that you have done the following:

Please check that:

- all questions from 1 to 11a inclusive have been answered.
- Question 11a
  - if you answered “Yes”, that questions 11b to 14a inclusive have been completed.
  - if you answered “No”, that no further questions have been answered.
- Question 12a
  - if you answered “Yes”, that questions 12b to 14a inclusive have been completed.
  - if you answered “No”, that questions 13 and 14a have been completed.
- Question 14a
  - if you answered “Yes”, that questions 14b to 14d inclusive have been completed.
  - if you answered “No”, “Requested but not yet undertaken” or “Unknown” that no further questions have been answered.

Please contact Lilian Lazarevic or Joe Scuteri on (08) 8150-5555 should you require any assistance.

THANK YOU FOR COMPLETING PART 1 OF THE SURVEY FORM

POSITION OF THE PERSON COMPLETING THE FORM: ____

1 DATE OF ADMISSION TO HOSPITAL ____/____/____ *dd mm yy*

2 ADMISSION DIAGNOSIS *(specify)*

____ |__|__|__|__|__|

For office use only

3 AGE OF PATIENT (IN YEARS)
(tick relevant box)
? 01 45 – 49 years
? 02 50 – 54 years
? 03 55 – 59 years
? 04 60 – 64 years
? 05 65 – 69 years
? 06 70 – 74 years
? 07 75 – 79 years
? 08 80 – 84 years
? 09 85 – 89 years
? 10 90 years and over

4 POSTCODE OF PATIENT'S RESIDENCE
(Unknown = 9999)
|__|__|__|__|

5 GENDER *(tick relevant box)*
? 01 Male
? 02 Female

6 IS THE PATIENT OF ABORIGINAL/ TORRES STRAIT ISLANDER ORIGIN? *(tick relevant box)*
? 01 Aboriginal
? 02 TSI
? 03 Both Aboriginal & TSI
? 04 Neither Aboriginal or TSI
? 09 Not Stated

7 WHAT IS THE MAIN LANGUAGE SPOKEN AT HOME? *(tick relevant box)*
? 01 English
? 02 Other *(specify main language)*
|__|__| ____________________________
? 99 Not Known

8 USUAL PLACE OF RESIDENCE?
(The type of accommodation setting the patient usually lived in prior to admission)
(tick relevant box)
? 01 Private residence
? 02 Residential Aged Care Facility
? 03 Psychiatric hospital
? 04 Alcohol/drug treatment residence
? 05 Mental health community facility
? 06 Dom. supported living facility
? 07 Boarding/Hostel
? 08 Homeless persons' shelter
? 09 Other shelter/refuge
? 10 Other supported accommodation
? 11 Prison/Remand/Youth Centre
? 12 Public place (Homeless)
? 13 Other accommodation *(specify)*
|__|__| ____________________________
? 99 Unknown/Not determined

9 SOURCE OF REFERRAL?
(The source from which the person was referred to the facility) (tick relevant box)
? 01 Emergency department
? 02 Community health
? 03 Outpatients
? 04 Other hospital/Day procedure centre
? 05 Residential Aged Care Facility
? 06 Medical Practitioner
? 07 Other agency
? 08 Extended care/Rehabilitation facility
? 09 Private psychiatric practice
? 10 Law enforcement agency
? 11 Crisis team
? 12 Relative
? 13 Self
? 14 Other *(specify)*
|__|__| ____________________________
? 99 Unknown/Not determined

10 WHAT CARE IS THE PATIENT CURRENTLY RECEIVING
(tick relevant box)
? 01 Acute
? 02 Rehabilitation
? 03 Palliative
? 04 Maintenance
? 05 Respite
? 06 Geriatric evaluation and management
? 07 Psychogeriatric
? 08 Hospital boarder
? 09 Other admitted patient care *(specify)*
|__|__| ___________________________________

11a DO THE HEALTH PROFESSIONALS RESPONSIBLE FOR THE CARE OF THE PATIENT CONSIDER THAT ANOTHER FORM OF CARE WOULD BE MORE CLINICALLY APPROPRIATE AT THIS TIME?
(tick relevant box)
? 01 Yes
? 02 No *(no further information is required. Thank you for filling in the survey)*

11b WHO ARE THE RESPONSIBLE HEALTH PROFESSIONALS THAT HOLD THIS VIEW?
(tick more than one box as appropriate)
? 01 Medical Officer
? 02 Nurse
? 03 Other health professional
|__|__| ? 04 Other *(specify)* _______________________

11c WHAT TYPE OF CARE WOULD BE MORE APPROPRIATE AT THIS TIME? *(tick relevant box)*
? 01 Acute
? 02 Rehabilitation
? 03 Maintenance
? 04 Palliative
? 05 Geriatric evaluation & management
? 06 Respite
? 07 Home and community care
? 08 Community Aged Care Package
? 09 Flexible care package
? 10 Residential aged care
? 11 Other admitted patient care *(specify)*
|__|__| _________________________________
? 12 Other non-admitted care *(specify)*
|__|__| _________________________________
? 99 Unknown

11d WHERE WOULD THIS TYPE OF CARE BE DELIVERED NOW IF THE OPTIONS BELOW WERE AVAILABLE?
(tick more than one box as appropriate)
? 01 Delivered in this hospital
? 02 Delivered in an(other) hospital
? 03 Delivered in an(other) facility
? 04 Delivered in the community
? 05 Delivered at home
? 99 Unknown

11e IS THIS TYPE OF CARE AVAILABLE IN THE PATIENT'S LOCAL AREA? *(tick relevant box)*
? 01 Yes
? 02 No
? 99 Unknown

12a HAS A RECOMMENDATION FOR ANOTHER TYPE OF CARE BEEN MADE *(tick relevant box)*
? 01 Yes
? 02 No *(go to question 13)*

12b WHO WAS RESPONSIBLE FOR MAKING THE RECOMMENDATION? *(tick more than one box as appropriate)*
? 01 Medical Officer
? 02 Nurse
? 03 Other health professional
|__|__| ? 04 Other *(specify)* _______________________

12c WHAT TYPE OF CARE HAS BEEN RECOMMENDED?
(tick more than one box as appropriate)

Facility Based

? 01 Rehabilitation
? 02 Maintenance
? 03 Palliative
? 04 Geriatric evaluation & management
? 05 Respite
? 06 Residential aged care
? 07 Other admitted patient care *(specify)*

|__|__| ________________________________

Community/Home Based

? 08 Rehabilitation
? 09 Palliative
? 10 Respite
? 11 Home and community care
? 12 Community aged care package
? 13 Flexible care package
? 14 Other non-admitted care *(specify)*

|__|__| ? ________________________________

? 99 Unknown

12d IF YOU TICKED ANY BOX BETWEEN 01 AND 07 IN QUESTION 12c, WHERE HAS IT BEEN RECOMMENDED THAT THIS CARE BE DELIVERED?
(tick more than one box as appropriate)

? 01 In this hospital
? 02 In an(other) hospital
? 03 In an(other) facility
? 99 Unknown

12e FROM WHAT DATE WAS THE PATIENT READY TO RECEIVE THE RECOMMENDED CARE?
(if actual date unknown, enter 99 for day and estimate month and year)

____/____/____
dd mm yy

13 WHY HAS THIS PATIENT BEEN UNABLE TO ACCESS MORE CLINICALLY APPROPRIATE TYPES OF CARE? *(tick relevant box)*

? 01 Waiting for assessment/reassessment (eg ACAT, Rehabilitation, etc)
? 02 Waiting for service in this facility (eg Rehabilitation, Palliative care, GEM, etc)
? 03 Waiting for services in an(other) facility
? 04 Waiting for community services to be arranged (eg HACC, CACP, Flexible packages, etc)
? 05 Awaiting family decision
? 06 Other – (eg transport, refused to be discharged) *(specify)*

|__|__| ________________________________

14a HAS THIS PATIENT BEEN ASSESSED BY AN ACAT? *(tick relevant box)*

? 01 Yes
? 02 No *(no further information is required. Thank you for filling in the survey)*
? 03 Requested but not yet undertaken *(no further information is required. Thank you for filling in the survey)*
? 99 Unknown *(no further information is required. Thank you for filling in the survey)*

14b WHAT WAS THE RECOMMENDATION OF THE ACAT?
(tick more than one box as appropriate)

? 01 RAC Facility – High care
? 02 RAC Facility – Low care
? 03 Home nursing
? 04 Day Hosp/Rehab Centre/Paramed
? 05 Comm. Options/Linkages/CACPS
? 06 Home help/Home care
? 07 Day centre
? 08 Domiciliary nursing
? 09 Home delivered meals
? 10 Home respite
? 11 Home maintenance/modifications
? 12 Residential respite
? 13 Other *(specify)*

|__|__| ________________________________

? 14 None

14c IS THERE A CURRENT ACAT APPROVAL? *(ie form 2624/NH5)?*
(tick relevant box)

? 01 Yes
? 02 No

14d DATE OF ACAT APPROVAL
*(ie date on form 2624/NH5)***?**

____/____/____
dd mm yy

Survey of Length of Stay for Older Persons in Acute and Sub-Acute Sectors

INSTRUCTIONS FOR COMPLETION OF PART 2

On follow-up night (12 midnight on Wednesday 8 May 2002) one form should be completed for each patient for whom a Part 1 survey form was completed on 17 April 2002. Please ensure that the Part 2 survey form has the same survey number as the Part 1 survey form completed for that patient. A Part 2 survey form should be provided for all patients surveyed on 17 April whether they have been separated or whether they are continuing inpatients.

CHECK LIST ON COMPLETION OF PART 2 SURVEY FORM

After you have completed answering part 2 of the survey form, please check that you have done the following:

Please check that:

- Question 15
  - if you answered "Yes", that questions 16 to 18 inclusive have been completed.
  - if you answered "No", that questions 19a to 20 inclusive have been completed.

---

15 HAS THE PATIENT BEEN SEPARATED (DISCHARGED/ TRANSFERRED)? *(tick relevant box)*

☐01 Yes
☐02 No *(go to question 19a)*

16 WHAT WAS THE PATIENT'S DATE OF SEPARATION (DISCHARGE/ TRANSFER)?

____/____/____
dd mm yy

17 WHAT WAS THE PATIENT'S STATUS AT SEPARATION? *(tick relevant box)*

☐01 Discharge/Transfer to an(other) acute hospital
☐02 Discharge/Transfer to a RAC service unless this is the usual place of residence
☐03 Discharge/Transfer to an(other) psychiatric hospital
☐04 Discharge/Transfer to other health care accommodation (eg hostels recognised by the Department of Health and Ageing unless this is the usual place of residence)
☐05 Statistical discharge – type change
☐06 Left against medical advice/discharge at own risk
☐07 Died
☐08 Usual place of residence
☐09 Other (eg hostels/homes providing primary welfare services)
☐99 Unknown

18 WHAT TYPE OF CARE WAS ARRANGED FOR THE PATIENT'S SEPARATION DESTINATION?
(tick more than one box as appropriate)

Facility Based

☐01 Rehabilitation
☐02 Maintenance
☐03 Palliative
☐04 Geriatric evaluation & management
☐05 Respite
☐06 Residential aged care
☐07 Other admitted patient care *(specify)*
|__|__| ____________________________________

Community/Home Based

☐08 Rehabilitation
☐09 Palliative
☐10 Respite
☐11 Home and community care
☐12 Community Aged Care Package
☐13 Flexible care package
☐14 Other non-admitted care *(specify)*
|__|__| ____________________________________
☐15 None
☐99 Unknown

Please stop here if 'Yes' answered to Question 15. Thank you for filling in the survey

19a IF THE PATIENT HAS NOT BEEN DISCHARGED, HAS A RECOMMENDATION FOR ANOTHER TYPE OF CARE BEEN MADE?
(tick relevant box)

☐01 Yes
☐02 No *(no further information is required. Thank you for filling in the survey)*

19b IF THE PATIENT HAS NOT BEEN DISCHARGED, WHAT TYPE OF CARE HAS BEEN RECOMMENDED?
(tick more than one box as appropriate)

Facility Based

☐01 Rehabilitation
☐02 Maintenance
☐03 Palliative
☐04 Geriatric evaluation & management
☐05 Respite
☐06 Residential aged care
☐07 Other admitted patient care *(specify)*

|__|__| ___________________________________

Community/Home Based

☐08 Rehabilitation
☐09 Palliative
☐10 Respite
☐11 Home and community care
☐12 Community Aged Care Package
☐13 Flexible care package
☐14 Other non-admitted care *(specify)*

|__|__| ___________________________________

☐99 Unknown

19c IF YOU TICKED ANY BOX BETWEEN 01 AND 07 IN QUESTION 19b, WHERE HAS IT BEEN RECOMMENDED THAT THIS CARE BE DELIVERED?
(tick relevant box)

☐01 In this hospital
☐02 In an(other) hospital
☐03 In an(other) facility
☐99 Unknown

20 WHY HAS THIS PATIENT BEEN UNABLE TO ACCESS MORE CLINICALLY APPROPRIATE TYPES OF CARE? *(tick relevant box)*

☐01 Waiting for assessment/reassessment (eg ACAT, Rehabilitation, etc)
☐02 Waiting for service in this facility (eg Rehab, Palliative care, GEM, etc)
☐03 Waiting for services in an(other) facility
☐04 Waiting for community services to be arranged (eg HACC, CACP, Flexible packages, etc)
☐05 Awaiting family decision
☐06 Other (eg transport, refused to be discharged, etc) *(specify)*

|__|__| ___________________________________

Please contact Lilian Lazarevic or Joe Scuteri on (08) 8150-5555 should you require any assistance.

THANK YOU FOR COMPLETING PART 2 OF THE SURVEY FORM

APPENDIX F
LENGTH OF STAY SUBGROUPS
STATISTICAL REPORT

This appendix discusses the following:

- Preparations made in order to organise the database into a suitable format for analysis, such as recoding of variables and creation of new variables
- A description of logistic regression analysis and why it was implemented
- Any assumptions made during the analysis
- A discussion of the processes and ideas used in arriving at the final model
- Justifications for removal of certain records from the analysis
- An explanation of how to interpret the logistic regression coefficients

DATA FORMATTING

Changes were made to the coding of the following variables:

Admission diagnosis (Question 2)

The admission diagnosis for each patient was recorded using the appropriate ICD-10 AM code. Some codes occurred in the database much more frequently than others, and those having one of the top ten highest frequencies were classified as a "Top 10 diagnosis". A new (0,1) indicator variable labelled Top10 was created, taking on the value 1 if the diagnosis was a Top 10 diagnosis, and 0 otherwise.

Patient age (Question 3)

The age groups 45-49 years, 50-54 years, 55-59 years and 60-64 years consisted of Aboriginal/Torres Strait Islander patients only, and thus the numbers of patients in each of these groups were very small compared to age groups above 65 years. Thus these four groups were combined to form one age group for Aboriginals/Torres Strait Islanders 45-64 years of age, with 223 patients.

Patients of Aboriginal or Torres Strait Islander origin (Question 6)

There were only 418 patients who indicated that they were of Aboriginal or Torres Strait Islander (TSI) decent. Due to the very small numbers in each of the categories of *Aboriginal, TSI* and *Both Aboriginal & TSI*, these were combined to form a new category *Aboriginal, TSI or both*.

Location of hospital

Although not collected on the survey form, metropolitan or rural location of hospital was indicated on the database. A (0,1) variable labelled Metro was created where a patient in a metropolitan hospital was assigned the value 1, and 0 otherwise.

Any variables with only two outcomes, such as Gender (*male* or *female*) and Questions 11a and 12a (*yes* or *no*) were recoded as (0,1) indicator variables with the value 99 indicating unknown/missing values (these were excluded from any analyses).

Those patients confirmed as being a *Yes* for Question 12a were only those who had previously been recorded as a *Yes* for Question 11a also. Any patients for whom Question 12a had been answered but **did not** have a *Yes* indicated at Question 11a were assumed to be invalid. Thus despite being a total of 2,567 *Yes* responses in the database for Question 12a, only 2505 were regarded as genuine.

RE-CATEGORISATION OF LENGTH OF STAY

In a previous study, some demographic characteristics of older patients were identified as being influential on the likelihood of patients being recommended for another type of care. Length of stay was one of the most significant of these characteristics. The following question was then raised: *do the significant predictors of the response to Question 12a vary across the different length of stay groups?* Perhaps type of care is an important predictor for patients who have been in hospital only a few weeks, but not important for patients who have been in hospital for a considerably longer period of time.

The dataset was subsequently divided into three sets of patients based on their length of stay in hospital, and independent analyses carried out in each. The three categorisations were: up to 4 weeks (Group A); between one month and 4 months (Group B); more than 4 months (Group C). The maximum length of stay in Group C was 5 years.

These particular groupings were chosen so that within each group, the relationship between length of stay and the likelihood of a "yes" at Question 12a was roughly linear. As a result, the datasets do not contain similar number of patients (Group A 11,562, Group B 2,460, Group C 905 in the truncated dataset).

SELECTING THE METHODS OF STATISTICAL ANALYSIS

Essentially, within each of the three datasets, we wanted to explore how the probability of a *Yes* response for Question 12a varied across the different response categories for each of Questions 2 to 10. For example, did the group of patients aged between 65 and 69 years have a higher rate of recommendations for another type of care than patients aged 90 years? And is this the case in each of the three groups?

In order to look at the effect of different independent variables on the outcome of interest (response to Question 12a), we had to select an appropriate model to fit to the data. Generally, a multiple linear regression model would be suitable, and would allow one to take a set of values for a series of explanatory variables and use the fitted regression curve to predict the value of the outcome variable. However, in our case, the outcome variable is dichotomous (only has two possible outcomes of interest – *yes* or *no*), so multiple linear regression is not appropriate.

What we were able to do instead was to fit a *logistic* regression model, rather than a linear model. Logistic regression is particularly useful in situations where we have values for a set of predictor variables which we want to use to predict the presence or absence of a certain characteristic or outcome. The dependent variable must have only two distinct outcomes of interest, but the predictor variables don't have to be restricted to indicator variables too – they can also include continuous or categorical variables.

FITTING A LOGISTIC REGRESSION MODEL

In logistic regression, we fit a model that looks like:

$$\ln[p/(1-p)] = \boldsymbol{a} + \boldsymbol{b_1}X_1 + b_2X_2 + b_3X_3 + \ldots + \boldsymbol{e}$$

where p is the probability of the outcome of interest (in our case a *yes* response for Question 12a), and $\ln[p/(1-p)]$ is called the *log odds ratio*.

This is equivalent to:

$$p/(1-p) = \exp(\boldsymbol{a} + \boldsymbol{b_1}X_1 + b_2X_2 + b_3X_3 + \ldots. + \boldsymbol{e})$$
$$= \exp(a)\exp(\boldsymbol{b_1}X_1)\exp(\boldsymbol{b_2}X_2)\exp(\boldsymbol{b_3}X_3)\ldots\ldots$$

Each term $\exp(\boldsymbol{b_i}X_i)$ tells us how much the odds ratio changes if we increase the value of X_i by one unit – from zero to one in our case, as all variables included in our model were (0,1) indicator variables.

For our hospital data there were two types of independent variables included in the logistic regression model:

(a) Categorical variables with only two outcomes (yes/no, coded as 0 = *no* and 1 = *yes*), such as *Top 10 diagnosis*; and
(b) Categorical variables with k>2 unordered categories, such as *State, Type of Care* etc.

Note that *Age* and *Length of Stay* were treated as categorical variables rather than quantitative variables, since the categories were not equally spaced. Within each of the three datasets, *Length of stay* was still included in the models, to maintain consistency with the earlier analysis on the complete dataset.

For a (0,1) indicator variable like *Top 10*, the coefficient exp(***b***) estimated in SPSS is the amount by which the odds ratio increases/decreases if a patient has a top 10 diagnosis (X=1), compared to a patient who does not have a top 10 diagnosis (X=0).

Categorical variables with k>2 categories must be recoded into k-1 indicator variables. Using *State* as an example, we obtain the following indicator variables:

Old variable	NEW VARIABLES						
State	**I1**	**I2**	**I3**	**I4**	**I5**	**I6**	**I7**
NSW	0	0	0	0	0	0	0
Vic	1	0	0	0	0	0	0
Qld	0	1	0	0	0	0	0
SA	0	0	1	0	0	0	0
WA	0	0	0	1	0	0	0
Tas	0	0	0	0	1	0	0
NT	0	0	0	0	0	1	0
ACT	0	0	0	0	0	0	1

All of these seven indicator variables are included in the model simultaneously instead of a single variable with eight categories representing *State*. So there will be seven coefficients added to the regression model. The category with all indicator variables taking on the value zero is called the *reference category* (NSW in the above example). Each of the coefficients for the indicator variables represents the effect that a particular state has on the odds ratio, compared to the reference category NSW. Suppose exp(***b***) = 2.0 for indicator variable I_1. This is interpreted as "the odds ratio for a patient who is from Victoria is 2 times higher than the odds ratio for a patient from NSW".

The variables *Age, Length of Stay, Q8, Q9, Q10* and *State* were all recoded using indicator variables. (Note that to calculate the effect that two or more indicator variables have on the odds ratio, the coefficients are simply multiplied together.)

REFINING THE FITTED LOGISTIC REGRESSION MODEL

(This methodology was applied separately for each of Group A, B and C.)

Firstly, univariate logistic regression models were fitted for each explanatory variable one by one. Those variables that were not statistically significant predictors of the response to Question 12a were not included in any further analysis. Next, the variables that had been significant in the univariate analyses were considered in the multivariate logistic regression model. A model including all significant univariate variables was fitted. Any variables that became non-significant when combined in a model with the other variables were not considered in any further multivariate analysis.

With the remaining variables that were significant in the multivariate model, we wanted to try and simplify the model if possible (that is, to fit a model with fewer variables but still explaining a similar amount of the variation in the response variable). The procedure carried out to obtain a reasonably uncomplicated model involved starting with the simplest multivariate model using the variables that had the highest R^2 values in the univariate analyses. Single variables or two-way interactions were added one at a time, and the change in the maximum log likelihood between the new model and the simpler model without the additional term was calculated. If there was a significant increase in the maximum log likelihood, the additional term was kept in the model, otherwise it was taken out and the effect of adding a different term was investigated.

Obviously we needed an idea of what an achievable R^2 might be, so we tested what value of R^2 could have been reached by fitting a model with all two-way interaction terms (R^2 = 35.5% for Group A, 49.9% for Group B and 86.2% for Group C). More complicated models involving higher-order interactions were not considered due to the large numbers of combinations of categories and the difficulty in interpreting the results of such complex models. Our simpler model would ideally achieve an R^2 comparable to the model with the two-way interactions (the “full” model). However, it was actually decided that no interactions would be experimented with in the simpler models due to some troubles that occurred regarding the interpretation of the previous logistic regression analysis. This meant that we limited the model-fitting process to include only the main effects and so could not expect to obtain R^2 values nearly as high as those of the full models.

REMOVAL OF RECORDS FROM DATABASE

Note that although the database initially contained 16104 records, the number of cases used in the final regression model was fewer than this. There were twelve explanatory variables to consider when fitting a statistical model, and some of these variables had large numbers of categories. Consequently, there were occasions where individual categories had few observations. There were also a number of unknown/missing responses for most questions. As small frequencies within categories makes it more difficult to detect statistically significant differences, and missing values provide no information, all records with at least one uncommon or unknown/missing/invalid response were excluded from the logistic regression analysis. Table A.1 shows the number of missing values and uncommon response categories for each variable included in the refined multiple logistic regression model.

Table A.1 *Cases excluded from analysis*

Variable	Category		No. removed
Length of stay	Unknown/missing		400
Age	Unknown/missing		97
Q8	Unknown/missing		132
	Psychiatric hospital		16
	Alcohol/drug treatment residence		3
	Mental Health community facility		10
	Homeless persons' shelter		7
	Other shelter/refuge		3
	Prison/remand centre		1
	Public place		13
		Total	185
Q9	Unknown/missing		217
	Private psychiatric practice		11
	Law enforcement agency		8
	Crisis team		34
		Total	270
Q10	Unknown/missing		150
	Hospital boarder		23
		Total	173
State	Unknown/missing		214

A total of 1,177 cases were excluded from the final analysis (note that some cases are included in more than one row of Table A.1). A further six cases were ignored due to missing responses to Question 12a. In removing records from the database, we have assumed that the responses to Question 12a for these deleted cases follow the same distribution as those cases retained for analysis.

The pruned dataset for the logistic regression analysis consisted of 14,921 records.

INTERPRETING THE LOGISTIC REGRESSION ODDS RATIOS

Comparing the odds ratios between two patients of different characteristics might not seem to be very informative. We want to know how much p, the probability of a recommendation for another type of care, increases or decreases when we change the set of patient characteristics.

It is certainly very easy to transform the coefficients from the logistic regression into meaningful results, which straight away can tell us how much more likely or unlikely one patient is to have alternative care recommended compared to a patient with a set of baseline (reference) characteristics.

Take any predictor variable and assume we know the probability p_r that a patient with the reference characteristic r for that variable is recommended for another type of care. Then we can calculate the odds ratio as

$$\frac{p_r}{1-p_r} = \boldsymbol{a} \qquad (1.1)$$

for patients in the reference category.

Suppose then that we have a patient with a different value k of the given characteristic (ie. not the reference characteristic) and we want to know how their chance p_k of being recommended for another type of care compares to the patient with the reference characteristic. We also know the value of the logistic regression coefficient, x say. Now x is

actually the amount by which we multiply the odds ratio, $\boldsymbol{a}$, for the patient in the reference category, to obtain the odds ratio for the patient with characteristic k. In other words,

$$\frac{p_k / 1 - p_k}{p_r / 1 - p_r} = \frac{p_k / 1 - p_k}{\boldsymbol{a}} = x \qquad (1.2)$$

With a bit of rearranging of equation 1.2, we obtain the expression

$$p_k = \frac{\boldsymbol{a}x}{1 + \boldsymbol{a}x} \qquad (1.3)$$

for the probability that a patient with characteristic k is recommended for another type of care. We can then determine *how much* more/less likely a patient with characteristic k is to have another type of care recommended than a patient with a reference characteristic r. That is, if we know p_r for a patient with the reference characteristic, how much do we multiply it by to get p_k? This is determined by

$$\frac{p_k}{p_r} = m \qquad (1.4)$$

So starting with p_r and a logistic regression coefficient x, we can apply expressions (1.1) – (1.4) to yield a multiplying factor telling us by how much the probability of another type of care being recommended is expected to change if we have a patient with a characteristic other than the reference characteristic.

REFERENCES

McCullagh, P. & Nelder, J.A. 1989. *Generalised Linear Models,* 2nd ed. London: Chapman and Hall.

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APPENDIX G
PREDICTION OF LENGTH OF STAY
STATISTICAL REPORT

This appendix discusses the following:

- Preparations made in order to organise the database into a suitable format for analysis, such as recoding of variables and creation of new variables
- A description of linear regression analysis and why it was implemented
- Any assumptions made during the analysis
- A discussion of the processes and ideas used in arriving at the final model
- Justifications for removal of certain records from the analysis

DATA FORMATTING

Changes were made to the coding of the following variables:

Admission diagnosis (Question 2)

The admission diagnosis for each patient was recorded using the appropriate ICD-10 AM code. Some codes occurred in the database much more frequently than others, and those having one of the top ten highest frequencies were classified as a "Top 10 diagnosis". A new (0,1) indicator variable labelled Top10 was created, taking on the value 1 if the diagnosis was a Top 10 diagnosis, and 0 otherwise.

Patient age (Question 3)

The age groups 45-49 years, 50-54 years, 55-59 years and 60-64 years consisted of Aboriginal/Torres Strait Islander patients only, and thus the numbers of patients in each of these groups were very small compared to age groups above 65 years. Thus these four groups were combined to form one age group for Aboriginals/Torres Strait Islanders 45-64 years of age, with 223 patients.

Patients of Aboriginal or Torres Strait Islander origin (question 6)

There were only 418 patients who indicated that they were of Aboriginal or Torres Strait Islander (TSI) decent. Due to the very small numbers in each of the categories of *Aboriginal, TSI* and *Both Aboriginal & TSI*, these were combined to form a new category *Aboriginal, TSI or both*.

Type of care recommended (Question 12c)

This question permitted more than one response option to be selected, as more than one type of care may have been recommended. The 14 response options were grouped into two broader categories: *facility based care* or *community/home based care*, and it was possible that patients may have been recommended for either one of these types of care, or even both. Of particular interest was *Facility based – Residential aged care*. In order to make analysis of the responses possible, a variable was created having the following five categories: *Facility based care only – Residential aged care*; *Facility based care only – other*; *Community/home based care only – any*; *Both facility and community/home based care*; *Not stated*.

Location of hospital

Although not collected on the survey form, metropolitan or rural location of hospital was indicated on the database. A (0,1) variable labelled Metro was created where a patient in a metropolitan hospital was assigned the value 1, and 0 otherwise.

Any variables with only two outcomes, such as Gender (*male* or *female*) and Questions 11a and 12a (*yes* or *no*) were recoded as (0,1) indicator variables with the value 99 indicating unknown/missing values (these were excluded from any analyses).

Those patients confirmed as being a *Yes* for Question 12a were only those who had previously been recorded as a *Yes* for Question 11a also. Any patients for whom Question 12a had been answered but **did not** have a *Yes* indicated at Question 11a were assumed to be invalid. Thus despite being a total of 2,567 *Yes* responses in the database for Question 12a, only 2,505 were regarded as genuine.

SELECTING THE METHODS OF STATISTICAL ANALYSIS

The main aim of this study was to determine whether there are any characteristics of older patients that could be used to predict the length of their stay in hospital. Essentially, this required us to explore how the length of stay (in days) varied across the different response categories for each of Questions 2 to 10 (and also Question 12a, as length of stay was found to be a predictor of Question 12a in a previous linear regression analysis). For example, are patients whose source of referral is a medical practitioner likely to have a shorter hospital stay than patients referred by a relative?

In order to look at the effect of different independent variables on the outcome of interest (length of stay), we had to select an appropriate model to fit to the data. As the response variable was continuous, a multiple linear regression model was suitable, and would allow one to take a set of values for a series of explanatory variables and use the fitted regression curve to predict the value of the outcome variable.

There is one limitation with this type of model – the explanatory variables must be quantitative (i.e. measured on a numeric scale) rather than categorical (unless there are only two categories, in which case recoding to a (0,1) indicator variable is acceptable). Categorical variables with more than two categories needed to be transformed into a series of indicator variables (this is explained in greater detail in next section). As all explanatory variables in our model were categorical, a large amount of recoding was required.

FITTING A LINEAR REGRESSION MODEL

In linear regression, we fit a model that looks like:

$$Y = \boldsymbol{a} + \boldsymbol{b_1}X_1 + \boldsymbol{b_2}X_2 + \boldsymbol{b_3}X_3 + \ldots + \boldsymbol{e}$$

where Y is the outcome of interest (in our case, Y represents the length of stay in days).

Each term $\boldsymbol{b_i}X_i$ tells us how much the length of stay changes if we increase the value of variable X_i by one unit – from zero to one in our case, as all variables included in our model are (0,1) indicator variables.

For our hospital data there were two types of independent variables included in the linear regression model:

(a) Categorical variables with only two outcomes (e.g. yes/no, coded as 0 = *no* and 1 = *yes*), such as *Top 10 diagnosis*
(b) Categorical variables with $k>2$ unordered categories, such as *State, Type of Care* etc.

Note that *Age* was treated as a categorical variable rather than a quantitative variable, since the categories were not equally spaced.

For a (0,1) indicator variable, for example *Top 10*, the coefficient ***b*** estimated in SPSS is the amount by which the length of stay increases/decreases if a patient has a top 10 diagnosis (*X*=1), compared to a patient who does not have a top 10 diagnosis (*X*=0).

Categorical variables with *k*>2 categories must be recoded into *k*-1 indicator variables. Using *State* as an example, we obtain the following indicator variables:

Old variable	New Variables						
State	I1	I2	I3	I4	I5	I6	I7
NSW	0	0	0	0	0	0	0
Vic	1	0	0	0	0	0	0
Qld	0	1	0	0	0	0	0
SA	0	0	1	0	0	0	0
WA	0	0	0	1	0	0	0
Tas	0	0	0	0	1	0	0
NT	0	0	0	0	0	1	0
ACT	0	0	0	0	0	0	1

All of these seven indicator variables are included in the model simultaneously instead of a single variable with eight categories representing *State*. So there will be seven coefficients added to the regression model. The category with all indicator variables taking on the value zero is called the *reference category* (*NSW* in the above example). Each of the coefficients for the indicator variables represents the effect that a particular state has on the length of stay, compared to the reference category *NSW*. Suppose ***b*** = 2.0 for indicator variable I_1. This is interpreted as “the length of stay for a patient who is from Victoria is 2 days longer than the length of stay for a patient from NSW”.

The variables *Age, Q8, Q9, Q10, ARIA* and *State* were all recoded using indicator variables. (Note that to calculate the effect that two or more indicator variables have on the length of stay, the coefficients are simply added together.)

REFINING THE FITTED LINEAR REGRESSION MODEL

Firstly, univariate linear regression models were fitted for each explanatory variable one by one. It should be noted that univariate analyses were also carried out for Questions 12c, 13 and 14a, even though these variables were not included in any multiple regression models (since the multivariate analysis was really to investigate the effects of demographic characteristics only on length of stay). Those variables that were not statistically significant predictors of length of stay in the univariate models were not included in any further analysis.

The variables that had been significant in the univariate analyses were considered in the multivariate linear regression model. A model including all significant univariate variables was fitted, and it was found that *indigenous status* and *language* were no longer significant when combined in a model with the other variables. The model was re-fitted without these two non-significant factors – the final regression model containing ten factors plus a constant term.

Note that although the database initially contained 16,104 records, the number of cases used in the final regression model was fewer than this. There were twelve explanatory variables to consider when fitting a statistical model, and some of these variables had large numbers of categories. Consequently, there were occasions where individual categories had few observations. There were also a number of unknown/missing responses for most questions. As small frequencies within categories makes it more difficult to detect statistically significant

differences, and missing values provide no information, all records with at least one uncommon or unknown/missing/invalid response were excluded from the linear regression analysis. Table A1 shows the number of missing values and uncommon response categories for each variable included in the refined multiple linear regression model.

Table A1 *Cases excluded from analysis*

Variable	Category		No. removed
Length of stay	Unknown/missing		400
Age	Unknown/missing		97
Q8	Unknown/missing		132
	Psychiatric hospital		16
	Alcohol/drug treatment residence		3
	Mental Health community facility		10
	Homeless persons' shelter		7
	Other shelter/refuge		3
	Prison/remand centre		1
	Public place		13
		Total	185
Q9	Unknown/missing		217
	Private psychiatric practice		11
	Law enforcement agency		8
	Crisis team		34
		Total	270
Q10	Unknown/missing		150
	Hospital boarder		23
		Total	173
State	Unknown/missing		214

A total of 1,177 cases were excluded from the final analysis (note that some cases are included in more than one row of Table A1). A further six cases were ignored due to missing responses to Question 12a. In removing records from the database, we have assumed that the responses to Question 12a for these deleted cases follow the same distribution as those cases retained for analysis.

The pruned dataset for the linear regression analysis consisted of 14,921 records.

REFERENCES

Flury, B. 1997. *A First Course in Multivariate Statistics*. New York: Springer-Verlag.