Soft Landing
Does Post-Discharge Community Care Reduce the Risk of Hospital Readmission for Mental Health Patients in NSW?

Research Brief #2: March 2019

Contents and Executive Summary

Executive Summary

This research brief examines whether post-discharge community care reduces the risk of hospital readmission for mental health patients in New South Wales.

Community-based care for mental health patients is often seen as desirable, providing support (a 'soft landing') for patients who may otherwise be left unsupported on discharge from an acute psychiatric inpatient unit.

The research brief draws on publicly available data released by NSW Health, broken down by local health district (LHD) to investigate the common sense proposition that community care for acute mental health patients improves their outcomes as measured by lower rates of hospital readmission.

Examination of the data showed that there was substantial variability in performance across LHDs: a patient with a mental health issue in Penrith had 18% less chance of receiving community care than a mental health patient in Gosford, and was almost twice as likely (18.5% vs. 10.2%) to be readmitted to an acute psychiatric inpatient unit.

Regression analysis was used to assess whether there is a relationship between community care for mental health patients (on the one hand) and readmission rates for mental health patients (on the other).

Analysis was also undertaken to determine, if that relationship does exist, whether community care and readmissions are inversely related (ie. is a higher proportion of patients with mental health issues accessing community care associated with a *lower* rate of hospital readmissions of mental health patients, and vice versa)? Analysis also sought to determine the degree to which community care influences readmissions, if a relationship between them was found to exist.

The analysis found that there *is* a statistically significant relationship between community care and readmissions; that more community care is associated with less hospital readmissions (and vice versa); and that a 10 percentage point increase in community care is associated with a 2.1 percent point drop in hospital readmission of mental health patients.

These results suggest that community care not only provides a 'soft landing' for people suffering acute mental health issues on their discharge from hospital, it can also be used as a 'lever' to reduce the likelihood of those people being readmitted to hospital.

Recommendations are made for the highest-performing LHDs to entrench and further enhance their performance; for other LHDs to examine and closely manage their results with a view to moving into the high-performing space; and for the NSW health sector to progressively work towards a series of future states where aggregate performance shifts such that outcomes for patients are progressively consolidated, re-set and improved over time.

Introduction

Does post-discharge community care reduce the risk of hospital readmission for patients with mental health issues?

It stands to reason that it would: experience in the health and human services – combined with common sense – suggests that receiving community care shortly after discharge from hospital provides support (a 'soft landing') that would improve outcomes for patients with mental health issues, in contrast to those patients being left unsupported. This, we would expect, would reduce the risk of readmission to hospital for those patients.

But can this common-sense proposition be proved empirically? Is there an evidentiary basis to underpin the beneficial effect of community mental health in respect of readmissions to acute psychiatric units?

This research brief addresses this issue in a NSW context, to move consideration of this issue to a testable proposition. It does so by analysing publicly available data using statistical techniques: this is possible because data on each of acute post-discharge community care and acute readmissions are published for every NSW local health district (LHD): these two indicators are both service performance measures which form part of the NSW Health Performance Framework.

Specifically, this research brief addresses three questions:

1. Is there an empirically verifiable relationship between community care for mental health patients (on the one hand) and readmission rates for mental health patients (on the other)?

2. If a relationship does exist, to what degree does community care influence readmissions? and

3. If it does exist, does the relationship run in the (negative) direction we would expect? That is, are community care and readmissions inversely related? Put another way, is a _higher_ proportion of patients with mental health issues accessing community care associated with a _lower_ rate of hospital readmissions of mental health patients (and vice versa)?

The statistical technique utilised to answer these questions is regression analysis. Regression analysis is a well-established methodology which produces an equation which relates one (or a number of) variables (predictors, or independent or explanatory variables) to a particular variable of interest (the dependent variable) whose movement is to be accounted for. Regression allows the analyst to draw a 'line of best fit' through the data. Hypothesis tests can be applied to the regression results to assess whether or not the results are statistically significant, that is, whether the results seen are likely to reflect a real underlying relationship, or are due to chance (a 'fluke'). The direction of the relationship is established via the sign (positive or negative) of the regression results (specifically, by the sign of the calculated coefficient of the relevant variable).

In this case, the readmission rate is the variable whose movement we are trying to 'explain' (the dependent variable) and the community care rate is the predictor.

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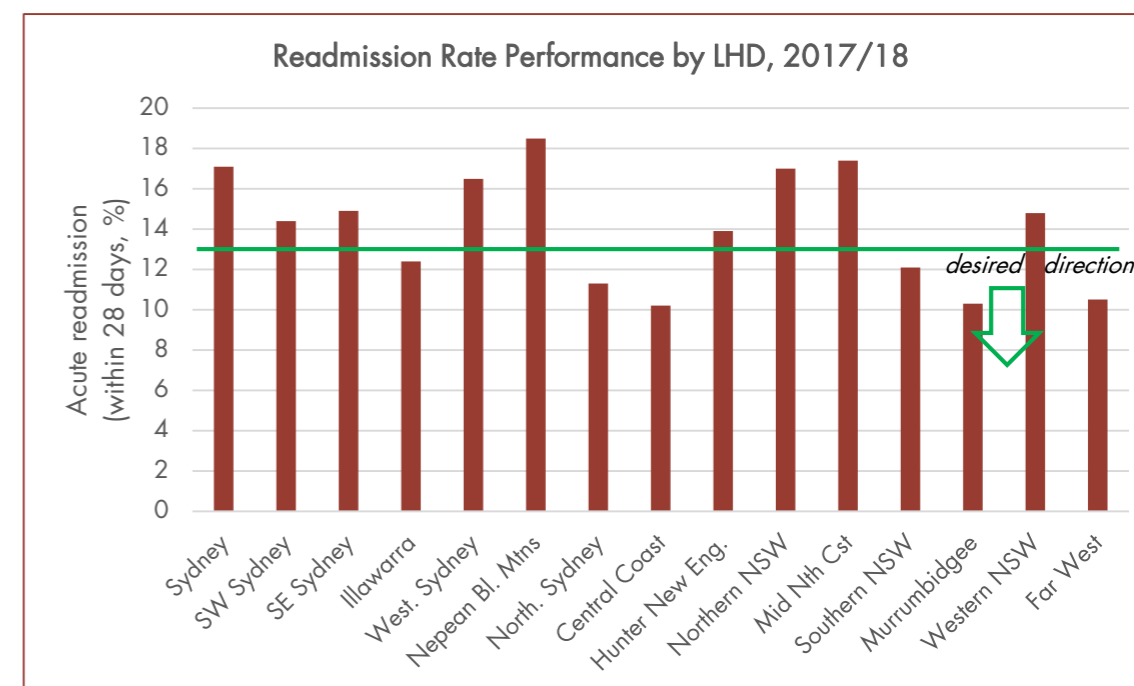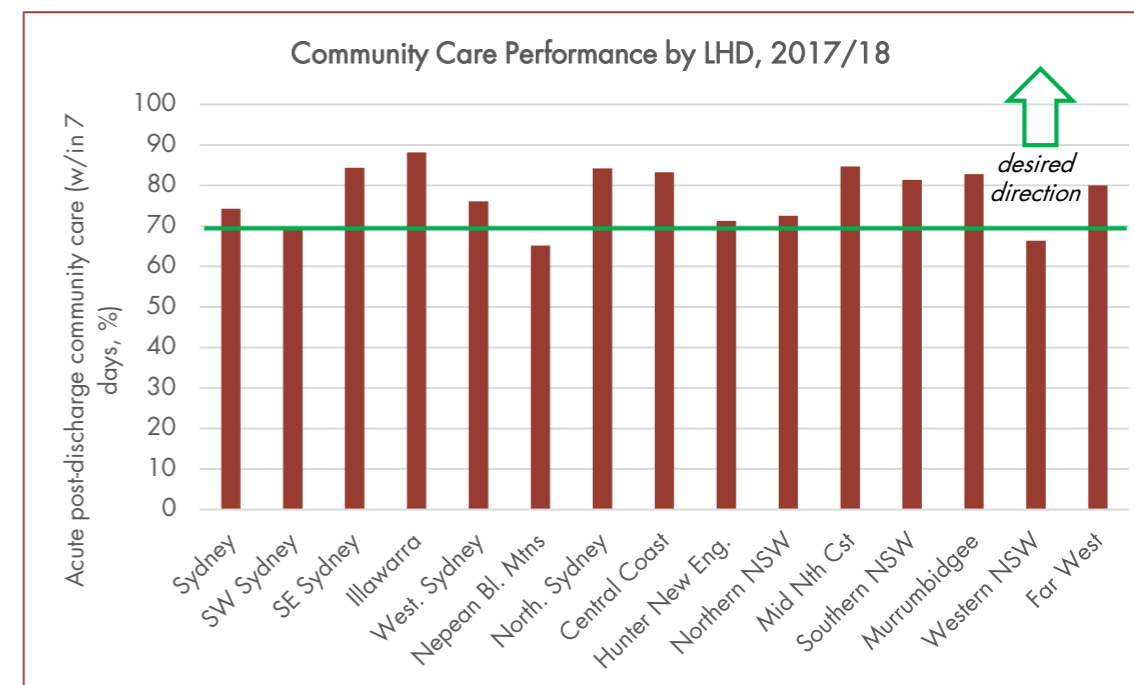# How Did Local Health Districts Perform? - I

The data used to test for a relationship between community care and readmissions was sourced from the NSW Ministry of Health (refer box *About the Data* on page 5).

Data for each of community care and readmissions for the 2017/18 year are shown in the charts opposite, along with the desired direction of each indicator. For reference, the performance targets for each measure set by the NSW Ministry of Health are shown by the green line:

- For community care: the target is that greater than 70% of mental health patients discharged from acute inpatient units should be followed up by community care within 7 days, and

- For readmissions: the target is that less than 13% of patients should be readmitted to the same or a different acute psychiatric hospital facility within 28 days of discharge.

The data show that most (12) of the 15 LHDs out-performed the >70% community care target set by the Ministry, while six LHDs bettered the Ministry's <13% readmission rate target.

While these charts show the data *as individual items*, graphing the measures against each other in a scatter plot gives a first indication if there is a relationship between these measures. This has been done in the chart on page 5, which shows the Community Care rate on the horizontal axis and the Readmission rate on the vertical axis. Each LHD is represented by one dot which plots that LHD on both dimensions of performance: the dots are labelled to indicate each LHD.

Community Care Performance by LHD, 2017/18

Readmission Rate Performance by LHD, 2017/18

Source for both graphs: *NSW Health Annual Report 2017/18*, Appendix 4

In the scatter plot opposite, the desired direction of community care (the higher the better) and readmissions (the lower the better) mean that those LHDs at the bottom right hand end of the performance 'spectrum' will be the high performers: those best performing LHDs are marked in the graph.

There are two things to note from the scatter plot. The first is that there does seem to be a pattern (and by implication, a relationship) between community care and readmissions: the data extend in a downwards diagonal direction from the top left to the bottom right. This direction of the pattern indicates – even before any statistical analysis is carried out – that an increase in community care would seem to be associated with a reduction in readmissions, and vice versa.

Secondly, there is a significant spread of performance across LHDs. On the one hand, Central Coast and Murrumbidgee LHDs had community care rates in excess of 80% and readmission rates around 10%, while Nepean Blue Mountains LHD's community care rate was around 65% and readmissions were nearly 19%. Put another way, a person with an acute mental health issue in Penrith has 18% less chance of receiving community care than a mental health patient in Gosford, and is almost twice as likely (18.5% vs. 10.2%) to be readmitted to hospital.

About the Data

The data for this research was sourced from NSW Health, which publishes the data in its annual report. The data analysed here is for the 2017/18 year and was sourced from appendix 4 of the annual report for that year (Table 2, pp.243-4).

The 7-Day Post-Discharge Community Care Rate is defined as the proportion of overnight separations (episodes of hospital care where the person stays at least one night in an acute psychiatric inpatient unit and concluded by discharge) for which a community mental health contact, in which the client participated, was recorded in the seven days following that separation.

The 28 Day Readmission Rate is the proportion of overnight separations from acute psychiatric inpatient units that are followed by readmission to the same or another acute psychiatric unit in the ensuing 28 days.

Community Care vs. Readmission Rates for Mental Health Patients NSW LHDs 2017/18

Best performing LHDs (ie. highest rate of community care combined with lowest readmission rate)
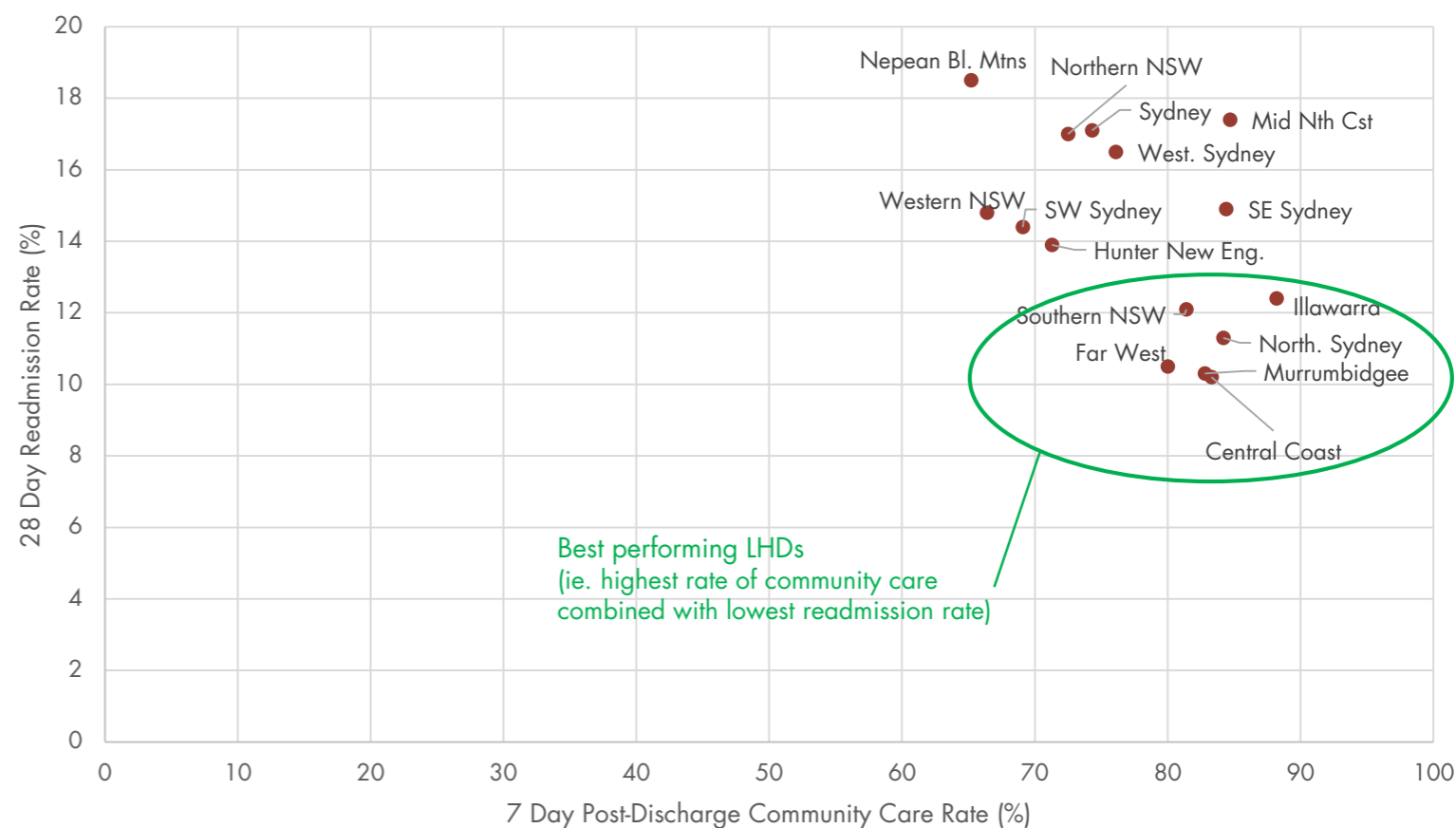
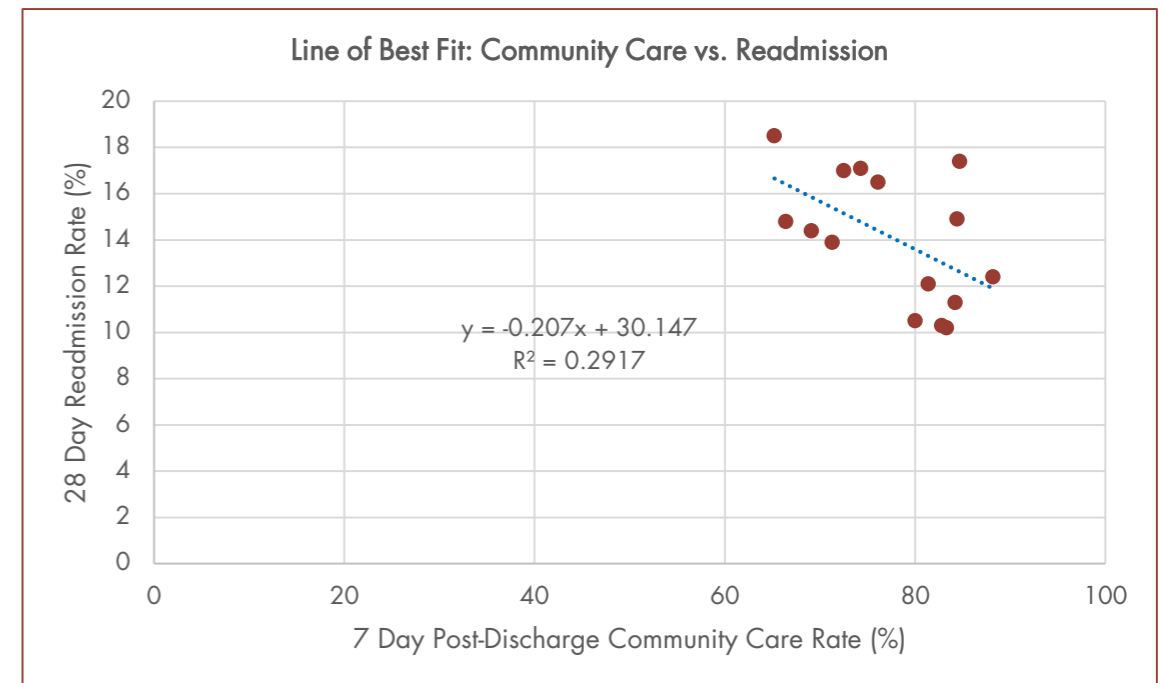Source: data drawn from *NSW Health Annual Report 2017/18*, Appendix 4

What Did the Analysis Show?

With the data described and visualised, analysis of the data was performed. A simple regression analysis was undertaken as described earlier (page 3) – the line of best fit and basic regression parameters are shown in the scatter plot opposite, and the regression output is shown in the lower panel opposite.

The analysis revealed the following:

- The regression equation was statistically significant at better than 5% (p-value for coefficient and overall equation: 3.77%)

- The coefficient of the community care variable (at -0.207) indicates that an increase in the community care rate for acute mental health patients of 10 percentage points is associated with a 2.1 percentage point reduction in the rate of readmissions

- The sign of the community care coefficient (negative) confirms that the relationship between the measures is inverse: that is, as one variable increases, the other decreases (and vice versa)

- The coefficient of determination (ie. the R-squared figure: 0.292) suggests that the regression has some explanatory power, accounting for 29% of the movement in the readmission rate, but implies that other factors also influence the readmission rate (as would be expected).

In summary, there is a statistically significant relationship between community care for and readmissions of acute mental health patients: a 10 percentage point increase in community care is associated with a 2.1 percentage point reduction in readmissions. While there are a range of factors influencing the rate of readmissions, community care is clearly one of those factors.

Line of Best Fit: Community Care vs. Readmission

$y = -0.207x + 30.147$
$R^2 = 0.2917$

28 Day Readmission Rate (%) / 7 Day Post-Discharge Community Care Rate (%)

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Model 1: OLS, using observations 1-15
Dependent variable: Readmn

                Coefficient    Std. Error    t-ratio      p-value
const           30.147         6.97106       4.3246       0.0008 ***
CommCare        -0.206981      0.0894641     -2.3136      0.0377 **

Mean dependent var    14.08667      S.D. dependent var    2.828646
Sum squared resid     79.34721      S.E. of regression    2.470553
R-squared             0.291652      Adjusted R-squared    0.237164
F(1, 13)              5.352571      P-value(F)            0.037698
Log-likelihood        -33.77745     Akaike criterion      71.55490
Schwarz criterion     72.97100      Hannan-Quinn  71.53982


White's test for heteroskedasticity -
 Null hypothesis: heteroskedasticity not present
 Test statistic: LM = 1.62743
 with p-value = P(Chi-square(2) > 1.62743) = 0.443208


Test for normality of residual -
 Null hypothesis: error is normally distributed
 Test statistic: Chi-square(2) = 1.41257
 with p-value = 0.493473
```

Conclusion & Recommendations – I

Conclusion

This research brief set out to answer three questions:

1. Is there an empirically verifiable relationship between community care for mental health patients (on the one hand) and readmission rates for mental health patients (on the other)?

2. If a relationship does exist, to what degree does community care influence readmissions? and

3. If it does exist, does the relationship run in the (negative) direction that would be expected? That is, are community care and readmissions inversely related: is a *higher* proportion of patients with mental health issues accessing community care associated with a *lower* rate of hospital readmissions of mental health patients (and vice versa)?

The answers to those questions are:

1. Yes – there is an empirically verifiable relationship between rates of community care for, and readmission of, acute mental health patients: this is given by the regression result showing a relationship which is statistically significant at better than the 5% threshold typically used for statistical hypothesis tests

2. The degree to which community care influences readmissions is given by the result showing that an increase in the rate of community care of 10% is associated with a reduction in the rate of readmissions of 2.1%, and

3. Yes – an *increase* in community care is associated with a *drop* in readmissions, and vice versa.

These results suggest that if an LHD increases its community care for patients with mental health issues, that same LHD will enjoy a reduction in hospital readmissions of those patients.

On the other hand, if an LHD reduces its rate of community care for patients with mental health issues, that LHD can expect an associated increase in the rate of hospital readmissions of patients with mental heath issues.

Recommendations

If an LHD wishes to reduce the rate of hospital readmissions, the foregoing analysis suggests that community care provides one 'lever' which LHDs can utilise to this end.

The variability in performance across LHDs, combined with the analysis results showing a relationship between community care and hospital readmissions, suggest that individual LHDs can work to improve their position on the community care – readmissions spectrum:

- The six best performing LHDs (Central Coast, Southern NSW, Illawarra Shoalhaven, Northern Sydney, Murrumbidgee and Far West) can entrench and further enhance their performance

- The remaining LHDs would be advised to examine and closely manage their performance against these measures with a view to moving into the high-performing space. They may wish to examine the community care offered to patients with mental health issues in their areas and increase the

Conclusion & Recommendations – II

community care provided to discharged patients with mental health issues in their areas, while monitoring readmission rates for an associated reduction.

Finally, the NSW health sector as a whole would be well-advised to work towards a series of future states where performance for community care and readmissions shifts *in toto* towards the desired directions of higher community care and lower readmissions (along the lines of continuous improvement) such that outcomes for patients are progressively consolidated, re-set and improved over time, as shown indicatively in the graphs below.

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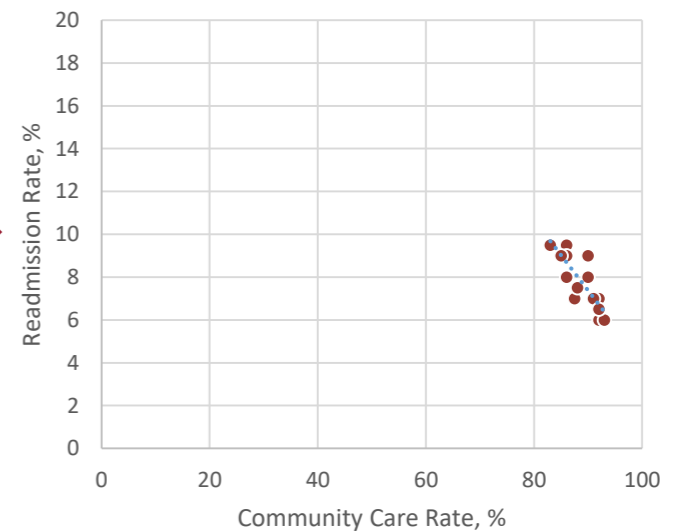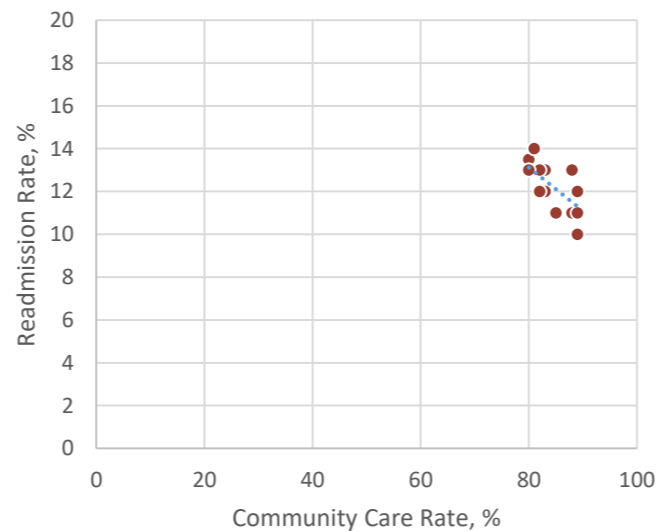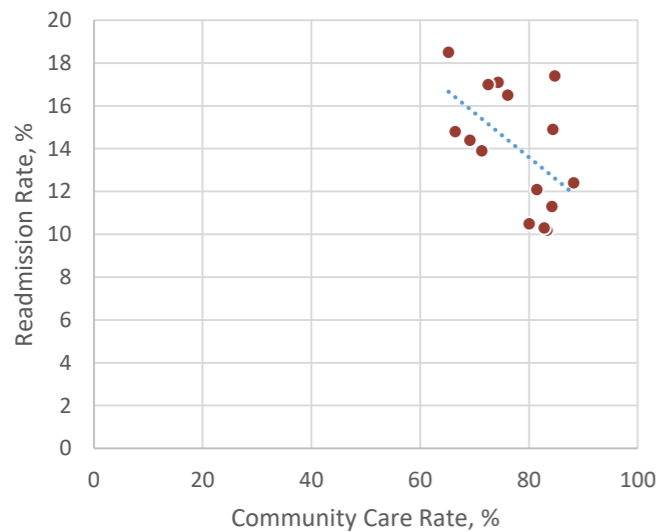
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