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# SENSW: Data Capture Plan Analysis

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Collaborative Commissioning Data Analytics

2 March 2023

# Deliverables

The table below lists the February deliverables for the Data Capture Plan that have been addressed by the Collaborative Commissioning Data Analytics team using the LUMOS data asset.

Question	
1	Which regions of SENSW see the highest prevalence of COPD (by SA2)? What practices should be targeted for CC Match by SA2?
2	What are the % patient representations for COPD
3	Is there an effect of patient seeing GP post COPD admission on readmission. 72 hours?

# Prevalence of COPD by SA3

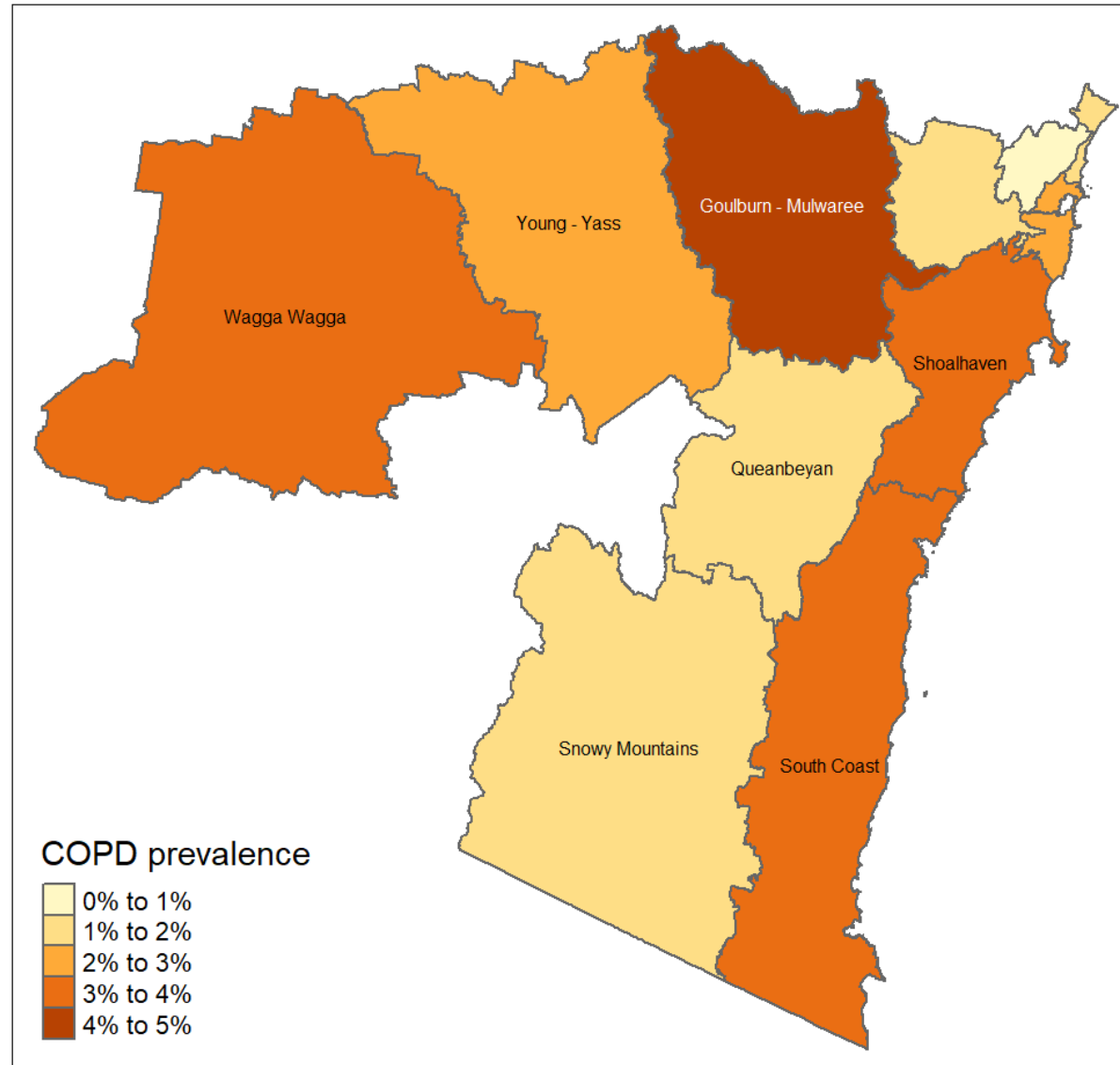
LUMOS data can only be reported at the SA3 level due to ethics guidelines. COPD prevalence is highest in the Goulburn – Mulwaree SA3 with 4.3% of the LUMOS population in this SA3 having COPD. The prevalence is lowest in the Queanbeyan SA3 at 1.2%, ignoring the Illawarra Catchment Reserve SA3 due to small population size

SA3 Code	SA3 Name	LUMOS population	COPD Prevalence (%)
10105	Goulburn - Mulwaree	17,576	4.3
11303	Wagga Wagga	377	3.4
10104	South Coast	14,463	3.3
10106	Young - Yass	1,224	2.9
10701	Dapto - Port Kembla	7,485	2.4
10703	Kiama - Shellharbour	12,187	2.2
10103	Snowy Mountains	1,396	1.6
10704	Wollongong	31,565	1.4
10102	Queanbeyan	11,106	1.2
10702	Illawarra Catchment Reserve	14	0

## Notes

- Patients were extracted from the LUMOS dataset, including their COPD status, as of the 2019 calendar year. Patients were included in this analysis if they had a recorded SA2 code located within the South Eastern NSW Primary Health Network (PHN106). SA2s were mapped to the SA3 level to conform with LUMOS ethics guidelines

# Map of COPD prevalence by SA3



*Note: Labels for some SA3s have been omitted for display purposes. See the table on the previous slide to infer what SA3s these refer to*

# COPD Re-admissions/presentations within 28 days

The tables below shows the number of hospital admissions and ED presentations where COPD was the primary reason. The number of COPD re-admissions and re-presentations within 28 days is also shown, noting the small magnitude in volumes. As of the 2019 calendar year, the **percentage of COPD-related re-admissions was 17.58%** and the **percentage of COPD related ED presentations was 13.9%**. See Appendix A1 for cohort definition and methodology.

## Hospital COPD re-admissions

Calendar Year	No. COPD hospital admissions	No. COPD re-admissions within 28 days	Re-admission %
2017	623	98	15.73
2018	650	125	19.23
2019	660	116	17.58

## ED COPD re-presentations

Calendar Year	No. COPD ED presentations	No. COPD ED re-presentations within 28 days	Re-presentation %
2017	578	73	12.63
2018	591	72	12.18
2019	626	87	13.9

# All-cause Re-admissions/presentations within 28 days

Due to the small volumes of *COPD specific* re-admission and re-presentation events within 28 days, this slide expands the scope to consider *all-cause* hospital events for the COPD cohort in SENSW. For 2019, the percentage of **re-admissions within 28 days was 49.35% of all-cause hospital admissions** in that year and the **percentage of all-cause re-presentations was 34.68%**, indicating that the cohort are frequently returning to the hospital

## Hospital all-cause re-admissions

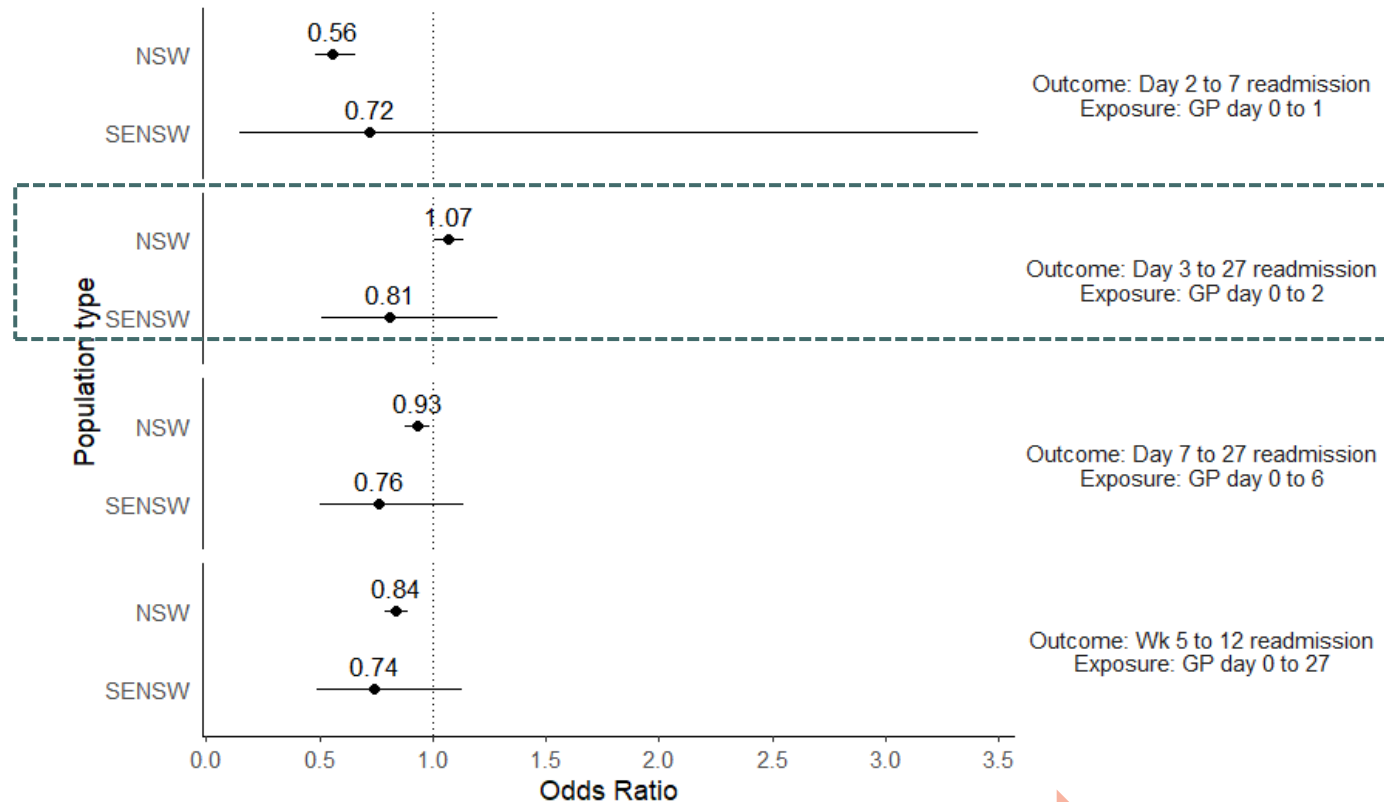
Calendar Year	No. all-cause hospital admissions	No. all-cause re-admissions within 28 days	Re-admission %
2017	10,591	5,244	49.51
2018	10,588	5,174	48.87
2019	10,645	5,253	49.35

## ED all-cause re-presentations

Calendar Year	No. all-cause ED presentations	No. all-cause ED re-presentations within 28 days	Re-presentation %
2017	8,625	3,191	37.00
2018	8,625	3,133	36.32
2019	8,889	3,083	34.68

# Impact of GP visit on readmission

The impact of a GP visit following discharge from hospital on re-admissions was modelled using the COPD population across NSW (to obtain a larger sample size) and only for patients residing in SENS. Generally, there is a **relative decrease in readmissions for patients that see a GP following their discharge from hospital**, except for the NSW cohort that see their GP in the first 3 days following discharge. For the **SENS cohort, there is a relative decrease in 28 day re-admissions of 19% if the patient saw their GP in the first 3 days following discharge.**



## Note:

- Error bars for the SENS estimate are *wider* compared to the NSW estimate due to smaller number of observations in the SENS cohort, hence the higher degree of uncertainty
- *Day 0 is counted as a day so "GP day 0 to 2" considers the first 3 days*

Relative **decrease** in re-admission

Relative **increase** in re-admission

# March Deliverables

The table below lists the upcoming March deliverables for the Data Capture Plan that will be addressed by the Collaborative Commissioning Data Analytics team using the LUMOS data asset

Question	Points for clarification
1 What are the no. of ED presentations for COPD?	<ul style="list-style-type: none"><li>Is this all-cause or COPD-related ED presentations? If the latter, is there a list of COPD related codes, noting ED uses multiple clinical code sets (e.g. SNOMED, ICD-10, ICD-9, etc.)</li></ul>
2 What % of COPD patients have a Chronic Disease Care Plan	<ul style="list-style-type: none"><li>Is there a time period to analysis uptake of MBS item 721? Noting that the claiming periods are generally every 24 months; shorter in certain circumstances</li></ul>
3 What % of patients receive a MDT intervention?	<ul style="list-style-type: none"><li>Is there a list of MBS items related to MDT intervention?</li></ul>
4 How many COPD patients access pulmonary rehabilitation?	<ul style="list-style-type: none"><li>This will be analysed using the Non-admitted Patient (NAP) data within LUMOS. Is there a list of Tier 2 of service codes that should be extracted?</li></ul>



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# Appendix

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# Appendix A.

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Re-admissions / re-presentations within 28 days

# A1. Methodology

The methodology pertaining the 28 days COPD re-admission and re-presentation analysis (slides 5 to 6) is as follows,

- **Cohort definition:** Patients diagnosed with COPD either in GP or AP setting (`GP_COPD = 1` or `AP_COPD = 1`) and attends a LUMOS GP practice located in South Eastern NSW PHN (`AREA_ID = 106`). This cohort was extracted from the LUMOS Patient Summary table
- **Identifying COPD related events:**
  - 1. *COPD hospital admissions.* The definition was taken from the Bureau of Health Information publication, [\*Bureau of Health Information. Chronic Disease Care: Another piece of the picture. 2\(2\). Sydney \(NSW\); 2012.\*](#)

*“... A principal diagnosis of COPD is identified by ICD-AM codes J41-J44, J47; and conditionally, J20 (only if there is a secondary diagnosis of J41-J44 or J47).” (p. 26)*

- 2. *COPD ED presentations.* An ED presentation was considered COPD related if it had an ICD-10-AM or SNOMED code related to COPD (see Slide 12 for the complete list). Limitations: The ED table in LUMOS also uses other clinical codesets, such as ICD-9, hence this analysis likely underestimates the number of COPD related ED presentations
- **Identifying 28 day re-admission/presentation:** The entire sequence of COPD related events for each patient were ordered in ascending dates (separation date for Admitted Patient and arrival date for Emergency Department). For each event in this sequence, if the proceeding event fell within 28 days then we flag this proceeding event as a re-admission or re-presentation event
- **Other rules:** Admitted Patient records were aggregated into a single stay number to represent a single hospital admission event. For example, a patient could transfer between different care types and this would be represented as multiple rows in the AP dataset; for the purposes of counting hospital admissions we combine these multiple records into a single admission event

## A2. COPD codes for ED presentations

The ICD-10-AM and SNOMED codes used to identify Emergency Department events related to COPD are shown below. This is based on the definitions used in the Collaborative Commissioning Data Analytics team. Note: The ED table in LUMOS also uses other clinical codesets, such as ICD-9, however this have not been included in this analysis

Clinical Codeset		Codes used
ICD-10-AM		J40, J41.0, J41.1, J41.2, J41.8, J42, J43.0, J43.1, J43.2, J43.8, J43.9, J44.0, J44.1, J44.8, J44.9
SNOMED	195951007	Acute exacerbation of chronic obstructive airways disease (disorder)
	285381006	Acute infective exacerbation of chronic obstructive airways disease (disorder)
	13645005	Chronic obstructive lung disease (disorder)
	32398004	Bronchitis (disorder)
	16146001	Viral bronchitis (disorder)
	196001008	Chronic obstructive pulmonary disease with acute lower respiratory infection (disorder)
	87433001	Pulmonary emphysema (disorder)

# A3. Comparison with LHD analysis

As a sense check, our analysis on hospital re-admission and ED re-presentations conducted using LUMOS was compared against the analysis done by Akshay at the LHD level. Our analysis reflects a higher percentage of COPD hospital re-admission and re-presentation (See slides 5 to 6) compared to the LHD analysis displayed below,

Financial year	Count of COPD IP/ED	Count of COPD IP/ED Admissions (ANDRG 2)	Percentage %
19-20	1691	164	9.6%
20-21	1263	116	9.1%
21-22	1154	96	8.3%

*Table 1 Counts of ED/IP presentations for COPD in respective financial year*

The table below lists the potential points of differences between the LUMOS and LHD analysis,

LUMOS analysis		LHD analysis
<b>Data</b>	<ul style="list-style-type: none"><li>LUMOS data asset, which is a subset of the NSW population so reflected volumes are lower</li></ul>	<ul style="list-style-type: none"><li>Health Information Exchange (HIE) database</li></ul>
<b>Cohort</b>	<ul style="list-style-type: none"><li>Patients diagnosed with COPD either in the GP or admitted patient setting <b>and</b> attend a LUMOS GP practice located in the South Eastern Primary Health Network (PHN106)</li></ul>	<ul style="list-style-type: none"><li>Unclear. Cohort is potentially identified from the facility ID for the Southern NSW LHD only. To be clarified with Akshay</li></ul>
<b>Clinical codeset</b>	<ul style="list-style-type: none"><li>BHI definition for hospital re-admission</li><li>ICD-10-AM and SNOMED COPD related codes for ED re-presentation</li></ul>	<ul style="list-style-type: none"><li>Australian Refined Diagnosis Related Groups (AR-DRG)</li></ul>
<b>28 days definition</b>	<ul style="list-style-type: none"><li>COPD-related event in the 28 days following another COPD-related event</li></ul>	<ul style="list-style-type: none"><li>Unclear. To be clarified with Akshay</li></ul>

# A4. Comparison with BHI analysis

Our hospital re-admission results using the LUMOS data was also compared to the Bureau of Health Information COPD analysis since we are using the same definitions (see Slide 11). BHI reports results at the LHD level so to reflect the South Eastern NSW PHN, both the Illawarra Shoalhaven and Southern NSW LHD numbers are shown.

The **results using LUMOS show a lower number of COPD hospitalisations**, which is to be expected given the activity we observe in the data reflects the subset of patients enrolled in LUMOS GP practices. The **rate of re-admissions is also higher in the LUMOS data**. This may reflect our use of more recent data (Jan to Dec 2019 compared to Jul 2009 to Jun 2010), but also patients enrolled in LUMOS are generally of poorer health hence may have higher rates of poorer outcomes

LHD	BHI Results (Jul 2009 to Jun 2010)		LUMOS Results (Jan to Dec 2019)	
	Number of COPD hospitalisations	Crude readmission rate	Number of COPD hospitalisations	Crude readmission rate
Illawarra Shoalhaven LHD	1,221	13.8	<b>660</b>	<b>17.58</b>
Southern NSW LHD	1,020	12.5		

## Notes

- Source: [Bureau of Health Information. Chronic Disease Care: Another piece of the picture. 2\(2\). Sydney \(NSW\); 2012. p. 20-22](#)
- The BHI results are for the period July 2009 to June 2010 whereas our LUMOS analysis is based on the period Jan to Dec 2019
- *Crude readmission rate* from the BHI results refers to “COPD discharges followed by condition-specific readmissions to any NSW hospital within 28 days, as a proportion of total principal diagnosis hospitalisations”. Based on this text description, our methods using the LUMOS data align to this definition

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# Appendix B.

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Impact of GP visit within 3 days of discharge on re-admissions

# B1. Methodology

The methodology of the impact of a GP visit within 3 days of discharge on readmissions is as follows,

- **Inclusion / Exclusion criteria**
  - Adults ages 20+
  - LUMOS data from 2017 to 2019
  - South-Eastern NSW (SENSW) PHN selected
  - All admissions and readmissions were unplanned
  - COPD patients were defined as being diagnosed either at the GP or during hospitalisation
  - Readmissions prior to the GP visit or within the GP follow-up period were removed to ensure the impact was appropriately measured
- **Statistical analysis**
  - A logistic regression model was used to analyse the effect of a GP visit within 3 days (0-2 days) on the outcome of 28-day readmission.
  - The impact of GP visits on readmission were adjusted for various patient factors (see Appendix B2)



# B1. Patient factors adjusted for

Below lists the various patient factors that were adjusted for in the regression model. This includes both patient sociodemographic factors and historical health activity. The modelled reference category is also shown.

- GP visit 1 year prior (Categorical)
- GP-type ED visit post discharge (Ref: No)
- Non GP-type ED visit post discharge (Ref: No)
- Age group (Categorical; Ref: 40-49)
- Gender (Ref: Male)
- SEIFA index (Categorical; Ref: 1<sup>st</sup> quintile)
- Martial Status (Categorical; Ref: Married)
- Smoking Status (Categorical; Ref: No)
- Remoteness (Categorical; Ref: Major cities)
- Number of conditions (Categorical; Ref: 0)
- Number of medications (Categorical; Ref: 0)
- Mode of separation (Categorical; Ref: Discharge by hospital)
- Length of Stay (Categorical; Ref: 2-7 days)
- Number of principal procedures (Categorical; Ref: 0)
- Historical hospital usage 1 year prior (Numeric)
  - Length of overnight stay for planned admissions
  - Length of overnight stay for unplanned admissions
  - Number of same-day unplanned admissions
  - Number of non GP-type ED visits
  - Number of GP-type ED visits
  - Number of days visiting NAP clinics

# B3. Detailed model output

Table 1. Model output for all SE NSW where the outcome variable was Readmission within 3-27 days and the exposure variable was GP visit within 0-2 days

Variable	OR	95% CI	p value
(Intercept)	0.0221865	[0, 0.1]	< 0.001
GP_PostDay0_2_binaryYes	0.812666	[0.51, 1.29]	0.3795
GP_Pre1y_cat1-2	0.6277202	[0.36, 1.08]	0.0933
GP_Pre1y_cat13+	1.2918923	[0.87, 1.92]	0.2077
GP_Pre1y_cat3-6	0.9849037	[0.56, 1.72]	0.9573
GP_Pre1y_cat7-12	1.0542878	[0.63, 1.77]	0.8417
ED_GPtype_Postw1_binaryTRUE	0.7436168	[0.25, 2.22]	0.5955
ED_nonGPtype_Postw1_binaryTRUE	20.440655	[13.33, 31.35]	< 0.001
agegroup_10y20-29	0.2975837	[0.05, 1.86]	0.1945
agegroup_10y30-39	2.34615	[0.62, 8.87]	0.2089
agegroup_10y50-59	0.9737144	[0.45, 2.09]	0.9454
agegroup_10y60-69	0.9957574	[0.48, 2.08]	0.991
agegroup_10y70-79	1.5113144	[0.72, 3.16]	0.2731
agegroup_10y80-89	1.3569567	[0.63, 2.94]	0.439
agegroup_10y90+	1.9584124	[0.84, 4.56]	0.1191
GenderFemale	0.9888143	[0.74, 1.32]	0.9396
irsad_quintile_at_adm3-4	0.9148909	[0.63, 1.33]	0.6416
irsad_quintile_at_adm5-6	1.8196119	[1.27, 2.61]	0.0012
irsad_quintile_at_adm7-8	1.2516933	[0.73, 2.15]	0.4143
irsad_quintile_at_adm9-10	1.945575	[1.07, 3.53]	0.0283
Marital_StatusDivorced	2.1071703	[1.41, 3.15]	3.00E-04
Marital_StatusNever Married	1.6797702	[1.01, 2.79]	0.045
Marital_StatusSeparated	1.4293537	[0.79, 2.57]	0.2328
Marital_StatusWidowed	1.0779206	[0.73, 1.59]	0.7067
Smoking_status	1.4446639	[1.07, 1.95]	0.0156
Remoteness_descInner Regional	1.1267958	[0.78, 1.63]	0.5285
Remoteness_descOuter Regional & Remote	1.2803538	[0.88, 1.87]	0.1933
number_condition_cat2	1.1868377	[0.32, 4.39]	0.7976
number_condition_cat3+	2.0068482	[0.6, 6.76]	0.2612
number_med_cat1-4	1.0015612	[0.71, 1.42]	0.993
number_med_cat5+	1.0769003	[0.71, 1.64]	0.7296
mode_of_separation10	1.28E-05	[0, 2.38524618203242e+2]	0.9702
mode_of_separation2	0.4955512	[0.16, 1.5]	0.2139
mode_of_separation3	0.9573156	[0.46, 2]	0.9078
mode_of_separation8	4.8531304	[0.23, 104.57]	0.3133
los_cat1	0.7192607	[0.46, 1.13]	0.1565
los_cat8+	0.9322591	[0.65, 1.34]	0.7038
los_catsame-day	0.0665493	[0.03, 0.13]	< 0.001
number_proc_cat1	1.0531943	[0.73, 1.53]	0.7855
number_proc_cat2+	0.9859528	[0.52, 1.86]	0.9653
los_planned_Pre1y	1.0059858	[1, 1.02]	0.1907
los_unplanned_Pre1y	1.0003637	[1, 1]	0.8666
sameday_planned_Pre1y	0.9059708	[0.84, 0.98]	0.0141
sameday_unplanned_Pre1y	0.6463618	[0.43, 0.85]	0.0022
ED_nonGPtype_Pre1y	1.0925145	[1.06, 1.13]	< 0.001
ED_GPtype_Pre1y	1.0530139	[1, 1.1]	0.0326
NAP_TREATMENTDAY_Pre1y	1.0031067	[1, 1.01]	0.1939

Table 2. Model output for all NSW where the outcome variable was Readmission within 3-27 days and the exposure variable was GP visit within 0-2 days

Variable	OR	95% CI	p value
(Intercept)	0.0531296	[0.04, 0.07]	< 0.001
GP_PostDay0_2_binaryYes	1.070909	[1.01, 1.14]	0.0269
GP_Pre1y_cat1-2	1.0020317	[0.93, 1.08]	0.9553
GP_Pre1y_cat13+	1.0097142	[0.95, 1.07]	0.7364
GP_Pre1y_cat3-6	0.8785538	[0.81, 0.95]	0.002
GP_Pre1y_cat7-12	0.8688707	[0.81, 0.94]	3.00E-04
ED_GPtype_Postw1_binaryTRUE	1.1753682	[1.01, 1.37]	0.0385
ED_nonGPtype_Postw1_binaryTRUE	12.938799	[12.11, 13.82]	< 0.001
agegroup_10y20-29	0.8522851	[0.65, 1.11]	0.2376
agegroup_10y30-39	1.0921464	[0.89, 1.34]	0.4006
agegroup_10y50-59	1.1862883	[1.05, 1.34]	0.0055
agegroup_10y60-69	1.3490248	[1.2, 1.51]	< 0.001
agegroup_10y70-79	1.5169216	[1.35, 1.7]	< 0.001
agegroup_10y80-89	1.5925097	[1.42, 1.79]	< 0.001
agegroup_10y90+	1.5624758	[1.37, 1.78]	< 0.001
GenderFemale	0.9536817	[0.91, 0.99]	0.0264
irsad_quintile_at_adm3-4	0.9710495	[0.92, 1.02]	0.2724
irsad_quintile_at_adm5-6	0.9321862	[0.88, 0.99]	0.0274
irsad_quintile_at_adm7-8	0.9045613	[0.84, 0.97]	0.0051
irsad_quintile_at_adm9-10	0.9003669	[0.84, 0.96]	0.0028
Marital_StatusDivorced	1.1233273	[1.05, 1.2]	4.00E-04
Marital_StatusNever Married	1.0730611	[1, 1.15]	0.0367
Marital_StatusSeparated	1.2355073	[1.13, 1.35]	< 0.001
Marital_StatusWidowed	1.0905902	[1.03, 1.15]	0.0018
Smoking_status	1.1794266	[1.13, 1.23]	< 0.001
Remoteness_descInner Regional	0.877939	[0.83, 0.93]	< 0.001
Remoteness_descOuter Regional & Remote	0.9051424	[0.84, 0.97]	0.0066
number_condition_cat2	1.289333	[1.07, 1.56]	0.0087
number_condition_cat3+	1.7143753	[1.43, 2.05]	< 0.001
number_med_cat1-4	0.9258368	[0.88, 0.97]	0.0025
number_med_cat5+	0.9931346	[0.93, 1.06]	0.8309
mode_of_separation10	0.7219854	[0.38, 1.39]	0.3293
mode_of_separation2	1.0620107	[0.93, 1.22]	0.386
mode_of_separation3	0.8666474	[0.79, 0.95]	0.0031
mode_of_separation8	0.3683358	[0.23, 0.59]	< 0.001
los_cat1	0.8382399	[0.79, 0.89]	< 0.001
los_cat8+	1.1062626	[1.05, 1.17]	2.00E-04
los_catsame-day	0.0912014	[0.08, 0.1]	< 0.001
number_proc_cat1	1.1280115	[1.07, 1.19]	< 0.001
number_proc_cat2+	0.8439722	[0.76, 0.93]	9.00E-04
los_planned_Pre1y	0.99934	[1, 1]	0.4386
los_unplanned_Pre1y	1.0052945	[1, 1.01]	< 0.001
sameday_planned_Pre1y	0.939292	[0.93, 0.95]	< 0.001
sameday_unplanned_Pre1y	1.0950996	[1.06, 1.13]	< 0.001
ED_nonGPtype_Pre1y	1.0596113	[1.05, 1.06]	< 0.001
ED_GPtype_Pre1y	0.9826282	[0.97, 0.99]	0.0011
NAP_TREATMENTDAY_Pre1y	1.0020136	[1, 1]	< 0.001

# B3. Detailed model output

Table 3. Model output for all SE NSW where the outcome variable was Readmission within 2-7 days and the exposure variable was GP visit within 0-1 days

Variable	OR	95% CI	p value
(Intercept)	4.17E-05	[0, 0]	< 0.001
GP_PostDay0_1_binary	0.72175906	[0.15, 3.41]	0.6809
GP_Pre1y_cat1-2	0.88306005	[0.25, 3.09]	0.8456
GP_Pre1y_cat13+	0.59442556	[0.23, 1.55]	0.2862
GP_Pre1y_cat3-6	1.06863824	[0.3, 3.75]	0.9174
GP_Pre1y_cat7-12	0.79171702	[0.24, 2.64]	0.704
ED_GPtype_PostW1_binaryTRUE	0.28555972	[0.05, 1.75]	0.1758
ED_nonGPtype_PostW1_binaryTRUE	2913.32643	[647.59, 13106.2]	< 0.001
agegroup_10y20-29	0.27049326	[0.01, 5.82]	0.4037
agegroup_10y30-39	1.21E-06	[0, Inf]	0.9899
agegroup_10y50-59	0.98120074	[0.2, 4.7]	0.9811
agegroup_10y60-69	2.34067221	[0.51, 10.83]	0.2765
agegroup_10y70-79	1.93996381	[0.38, 9.83]	0.4235
agegroup_10y80-89	3.91039565	[0.7, 21.8]	0.1199
agegroup_10y90+	4.31177772	[0.64, 29.18]	0.1341
GenderFemale	1.02490427	[0.49, 2.13]	0.9474
irsad_quintile_at_adm3-4	0.82964893	[0.36, 1.93]	0.6643
irsad_quintile_at_adm5-6	1.2137542	[0.44, 3.34]	0.7075
irsad_quintile_at_adm7-8	0.65401313	[0.21, 2.07]	0.4698
irsad_quintile_at_adm9-10	1.41730909	[0.39, 5.2]	0.599
Marital_StatusDivorced	0.69905447	[0.25, 1.96]	0.4969
Marital_StatusNever Married	1.99422142	[0.45, 8.91]	0.3662
Marital_StatusSeparated	2.04170736	[0.54, 7.75]	0.2945
Marital_StatusWidowed	1.36460505	[0.55, 3.37]	0.5007
Smoking_status	1.40997601	[0.68, 2.9]	0.3513
Remoteness_descInner Regional	1.10483958	[0.45, 2.74]	0.8293
Remoteness_descOuter Regional & Remote	1.10077361	[0.37, 3.24]	0.8618
number_condition_cat2	4.39694297	[0.13, 153.64]	0.4141
number_condition_cat3+	3.58443089	[0.12, 104.15]	0.4577
number_med_cat1-4	2.10002765	[0.89, 4.93]	0.0884
number_med_cat5+	2.11510932	[0.73, 6.09]	0.1653
mode_of_separation10	9.32E-06	[0, Inf]	0.9974
mode_of_separation2	0.11747751	[0.01, 1.31]	0.0816
mode_of_separation3	0.29045737	[0.02, 3.92]	0.3518
mode_of_separation8	3.43E-06	[0, Inf]	0.9978
los_cat1	1.05053751	[0.36, 3.06]	0.9281
los_cat8+	1.07401066	[0.4, 2.89]	0.8875
los_catsame-day	0.03365035	[0.01, 0.1]	< 0.001
number_proc_cat1	1.30292372	[0.56, 3.01]	0.5355
number_proc_cat2+	2.73645105	[0.46, 16.34]	0.2696
los_planned_Pre1y	NA	[NA, NA]	0.7971
los_unplanned_Pre1y	NA	[NA, NA]	0.0504
sameday_planned_Pre1y	NA	[NA, NA]	0.9254
sameday_unplanned_Pre1y	NA	[NA, NA]	< 0.001
ED_nonGPtype_Pre1y	1.00882555	[0.94, 1.08]	0.6809
ED_GPtype_Pre1y	1.08232047	[1, 1.17]	0.8456
NAP_TREATMENTDAY_Pre1y	0.99934331	[0.99, 1.01]	0.2862

Table 4. Model output for all NSW where the outcome variable was Readmission within 2-7 days and the exposure variable was GP visit within 0-1 days

Variable	OR	95% CI	p value
(Intercept)	0.0013658	[0, 0]	< 0.001
GP_PostDay0_1_binary	0.56173016	[0.48, 0.66]	< 0.001
GP_Pre1y_cat1-2	1.15575298	[1, 1.34]	0.0576
GP_Pre1y_cat13+	1.09701111	[0.97, 1.24]	0.1374
GP_Pre1y_cat3-6	1.04906884	[0.88, 1.25]	0.5955
GP_Pre1y_cat7-12	1.15699012	[0.99, 1.36]	0.0751
ED_GPtype_PostW1_binaryTRUE	0.67243418	[0.53, 0.86]	0.0016
ED_nonGPtype_PostW1_binaryTRUE	651.684954	[560.85, 757.23]	< 0.001
agegroup_10y20-29	1.24329629	[0.86, 1.8]	0.2522
agegroup_10y30-39	1.13958419	[0.81, 1.59]	0.4459
agegroup_10y50-59	1.26791105	[1.03, 1.57]	0.0276
agegroup_10y60-69	1.52519427	[1.24, 1.87]	1.00E-04
agegroup_10y70-79	1.94529784	[1.59, 2.38]	< 0.001
agegroup_10y80-89	2.15431668	[1.74, 2.66]	< 0.001
agegroup_10y90+	2.20739001	[1.72, 2.84]	< 0.001
GenderFemale	1.08853526	[0.99, 1.19]	0.0676
irsad_quintile_at_adm3-4	0.95806864	[0.85, 1.07]	0.4625
irsad_quintile_at_adm5-6	1.14507246	[1, 1.31]	0.0511
irsad_quintile_at_adm7-8	1.00221203	[0.86, 1.17]	0.9776
irsad_quintile_at_adm9-10	1.16130102	[1, 1.35]	0.0478
Marital_StatusDivorced	0.87367345	[0.76, 1.01]	0.0657
Marital_StatusNever Married	1.10437655	[0.96, 1.27]	0.1582
Marital_StatusSeparated	1.09100459	[0.9, 1.33]	0.3878
Marital_StatusWidowed	1.08229726	[0.96, 1.22]	0.2006
Smoking_status	1.04944991	[0.96, 1.15]	0.3126
Remoteness_descInner Regional	0.85511964	[0.76, 0.96]	0.0096
Remoteness_descOuter Regional & Remote	1.05137978	[0.9, 1.23]	0.5305
number_condition_cat2	1.00806607	[0.7, 1.46]	0.9662
number_condition_cat3+	1.13972983	[0.81, 1.61]	0.4584
number_med_cat1-4	0.95964542	[0.86, 1.07]	0.4487
number_med_cat5+	0.93522601	[0.81, 1.08]	0.3524
mode_of_separation10	1.19437216	[0.3, 4.7]	0.7994
mode_of_separation2	0.8915119	[0.71, 1.12]	0.3155
mode_of_separation3	0.76071956	[0.6, 0.96]	0.023
mode_of_separation8	0.34202674	[0.14, 0.83]	0.0182
los_cat1	0.73302393	[0.64, 0.84]	< 0.001
los_cat8+	1.07753016	[0.95, 1.23]	0.26
los_catsame-day	0.03752918	[0.03, 0.04]	< 0.001
number_proc_cat1	1.06218614	[0.95, 1.19]	0.2914
number_proc_cat2+	0.96466363	[0.76, 1.22]	0.7676
los_planned_Pre1y	1.07353548	[0.85, 1.36]	0.5556
los_unplanned_Pre1y	1.04276919	[0.75, 1.45]	0.8036
sameday_planned_Pre1y	0.9917453	[0.74, 1.33]	0.9554
sameday_unplanned_Pre1y	1.83925156	[0.14, 24.09]	0.6425
ED_nonGPtype_Pre1y	1.00371469	[1, 1.01]	0.0159
ED_GPtype_Pre1y	0.99353241	[0.98, 1.01]	0.4213
NAP_TREATMENTDAY_Pre1y	1.00094142	[1, 1]	0.1937

# B3. Detailed model output

Table 5. Model output for all SE NSW where the outcome variable was Readmission within 7-27 days and the exposure variable was GP visit within 0-6 days

Variable	OR	95% CI	p value
(Intercept)	0.03177747	[0.01, 0.14]	< 0.001
GP_PostW1_binaryYes	0.75845	[0.5, 1.14]	0.1868
GP_Pre1y_cat1-2	0.67678228	[0.38, 1.2]	0.1794
GP_Pre1y_cat13+	1.4234626	[0.91, 2.24]	0.1257
GP_Pre1y_cat3-6	0.93398988	[0.5, 1.74]	0.8293
GP_Pre1y_cat7-12	1.15790405	[0.67, 2.01]	0.6028
ED_GPtype_PostW1_binaryTRUE	1.56754241	[0.54, 4.52]	0.4052
ED_nonGPtype_PostW1_binaryTRUE	1.08308763	[0.55, 2.14]	0.8181
agegroup_10y20-29	0.29562944	[0.03, 2.53]	0.2656
agegroup_10y30-39	1.86526146	[0.51, 6.81]	0.3456
agegroup_10y50-59	0.79682143	[0.38, 1.69]	0.5536
agegroup_10y60-69	0.7125854	[0.34, 1.49]	0.3682
agegroup_10y70-79	1.16672002	[0.56, 2.43]	0.6808
agegroup_10y80-89	0.9246	[0.42, 2.02]	0.8445
agegroup_10y90+	1.2920207	[0.55, 3.06]	0.5598
GenderFemale	1.00253963	[0.74, 1.36]	0.9871
irsad_quintile_at_adm3-4	0.95602324	[0.64, 1.43]	0.8253
irsad_quintile_at_adm5-6	1.83152436	[1.26, 2.67]	0.0017
irsad_quintile_at_adm7-8	1.23501461	[0.68, 2.23]	0.4852
irsad_quintile_at_adm9-10	2.04855934	[1.11, 3.8]	0.0227
Marital_StatusDivorced	2.39586824	[1.58, 3.63]	< 0.001
Marital_StatusNever Married	1.66931201	[0.99, 2.82]	0.0558
Marital_StatusSeparated	1.45950837	[0.79, 2.69]	0.2249
Marital_StatusWidowed	1.12700847	[0.73, 1.73]	0.5841
Smoking_status	1.45129654	[1.06, 1.98]	0.0196
Remoteness_descInner Regional	1.28714366	[0.88, 1.89]	0.1973
Remoteness_descOuter Regional & Remote	1.57656686	[1.07, 2.32]	0.0216
number_condition_cat2	1.08296239	[0.29, 4.06]	0.9059
number_condition_cat3+	1.79893441	[0.53, 6.11]	0.3464
number_med_cat1-4	0.94859051	[0.66, 1.37]	0.7779
number_med_cat5+	0.99330681	[0.64, 1.55]	0.9764
mode_of_separation10	3.53E-06	[0, Inf]	0.9797
mode_of_separation2	0.89554044	[0.33, 2.45]	0.8296
mode_of_separation3	1.01442544	[0.47, 2.18]	0.9708
mode_of_separation8	3.78752545	[0.16, 91.47]	0.4124
los_cat1	0.57768383	[0.35, 0.95]	0.0317
los_cat8+	0.92587403	[0.63, 1.35]	0.691
los_catsame-day	0.71318689	[0.29, 1.73]	0.4558
number_proc_cat1	1.03503592	[0.7, 1.53]	0.8637
number_proc_cat2+	0.88923572	[0.45, 1.74]	0.7327
los_planned_Pre1y	NA	[NA, NA]	< 0.001
los_unplanned_Pre1y	NA	[NA, NA]	0.2282
sameday_planned_Pre1y	NA	[NA, NA]	0.5472
sameday_unplanned_Pre1y	NA	[NA, NA]	< 0.001
ED_nonGPtype_Pre1y	1.08669884	[1.05, 1.12]	0.1868
ED_GPtype_Pre1y	0.96782083	[0.92, 1.02]	0.1794
NAP_TREATMENTDAY_Pre1y	1.00152769	[1, 1.01]	0.1257

Table 6. Model output for all NSW where the outcome variable was Readmission within 7-27 days and the exposure variable was GP visit within 0-6 days

Variable	OR	95% CI	p value
(Intercept)	0.04788167	[0.04, 0.06]	< 0.001
GP_PostW1_binaryYes	0.93367362	[0.88, 0.99]	0.0207
GP_Pre1y_cat1-2	1.00675238	[0.93, 1.08]	0.8595
GP_Pre1y_cat13+	1.00137938	[0.94, 1.07]	0.967
GP_Pre1y_cat3-6	0.86330822	[0.79, 0.94]	0.0011
GP_Pre1y_cat7-12	0.84273075	[0.78, 0.92]	1.00E-04
ED_GPtype_PostW1_binaryTRUE	1.35459382	[1.16, 1.58]	1.00E-04
ED_nonGPtype_PostW1_binaryTRUE	0.84480025	[0.76, 0.94]	0.0012
agegroup_10y20-29	0.9321797	[0.71, 1.22]	0.6049
agegroup_10y30-39	1.06685426	[0.86, 1.33]	0.5615
agegroup_10y50-59	1.20245573	[1.06, 1.37]	0.0044
agegroup_10y60-69	1.33031413	[1.18, 1.5]	< 0.001
agegroup_10y70-79	1.46603104	[1.3, 1.65]	< 0.001
agegroup_10y80-89	1.54405754	[1.36, 1.75]	< 0.001
agegroup_10y90+	1.53969398	[1.34, 1.77]	< 0.001
GenderFemale	0.95250958	[0.91, 1]	0.0311
irsad_quintile_at_adm3-4	0.95082837	[0.9, 1]	0.0744
irsad_quintile_at_adm5-6	0.91492679	[0.86, 0.98]	0.0085
irsad_quintile_at_adm7-8	0.88715608	[0.82, 0.96]	0.0016
irsad_quintile_at_adm9-10	0.87532712	[0.81, 0.94]	3.00E-04
Marital_StatusDivorced	1.18743587	[1.11, 1.27]	< 0.001
Marital_StatusNever Married	1.09824204	[1.02, 1.18]	0.0085
Marital_StatusSeparated	1.29384131	[1.18, 1.42]	< 0.001
Marital_StatusWidowed	1.094815	[1.03, 1.16]	0.0022
Smoking_status	1.22845213	[1.17, 1.29]	< 0.001
Remoteness_descInner Regional	0.86181	[0.81, 0.91]	< 0.001
Remoteness_descOuter Regional & Remote	0.86853007	[0.8, 0.94]	3.00E-04
number_condition_cat2	1.41465954	[1.14, 1.76]	0.0017
number_condition_cat3+	1.93978844	[1.58, 2.38]	< 0.001
number_med_cat1-4	0.90860328	[0.86, 0.96]	4.00E-04
number_med_cat5+	0.99442443	[0.93, 1.06]	0.8689
mode_of_separation10	0.64423127	[0.31, 1.34]	0.239
mode_of_separation2	1.08021523	[0.94, 1.24]	0.2865
mode_of_separation3	0.94994822	[0.86, 1.05]	0.3078
mode_of_separation8	0.48256855	[0.3, 0.78]	0.0028
los_cat1	0.8468549	[0.79, 0.91]	< 0.001
los_cat8+	1.14188227	[1.08, 1.21]	< 0.001
los_catsame-day	0.888852	[0.78, 1.01]	0.0652
number_proc_cat1	1.1060466	[1.05, 1.17]	4.00E-04
number_proc_cat2+	0.80505161	[0.72, 0.9]	1.00E-04
los_planned_Pre1y	0.02192139	[0, 3.8604427132546e+27]	0.9115
los_unplanned_Pre1y	0.9003445	[0.72, 1.13]	0.3628
sameday_planned_Pre1y	1.16595861	[0.49, 2.77]	0.7277
sameday_unplanned_Pre1y	1.04914943	[0.17, 6.66]	0.9594
ED_nonGPtype_Pre1y	1.08084301	[1.08, 1.09]	< 0.001
ED_GPtype_Pre1y	0.97928487	[0.97, 0.99]	2.00E-04
NAP_TREATMENTDAY_Pre1y	1.00191449	[1, 1]	< 0.001

# B3. Detailed model output

Table 7. Model output for all SE NSW where the outcome variable was Readmission within week 5 to 12 and the exposure variable was GP visit within 0-27 days

Variable	OR	95% CI	p value
(Intercept)	0.024964221	[0, 0.22]	9.00E-04
GP_PostW2W4_binaryYes	0.744675222	[0.49, 1.13]	0.1635
GP_Pre1y_cat1-2	0.814879511	[0.49, 1.35]	0.4296
GP_Pre1y_cat13+	0.882457315	[0.55, 1.43]	0.6098
GP_Pre1y_cat3-6	0.838302656	[0.45, 1.55]	0.5727
GP_Pre1y_cat7-12	0.817199676	[0.47, 1.42]	0.475
ED_GPtype_PostW1_binaryTRUE	0.580565275	[0.15, 2.2]	0.4233
ED_nonGPtype_PostW1_binaryTRUE	0.729728264	[0.35, 1.53]	0.4026
agegroup_10y20-29	0.622012612	[0.12, 3.28]	0.5756
agegroup_10y30-39	1.997315022	[0.5, 8.04]	0.3301
agegroup_10y50-59	1.094572613	[0.49, 2.43]	0.8245
agegroup_10y60-69	1.39087269	[0.63, 3.05]	0.4102
agegroup_10y70-79	1.530689066	[0.7, 3.35]	0.2863
agegroup_10y80-89	1.732639839	[0.77, 3.92]	0.187
agegroup_10y90+	2.326533736	[0.96, 5.62]	0.0608
GenderFemale	0.986601546	[0.73, 1.33]	0.9289
irsad_quintile_at_adm3-4	0.819599326	[0.57, 1.17]	0.2756
irsad_quintile_at_adm5-6	0.839358722	[0.57, 1.25]	0.3841
irsad_quintile_at_adm7-8	0.725937889	[0.41, 1.28]	0.2666
irsad_quintile_at_adm9-10	1.126540908	[0.62, 2.04]	0.6946
Marital_StatusDivorced	1.035636403	[0.67, 1.6]	0.8754
Marital_StatusNever Married	1.33470307	[0.79, 2.27]	0.2861
Marital_StatusSeparated	1.707625887	[0.96, 3.03]	0.0669
Marital_StatusWidowed	1.156036268	[0.79, 1.69]	0.452
Smoking_status	1.531726214	[1.14, 2.06]	0.0046
Remoteness_descInner Regional	0.689271199	[0.47, 1]	0.0525
Remoteness_descOuter Regional & Remote	0.74930503	[0.5, 1.12]	0.155
number_condition_cat2	4.020419104	[0.51, 31.67]	0.1864
number_condition_cat3+	5.870251387	[0.79, 43.79]	0.0843
number_med_cat1-4	0.940200558	[0.66, 1.35]	0.7357
number_med_cat5+	0.930308104	[0.6, 1.45]	0.7506
mode_of_separation10	4.92E-06	[0, 1.46355820714444e+286]	0.9715
mode_of_separation2	0.663492309	[0.24, 1.83]	0.4282
mode_of_separation3	0.883492566	[0.39, 2.02]	0.7693
los_cat1	0.586694532	[0.37, 0.94]	0.0275
los_cat8+	1.004118349	[0.7, 1.45]	0.9824
los_catsame-day	1.433766719	[0.59, 3.46]	0.4223
number_proc_cat1	0.957133027	[0.65, 1.4]	0.8225
number_proc_cat2+	0.721511615	[0.38, 1.39]	0.3276
los_planned_Pre1y	NA	[NA, NA]	0
los_unplanned_Pre1y	NA	[NA, NA]	0.2818
sameday_planned_Pre1y	NA	[NA, NA]	0.2381
sameday_unplanned_Pre1y	NA	[NA, NA]	9.00E-04
ED_nonGPtype_Pre1y	1.113092796	[1.07, 1.16]	0.1635
ED_GPtype_Pre1y	0.972916189	[0.93, 1.02]	0.4296
NAP_TREATMENTDAY_Pre1y	1.00258189	[1, 1.01]	0.6098

Table 8. Model output for all NSW where the outcome variable was Readmission within week 5 to 12 and the exposure variable was GP visit within 0-27 days

Variable	OR	95% CI	p value
(Intercept)	0.08453643	[0.07, 0.11]	< 0.001
GP_PostW2W4_binaryYes	0.83851309	[0.79, 0.89]	< 0.001
GP_Pre1y_cat1-2	0.97194209	[0.9, 1.05]	0.4666
GP_Pre1y_cat13+	0.88003247	[0.82, 0.95]	5.00E-04
GP_Pre1y_cat3-6	0.87209108	[0.8, 0.95]	0.0022
GP_Pre1y_cat7-12	0.78424371	[0.72, 0.85]	< 0.001
ED_GPtype_PostW1_binaryTRUE	0.85922754	[0.71, 1.03]	0.1091
ED_nonGPtype_PostW1_binaryTRUE	0.44520417	[0.39, 0.5]	< 0.001
agegroup_10y20-29	0.73396662	[0.55, 0.98]	0.0361
agegroup_10y30-39	0.9296765	[0.74, 1.16]	0.5192
agegroup_10y50-59	1.06708854	[0.94, 1.21]	0.3153
agegroup_10y60-69	1.11775397	[0.99, 1.26]	0.0716
agegroup_10y70-79	1.28748017	[1.14, 1.45]	< 0.001
agegroup_10y80-89	1.42712164	[1.26, 1.61]	< 0.001
agegroup_10y90+	1.6322726	[1.42, 1.87]	< 0.001
GenderFemale	0.94902823	[0.91, 0.99]	0.0217
irsad_quintile_at_adm3-4	0.92050043	[0.87, 0.97]	0.0036
irsad_quintile_at_adm5-6	0.89292006	[0.84, 0.95]	9.00E-04
irsad_quintile_at_adm7-8	0.84760673	[0.79, 0.91]	< 0.001
irsad_quintile_at_adm9-10	0.80097153	[0.74, 0.86]	< 0.001
Marital_StatusDivorced	1.178281	[1.1, 1.26]	< 0.001
Marital_StatusNever Married	1.12717922	[1.05, 1.21]	9.00E-04
Marital_StatusSeparated	1.12607072	[1.02, 1.25]	0.0215
Marital_StatusWidowed	1.12286946	[1.06, 1.19]	1.00E-04
Smoking_status	1.30854386	[1.25, 1.37]	< 0.001
Remoteness_descInner Regional	0.86638736	[0.82, 0.92]	< 0.001
Remoteness_descOuter Regional & Remote	0.84996232	[0.79, 0.92]	< 0.001
number_condition_cat2	1.37302936	[1.12, 1.68]	0.002
number_condition_cat3+	2.01913836	[1.67, 2.44]	< 0.001
number_med_cat1-4	0.94031467	[0.89, 0.99]	0.0235
number_med_cat5+	1.0178395	[0.95, 1.09]	0.609
mode_of_separation10	0.53466904	[0.24, 1.18]	0.1204
mode_of_separation2	1.0240336	[0.88, 1.19]	0.7587
mode_of_separation3	0.98769607	[0.89, 1.09]	0.8086
mode_of_separation8	0.95006483	[0.64, 1.42]	0.8013
los_cat1	0.85581847	[0.8, 0.91]	< 0.001
los_cat8+	1.0994972	[1.04, 1.16]	0.0012
los_catsame-day	1.6826229	[1.47, 1.93]	< 0.001
number_proc_cat1	0.96374561	[0.91, 1.02]	0.1853
number_proc_cat2+	0.79510893	[0.72, 0.88]	< 0.001
los_planned_Pre1y	0.03400124	[0, 12502035670943428608]	0.8887
los_unplanned_Pre1y	0.91361304	[0.77, 1.09]	0.3096
sameday_planned_Pre1y	1.40160206	[0.62, 3.17]	0.4168
sameday_unplanned_Pre1y	6.20E-06	[0, 6.53098095994546e+218]	0.9637
ED_nonGPtype_Pre1y	1.06683512	[1.06, 1.07]	< 0.001
ED_GPtype_Pre1y	0.98766687	[0.98, 1]	0.0353
NAP_TREATMENTDAY_Pre1y	1.00252942	[1, 1]	< 0.001