Unemployment and the rate of psychoactive-substance-related psychiatric hospital admission in regional Queensland: An observational, longitudinal study

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Abstract
Objectives: To examine the relationship between a regional economic downturn (indicated by the rise of population unemployment rate) and the rate of psychoactive-substance-induced psychiatric hospital admissions in the population in a rural/regional setting.
Methods: Hospital admission records from January 2013 to December 2016 were reviewed retrospectively. All patients with admissions to the Mackay inpatient psychiatric unit with diagnosis of mental and behavioural disorders due to psychoactive substance use were recorded using (ICD-10) F10-F19 codes. The relationship between the regional unemployment rate and the hospital admission rate was analysed using linear regression analysis.
Results: A statistically significant regression was found (F(1,46) = 39.46, p < 0.0001), R^2 = 0.46). The predicted number of admissions per 100,000 population in a month was observed to increase on average by 3.13 per month (95% CI = 2.12–4.13, p < 0.0001) for each percentage increase in the regional unemployment rate.
Conclusions: There was a statistically significant association between the population unemployment rate and the rate of substance induced psychiatric hospital admissions. Implications for regional Australian service provision and unmet needs were discussed. Further research is required to confirm this observation.

Keywords: unemployment, drug and alcohol, mental health, hospital admission

Unemployment and involuntary job loss have been suggested to increase the risk of illicit substance misuse and the development or having relapses of substance use disorders in affected individuals. In contrast, stable employment may reduce the risk of drug use in at-risk individuals. During economic downturns, harmful substance misuse may become more prevalent as affected individuals are more likely to use drugs as a coping mechanism for the psychological distress associated with unemployment and involuntary job loss. A study in European youths found that each percentage increase in the population unemployment rate was associated with a 0.7% higher use of illicit substances. A rise in the unemployment rate of a population has also been linked to an increase in suicide, homicide and substance-related mortality, and active labour programs were shown to be able to mitigate some of these risks. In Australia, illicit substance use, especially methamphetamine, is associated with a higher health services utilisation and more frequent emergency and psychiatric hospital admissions. Cross-sectionally, an additional 28,400–80,900 psychiatric hospital admissions were attributed to methamphetamine in 2013 alone, with unemployment, lower education and unstable housing all found to be associated with even more frequent hospital admissions. There is limited information in the current literature about how much that burden changes longitudinally in the setting of economic downturn.

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with an increase in the population unemployment and job losses. Previous studies in Europe have found significant positive correlations between increase in unemployment rate of the population and a higher number of avoidable hospital admissions, and the results showed a large effect size. However, it is important to note that hospital admission rates are multifactorial, with many potential confounding factors both clinical and non-clinical that are difficult to account for.

In Mackay – a regional area of Queensland – there was a regional economic downturn in the first half of the 2010s due to a combination of a downturn in tourism, cancellation of mining projects and natural disasters, and the unemployment rate doubled from 3.6% in 2011 to 7.7% in 2015. Given the lack of available information, especially in a rural setting, we aim to investigate the association between the rise of regional unemployment rate and the rate of psychiatric hospital admission for substance-induced psychiatric disorders.

Method
Study design and procedures
We tested the null hypothesis that the unemployment rate in a month does not correlate with the rate of psychiatric hospital admissions with diagnoses of substance-induced mental health disorder in people over 15 years old.

The 15–18 year old group was included for consistency with previous studies, which suggested that this group is more likely to be affected by economic downturn. Using G-POWER for power analysis for linear regression, with an alpha of 0.05 and power of 0.8, and expecting effect size to be large from previous studies (Cohen’s $f^2 = 0.35$), the minimum adequately powered sample size was estimated to be 25. However, as information from January 2013 to December 2016 was available at the time of study commencement, all 48 months were included to increase study power.

The monthly regional unemployment rate in Mackay and in the regional population over 15 years old were obtained retrospectively from the regional labour force reports from the Queensland Government’s Statistician Office. The hospital admission rate per 100,000 population with psychoactive-substance-induced mental health disorders in a month (hereafter referred to as hospital admission rate) is expressed in our study using the following equation:

$$\text{Admission rate} = \frac{\text{Number of admissions}}{\text{Region’s population over 15 years old in the same month}} \times 100,000$$

The hospital admission records were reviewed retrospectively. Using the International Classification of Diseases, tenth revision (ICD-10), the data of all admissions with a diagnosis of F10-F19, i.e. Mental and behavioural disorders due to psychoactive substance use, was collected. Only patients over 15 years old at the time of admission were included. No other inclusion or exclusion criteria were adopted.

Statistical analysis
The relationship between hospital admission rate and regional unemployment rate was examined via scatter plot and simple linear regression analysis. Additionally, the regression residuals were tested for the presence of violations – e.g. a non-normal distribution (Shapiro-Wilk test), non-constant variance (Breusch-Pagan test) and autocorrelation (Durbin-Watson test) to ensure the validity of our model. A $p$-value below 0.05 in any of these tests would indicate violations of the assumptions for linear regression analysis.

Data was recorded and collated using Microsoft Excel 2010, and the analyses were performed using statistical software XLSTAT-Base 2018.

Ethical approval and consent waiver
Ethical approval was obtained (HREC/18/QTHS/156). Consent waiver was granted via the Public Health Act 2005 (RD007532) for the data collection process of this study.

Results
The demographic information of patients presenting with substance-induced mental health disorder across the timeline is summarised in Table 1. In total, there were 1515 admissions that met inclusion criteria; our patients were predominantly male, in prime working age, and unemployed.

Figure 1 shows the changes in unemployment rate and the rate of substance induced psychiatric admissions in region of Mackay across 48 months. Both trends were much higher in 2015 compared with the year before.

The relationship between the regional unemployment rate and the monthly hospital admission rate is illustrated by the scatter plot presented in Figure 2. Using simple linear regression analysis, a statistically significant regression was found [$F(1,46) = 39.46$, $p < 0.0001$], with an $R^2 = 0.46$. The predicted number of admissions per 100,000 people in a month is equal to $4.51 + 3.13 \times$ (regional unemployment rate).

According to our model, the number of substance-induced psychiatric hospital admissions per 100,000 people is predicted to increase on average by $3.13$ per month (95% CI $= 2.12$–$4.13$, $p < 0.0001$) for each
percentage increase in the regional unemployment rate, and 46% of the variability of the admission rate can be explained by the regional unemployment rate.

Residual analysis
The regression residuals were analysed to check the validity of the assumptions for our linear regression analysis model. No significant violation of any assumptions were found (Shapiro-Wilk test \( p = 0.156 \), Durbin-Watson test \( p = 0.338 \) and Breusch-Pagan test \( p = 0.235 \)).

Discussion
Our study findings suggest that regional unemployment rate is strongly correlated with the rate of hospital admissions due to substance-induced mental health disorders in individuals over 15 years old, and almost half of the variance of admission rate was accounted for by the unemployment rate. However, causation is not implied from our findings. As mentioned before, admission rate is multifactorial, and there are multiple clinical and non-clinical confounding factors that we were unable to adjust for. Our study is a small, single-sited study with an epidemiological approach and the results

![Figure 1. Regional unemployment rate and substance-induced psychiatric hospital admission rate in Mackay.](image)
obtained here may not be applicable to the general population, especially in large metropolitan cities, due to potential differences in population characteristics. We are also limited in the duration of the study, with changes in admission rate and economy over time, a longer duration may be required to observe the full effect of unemployment.

A potential explanation for our result is the increase in harmful use of alcohol and illicit substances in affected populations facing long-term unemployment or losing employment, leading to increased relapse, or hospitalisation of affected individuals; this is consistent with previous findings. It was also suggested that loss of income could lead to an increase in intravenous drug use, thus leading to higher bioavailability and intoxication; however, we did not specifically look at this in our study.

Our study findings contribute to current knowledge on the relationship between economic downturn and the burden of substance-related psychiatric disorders, especially in an Australian regional setting, where information is lacking. Further research, comparing with another population that has not gone through such dramatic changes in unemployment rate, is required to confirm our observations. This may also aid with local service planning and resource allocation, as more frequent hospital admissions are observed with rising unemployment, increased availability of community drug and alcohol services; a focus on primary prevention at such times may be helpful in reducing inpatient resource utilisation. This is particularly challenging in rural areas such as Mackay, as we have for many years struggled to attract and retain addiction specialists. There is also limited availability of drug and alcohol detoxification and rehabilitation services locally, with long waiting times. Being a small rural community, patients may also face more barriers with stigma and confidentiality problems when wanting to access our services.

Conclusion

In conclusion, we observed that an increase in regional unemployment rate was significantly associated with a higher rate of psychiatric admission for substance-induced mental health disorders in the population. Further research is required to confirm this observation.

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