Health Care Home evaluation addendum

Updated analysis

April 2017-June 2018

Dr Gary Jackson
Alex Stuteley

November 2018

Building a better working world

For further information please contact:

Alex Stuteley alex.stuteley@nz.ey.com

Ernst & Young
2 Takutai Square, Britomart, Auckland 1010, New Zealand

Suggested citation: *Health Care Home evaluation addendum: Updated analysis, April 2017-June 2018*. Auckland: Ernst & Young, 2018.

Contents

List of figures

List of tables

1. Summary

Since the publication of EY's initial Health Care Home (HCH) evaluation report in February 2017 and the evaluation update report which analysed data captured between April and September 2017, a further year's data has been added to the time series. This allows a more comprehensive analysis of the effect of the HCH model on healthcare usage.

Note: In the April – September 2017 analysis hospitalisations included under ambulatory-sensitive hospitalisations (ASH) were not restricted to the correct definition (less the age-restriction). However, once correctly defined ASH events were analysed the difference in outcome of analysis was not materially different.

This analysis compared health care utilisation rates by patients at Health Care Home (HCH) practices with patients at comparable practices with a traditional general practice model of care over a 15-month period (April 2017 to June 2018).

Four different analyses were conducted to test differing demographic and model of care contexts across the region e.g. very high use of ED in Tokoroa and Te Kuiti is attributable to these hospital acting as the designated after-hours primary care facility, and these visits being coded as ED presentations.

In the overall analysis model, the HCH model was associated with s**ignificantly lower rates of ambulatory sensitive hospitalisations (ASH)**, with an overall odds ratio (OR) **of 0.83** favouring HCH.

Each version of the analysis showed significantly reduced ASH rates. ED presentation figures were more variable, showing increases in some contexts and decreases in others. This seems to be related to the after-hours configurations locally. We would consider ED rates to not be useful for evaluating primary care interventions across different rural areas.

Māori patients had similar proportionate reductions in ASH as European patients, despite those living in more deprived areas having a lesser reduction. By age children had a greater reduction than adults, with a significant reduction in those aged 65+.

While the study design cannot definitively prove a causative effect, these findings suggest **significant acute need being prevented or successfully dealt with out of hospital** by HCH practices.

2. Methods

This analysis assesses whether there is a difference in the rates of health care utilisation events for patients at HCH practices compared with those at similar practices that have not implemented the HCH model. The analysis is based on data provided to EY by Pinnacle at a summarised line item level.[1] Events covered include:

- Ambulatory sensitive hospitalisation (ASH) – number of events that fit the ASH criteria as defined by the Ministry of Health (no age limit used)

- ED presentations (non-admitted).

2.1 Data sources and structure

Practice enrolment data was linked by enrolee NHI to ED and inpatient data provided by Waikato DHB for the months April 2017 to June 2018 (15 months in total). The analysis is based on the model of a matched open cohort study, with data from all of the HCH general practices in Pinnacle, as well as a selection of matched control practices. The control practices were chosen on the basis of having similar:

- Geographic location – especially distance from hospital
- Very low cost access (VLCA) status
- Practice size.

Note that all four practices in the Lakes locality have implemented the HCH model so there were no controls matched by location for this locality – instead similar practices in Morrinsville, Raglan and Gisborne were selected.

In the dataset there are 82,162 patients enrolled with fourteen HCH practices, and 81,785 patients enrolled with nine control practices. Due to data errors, some of these patients have been removed from the final analysis (see below). Demographic variables available for these patients include:

- Ethnicity, prioritised to level 1. It is assumed that Middle Eastern/Latin America/African (MELAA) patients are assigned to the 'Other' category
- Age – divided into 0-4, 5-14, 15-24, 25-44, 45-64 and 65+ age groups
- Deprivation quintile – taken from the NZDep13 and converted from decile to quintile. Ranges from 1-5, with 5 representing patients in the 20% most deprived areas of New Zealand.

The outcomes of interest are presented as an absolute count of events and age-standardised rates over the 15-month period of study. This analysis will not describe outcomes at the practice level – for most practices this results in an issue of small numbers, and the main focus is on the HCH model overall, not performance of individual practices.

A multiple logistic regression model was developed, allowing analysis of each demographic variable to be controlled for each other variable.

[1] Data provided by Alex Poor, Health Informatics Manager at Pinnacle Ventures Ltd on 24/9/18, covering April 2017 to June 2018. Each line has a practice/age/ethnicity/quintile/month/event type grouping and a total.

A fair proportion of patients (6.8%) were classed as having a deprivation quintile of 0. This is differentially distributed between HCH (11.9%) and control (1.6%) practices. This may introduce a degree of error in comparative analyses.

2.2 Admissions and ED presentation models

We performed a multiple logistic regression (MLR) to determine overall adjusted risks by various attributes for ASH and ED presentation. Across both HCH and control practices these rates are affected by age, ethnicity, deprivation quintile and level of ED. The following models and their estimates of effects (i.e. odds ratios) do not control for the level of ED (i.e. the type of service provided in the facility). Note the beta-coefficients were generated relative to a European 0-4 year old in quintile 1, and that this model is not validated for use with individuals (i.e. it cannot be used to predict the odds of ASH or ED attendance for a particular patient), it is only capable of explaining the factors that contribute to event rates across the population. A statistically significant OR less than 1.0 favours the HCH model.

When the analysis was initially conducted, a surprising result emerged with an increase in the rate of ED attendances under the HCH model. This is the opposite to what would be expected and led to further investigation of the data. This pointed to the differential roles of hospital EDs around Midlands, e.g. Tokoroa Hospital has an after-hours contract with local GPs, and others such as Te Kuiti, Hawera, Thames, and Taupō tend to run in a similar fashion. Because of the way these EDs function, the location of the intervention and control general practices impact the rate of ED attendance. For this reason, the merit of rate of ED attendance as a measure of management of acute health conditions is called into question. To explore the inconsistency a set of four different models were constructed and run on the data to illustrate the geographic effect. The model focused only on Waikato is likely to have the least biased comparison of practices. We also considered a Hamilton-only analysis, but this is likely biased due to significant differences in enrolled population demographics between intervention and control practices for that limited cohort.

3. Results

3.1 Model 1: All practices

This model was found to explain a significant degree of variance, with most factors producing a statistically significant effect.

The MLR found that for:

- *ASH:* The overall exponentiated coefficient (odds ratio) for patients at a HCH practice being admitted with an ASH was **0.83**
- ED: The overall odds ratio for patients at a HCH practice presenting to ED was **1.29.**

The findings for ASH are congruent with the expectations of effects of the model of care. The findings for ED are unexpected when the operating model of rural EDs is not accounted for.

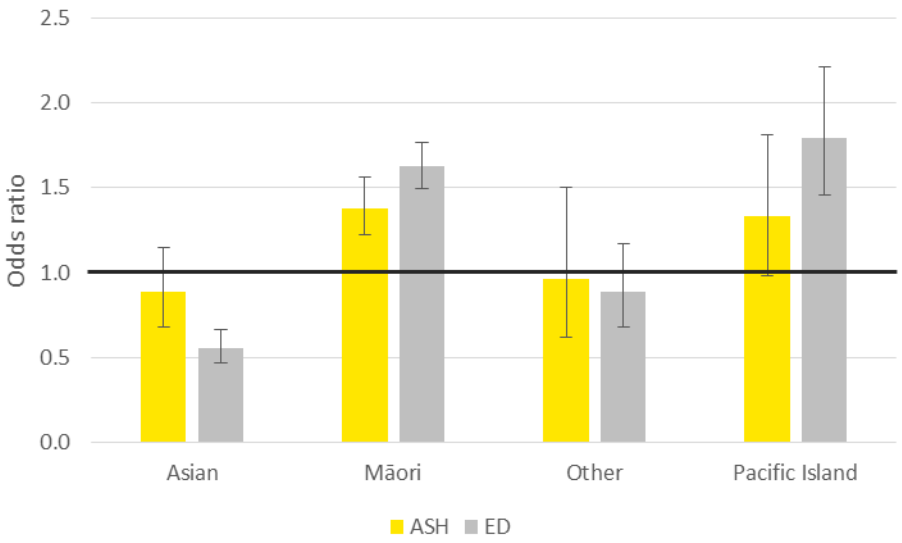

Figure 1 – Model 1: Odds ratios by ethnicity (compared to European)

The effects of Asian, Other and Pacific Island ethnicity are not significant for ASH rates in the MLR model, while the effect of Other ethnicity is not significant for ED presentation – there are small numbers of events for these patients in the dataset. These results show an increased odds associated with Māori and Pacific ethnicity for both ASH and ED, controlling for age and deprivation quintile.

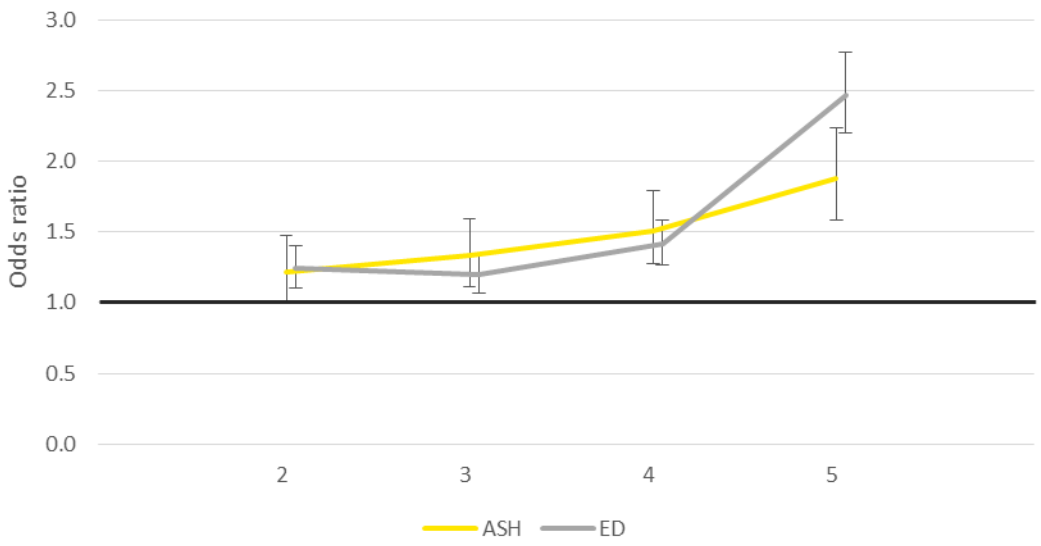

Figure 2 – Model 1: Odds ratios by deprivation (relative to quintile 1)

Controlling for age and ethnicity, odds ratios for all deprivation quintiles are significant for ASH and ED. There is the expected increasing relationship between level of deprivation and odds of ASH and ED presentation. The relationship is clearer for ASH, although spikes higher for quintile 5 for ED.

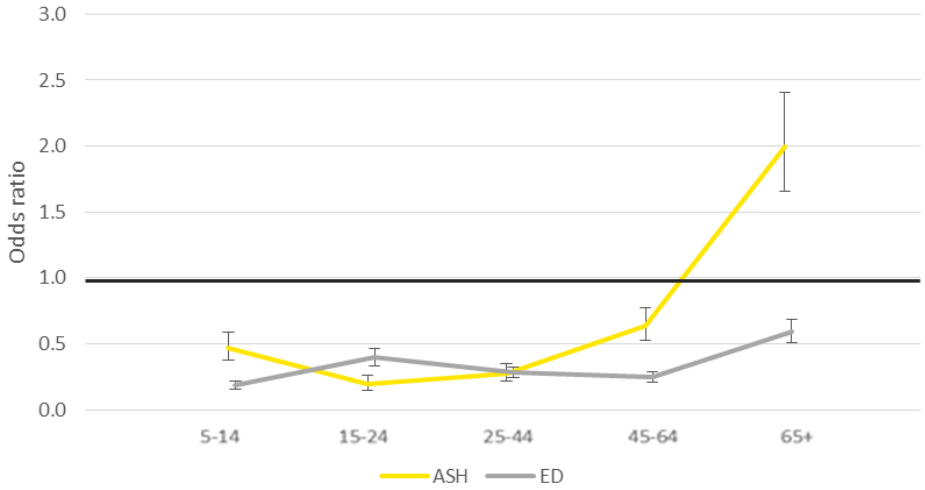

Figure 3 – Model 1: Odds ratios by age group (relative to 0-4)

For age groups the lowest risk group for ASH is 15-24 years, while the lowest risk for ED presentation is 5-14 year olds – controlling for ethnicity and deprivation. All age relationships are significant.

3.1.1 Single variable effects for ASH

For reference ethnicity, deprivation and age group tables of volumes and rates for HCH and control practices are shown. All rates are internally age-standardised in Table 1 and 2, and in Table 3 rates are age-specific rates except for the Total or age-standardised column.

Māori patients had similar proportionate reductions in ASH as European patients. Asian, Pacific and Other patients are a little small to interpret. Those living in less deprived areas (quintiles 1-3) had a higher reduction than those in poorer areas. By age children had a greater reduction than adults, with a significant reduction in those aged 65+.

Table 1 - ASH events by ethnicity and practice type

	Asian	European	Māori	Other	Pacific
Control	55	882	308	13	25
Rate per 1,000	8.3	14.3	15.3	6.9	14.3
HCH	26	806	257	14	34
Rate per 1,000	6.0	11.2	12.8	7.0	12.2
IRR	0.72	0.78	0.83	1.01	0.85

Table 2 - ASH events by deprivation and practice type

	1	2	3	4	5
Control	184	152	243	347	357
Rate per 1,000	10.8	11.8	13.6	15.0	18.3
HCH	75	185	214	293	370
Rate per 1,000	7.6	10.6	10.3	13.3	16.2
IRR	0.70	0.89	0.76	0.88	0.88

Table 3 - ASH events by age group and practice type

	00-04	05-14	15-24	25-44	45-64	65+	Total / ageSR
Control	111	157	55	127	284	549	1,283
Rate per 1,000	17.1	11.9	4.8	5.5	12.5	41.3	14.2
HCH	74	93	30	101	277	562	1,137
Rate per 1,000	14.4	7.9	3.2	5.6	12.7	34.5	12.3
IRR	0.84	0.67	0.67	1.02	1.02	0.84	0.87

3.2 Model 2: Midlands excl. Tokoroa and Te Kuiti

The rationale here is that Tokoroa (HCH) and the control used (Te Kuiti) both have populations with high-use of ED through after-hours care arrangements. If these don't balance it may distort the ED findings.

This model was found to explain a significant degree of variance, with most factors producing a statistically significant effect.

The MLR found that for:

- *ASH:* The overall exponentiated coefficient (odds ratio) for patients at a HCH practice being admitted with an ASH was **0.80**
- ED: The overall odds ratio for patients at a HCH practice presenting to ED was **1.61.**

The findings for ASH are congruent and for ED incongruent with the expectations of effects of the model of care.

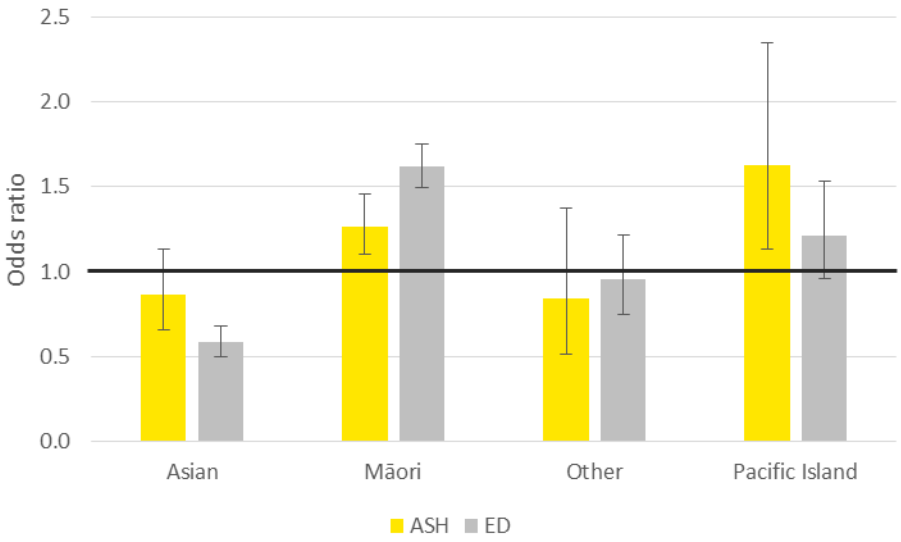

Figure 4 – Model 2: Odds ratios by ethnicity (compared to European)

The effects of Asian and Other ethnicity are not significant for ASH rates in the MLR model, while the effect of Other and Pacific Island ethnicity are not significant for ED presentation – there are small numbers of events for these patients in the dataset. These results show an increased odds associated with Māori and Pacific ethnicity for both ASH and ED, controlling for age and deprivation quintile.

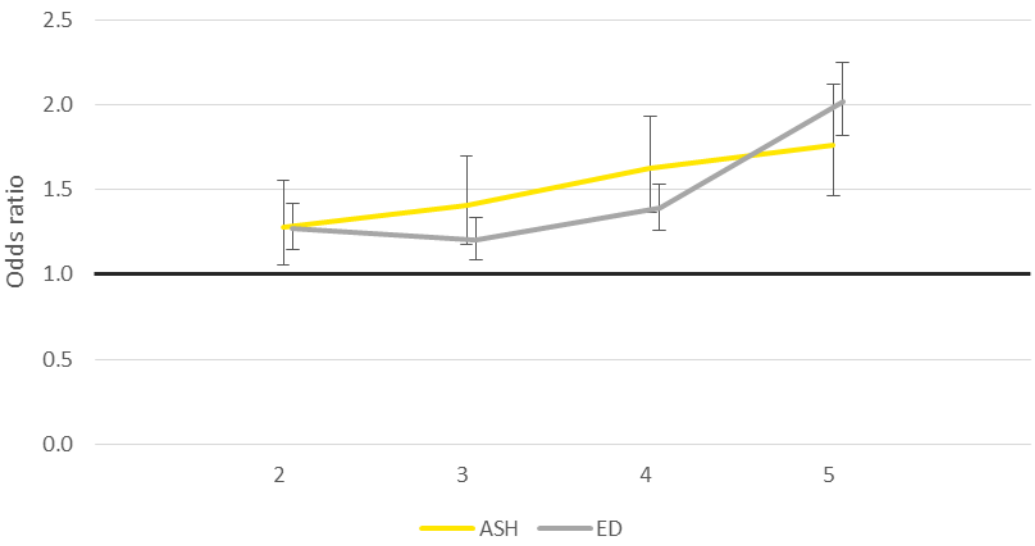

Figure 5 – Model 2: Odds ratios by deprivation (relative to quintile 1)

Controlling for age and ethnicity, odds ratios for all deprivation quintiles are significant for ASH and ED. There is a gradually increasing relationship between level of deprivation and odds of ASH and ED presentation. The relationship is clearer for ASH, although spikes higher for quintile 5 for ED.

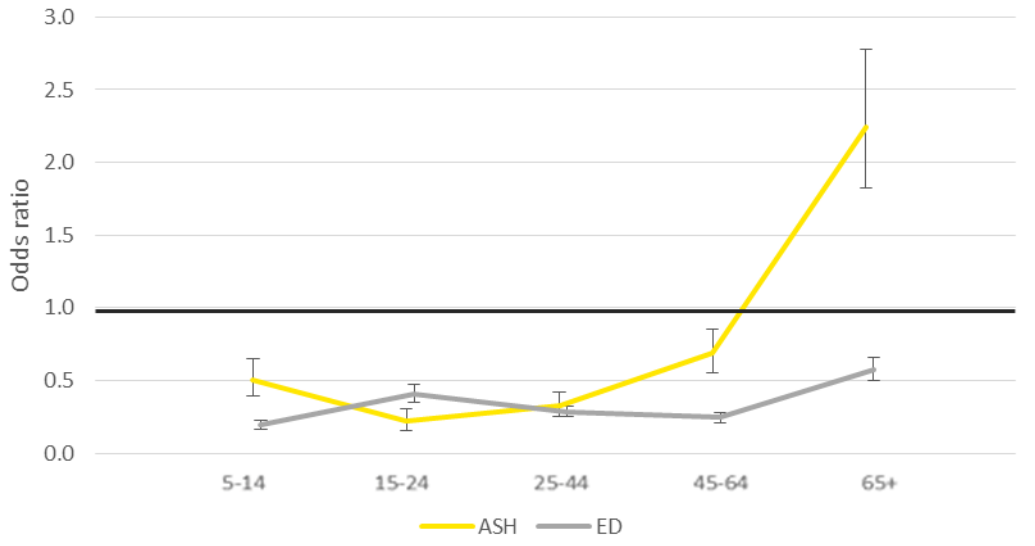

Figure 6 – Model 2: Odds ratios by age group (relative to 0-4)

For age groups the lowest risk group for ASH is 15-24 years, while the lowest risk for ED presentation is 5-14 year olds, closely followed by 45-64 year olds – controlling for ethnicity and deprivation. All age relationships are significant.

3.3 Model 3: Midlands excl. Lakes, Thames, Tokoroa and Te Kuiti

The rationale here is as for Model 2 – Thames and Taupō also have populations with high-use of ED through after-hours care arrangements. If these don't balance it may distort the ED findings.

This model was found to explain some of the variance, with few factors producing a statistically significant effect.

The MLR found that for:

- *ASH:* The overall exponentiated coefficient (odds ratio) for patients at a HCH practice being admitted with an ASH was **0.85**
- ED: The overall odds ratio for patients at a HCH practice presenting to ED was **0.68.**

The findings for ASH and ED are congruent with the expectations of effects of the model of care.

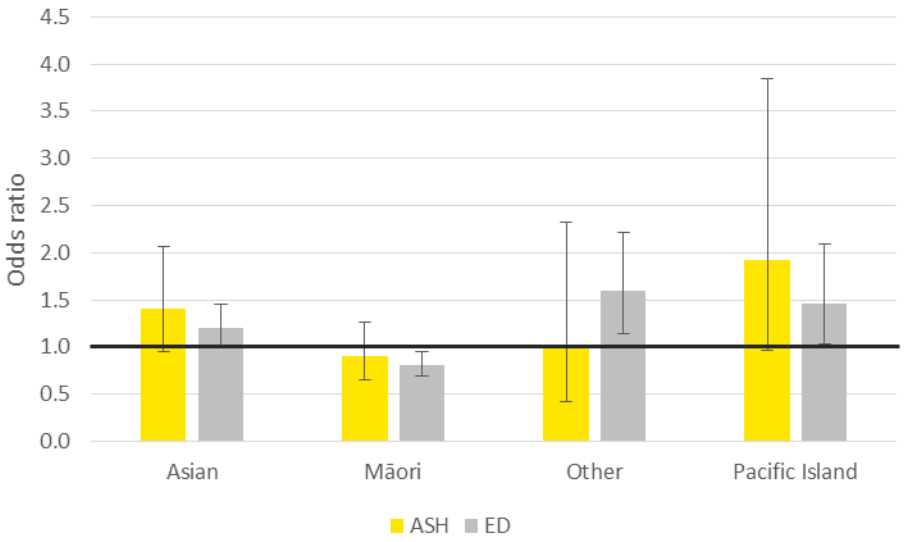

Figure 7 – Model 3: Odds ratios by ethnicity (compared to European)

The effects of ethnicity are not significant for ASH rates in the MLR model, but were all significant except for Asian ethnicity for ED rates. These results show an increased odds associated with Other and Pacific Island ethnicity for ED, controlling for age and deprivation quintile.

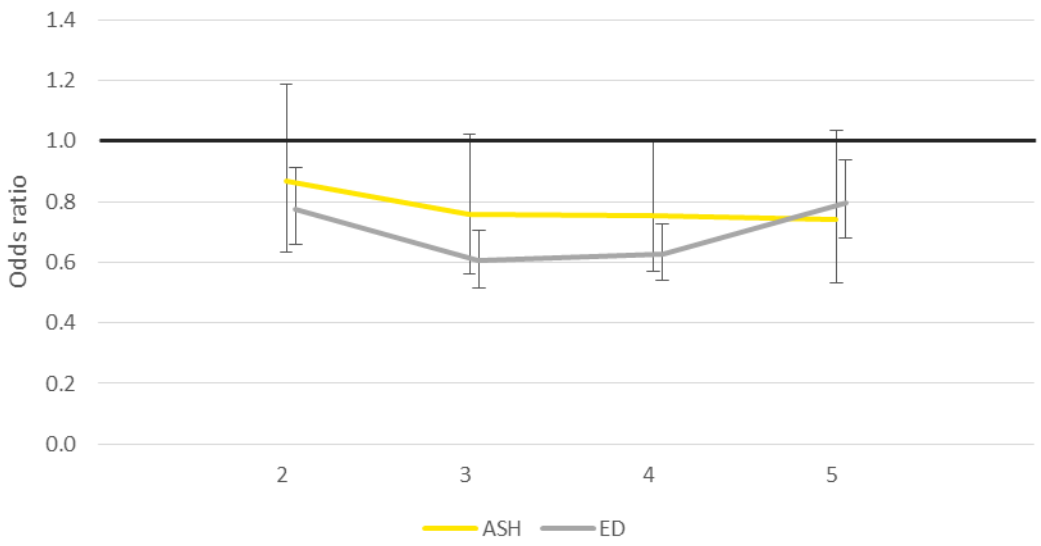

Figure 8 – Model 3: Odds ratios by deprivation (relative to quintile 1)

Controlling for age and ethnicity, odds ratios for all deprivation quintiles were not significant for ASH, but were significant for ED. It appears that as deprivation increases there is a decrease in odds of ASH and an increase in odds of ED beyond deprivation quintile 3. This finding is particularly odd as we would expect increased odds of ASH and ED as deprivation increases.

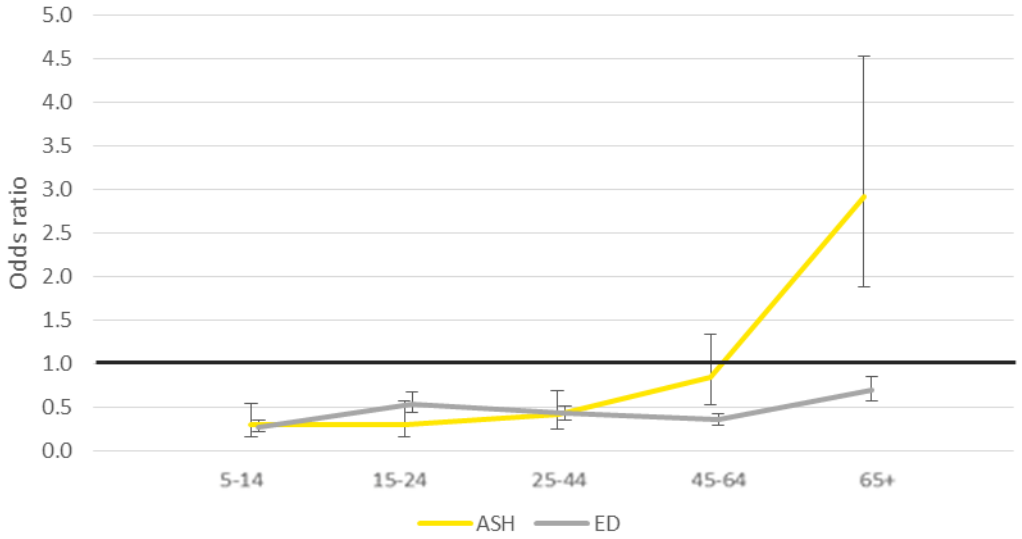

Figure 9 – Model 3: Odds ratios by age group (relative to 0-4)

For age groups the lowest risk group for ASH is 15-24 years, while the lowest risk for ED presentation is 5-14 year olds – controlling for ethnicity and deprivation. All age relationships are significant except for 45-64 year olds for ASH.

3.4 Model 4: Waikato only

This model was found to explain a significant degree of variance, with most factors producing a statistically significant effect.

The MLR found that for:

- *ASH:* The overall exponentiated coefficient (odds ratio) for patients at a HCH practice being admitted with an ASH was **0.75**
- ED: The overall odds ratio for patients at a HCH practice presenting to ED was **0.68.**

The findings for ASH and ED are congruent with the expectations of effects of the model of care, though are potentially higher than expected.

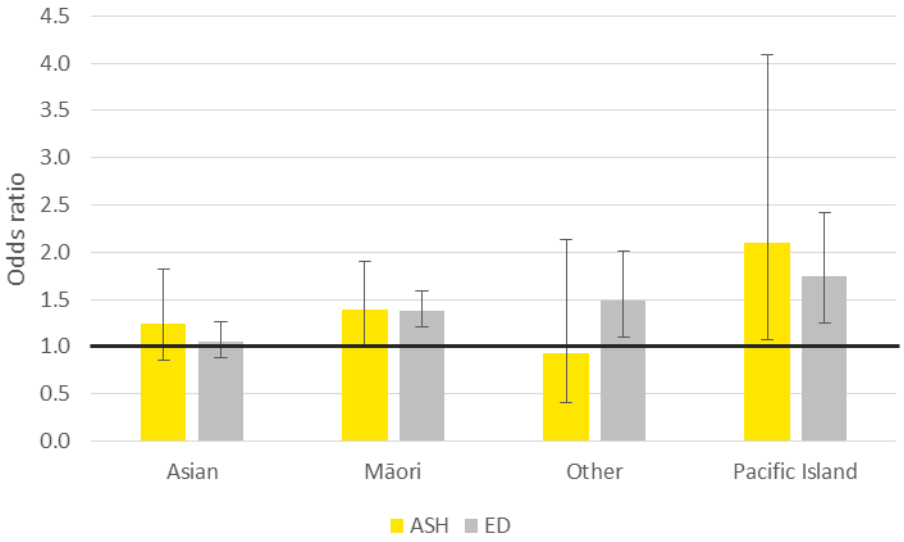

Figure 10 – Model 4: Odds ratios by ethnicity (compared to European)

The effects of Asian, Other and Pacific Island ethnicity are not significant for ASH rates in the MLR model, while the effect of Asian ethnicity is not significant for ED presentation. These results show an increased odds associated with Māori and Pacific Island ethnicity for both ASH and ED, controlling for age and deprivation quintile.

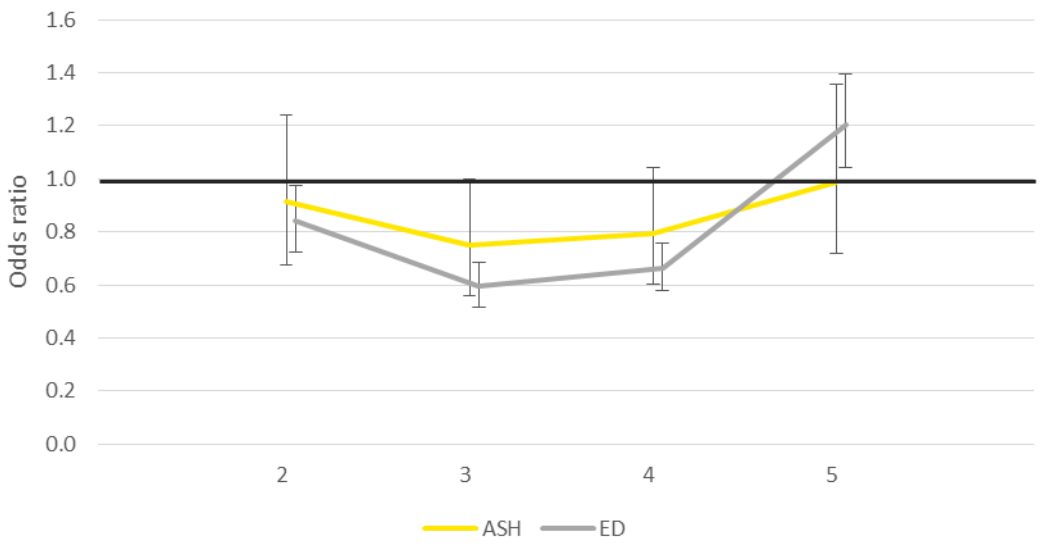

Figure 11 – Model 4: Odds ratios by deprivation (relative to quintile 1)

Controlling for age and ethnicity, odds ratios for all deprivation quintiles were not significant for ASH, but were significant for ED. It appears that as deprivation increases there is an increase in odds of ASH and ED beyond deprivation quintile 3. This finding is particularly odd as we would expect increased odds of ASH and ED as deprivation increases.

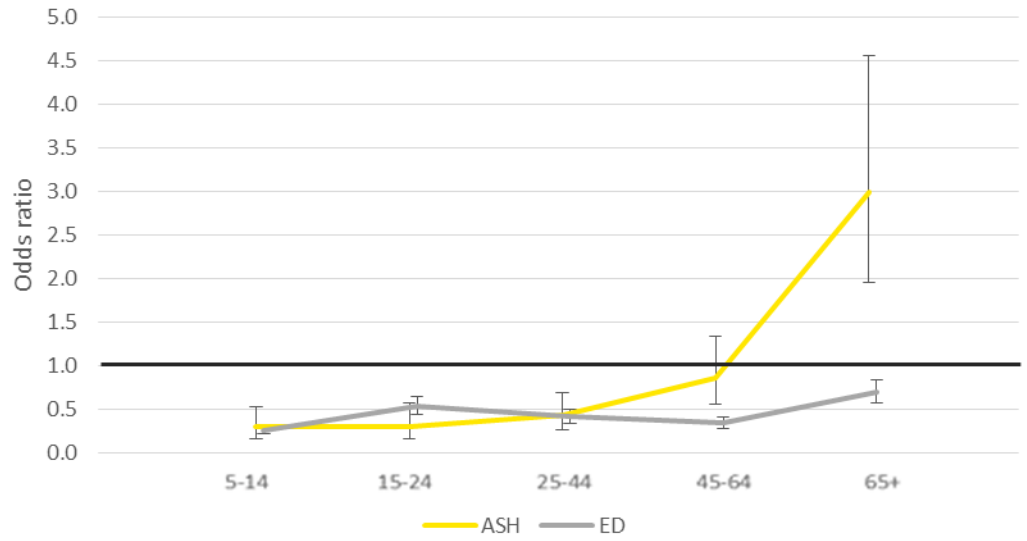

Figure 12 – Model 4: Odds ratios by age group (relative to 0-4)

For age groups the lowest risk group for ASH is 15-24 years, while the lowest risk for ED presentation is 5-14 year olds – controlling for ethnicity and deprivation. All age relationships are significant except for 45-64 year olds for ASH.

EY | Assurance | Tax | Transactions | Advisory

About EY

EY is a global leader in assurance, tax, transaction and advisory services. The insights and quality services we deliver help build trust and confidence in the capital markets and in economies the world over. We develop outstanding leaders who team to deliver on our promises to all of our stakeholders. In so doing, we play a critical role in building a better working world for our people, for our clients and for our communities.

EY refers to the global organisation and may refer to one or more of the member firms of Ernst & Young Global Limited, each of which is a separate legal entity. Ernst & Young Global Limited, a UK company limited by guarantee, does not provide services to clients. For more information about our organisation, please visit ey.com.

ey.com