

Psychiatric admissions among young people involved with the youth justice system in New South Wales (NSW), Australia

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1. Proposed paper information

Working paper title: Psychiatric admissions among young people involved with the youth justice system in New South Wales (NSW), Australia

2. Rationale

2.1 Background

The problem being studied

Young people involved with the youth justice system have a more likelihood of having mental health problems, compared to their peers in the general population¹. Previous studies have demonstrated an increased prevalence of several physical and mental health conditions, which contribute directly and indirectly to the burden of mental health morbidity in this population². About 45-66% of males and 45-73% of females involved in the criminal justice system meet the criteria for 1 or more mental health disorders³. The range of mental health disorders commonly diagnosed include substance use disorders, self-harm and suicidal behaviours, anxiety disorders, mood disorders, conduct disorders, cognitive disorders and learning difficulties⁴. Most young people who are involved with the justice system in New South Wales have contacts with mental health services for the treatment of mental health conditions. However, the occurrence of mental health hospitalisations after release in this population suggests the scope and severity of unmet mental health needs despite available services⁵.

The goal of youth justice supervision is to rehabilitate young people and address their physical and mental health needs to ensure successful reintegration into society. In Australia, the occurrence of post-release hospitalisations has been explored in the custodial adult population for physical and mental health conditions^{6,7}. Other studies outside Australia have examined mental health hospitalisations in young people while in custody⁵. Within and outside Australia, there is a research gap in the assessment of clinically significant mental health morbidity among young people involved in the youth justice system after release. So far, the focus of mental health morbidity studies has been on young people involved in custody using self-report measures^{4,8-10}. Very little is known about clinically significant mental health morbidity among young people supervised in the community. Also, the impact of family and environmental exposures, such as a family history of psychiatric disorder, parental incarceration, parental substance abuse, out-of-home care, and prior contact with mental health services^{3,11,12} is yet to be explored in this population.

Its significance

Young people in the justice system experience higher rates of mental health conditions compared to their peers in the general population. Given their elevated risk, these individuals may require extra support after being released from youth justice supervision. However, post-release mental health hospitalizations indicate unmet needs, despite the presence of coordinated mental health outpatient services. These highlights individual and systemic barriers to accessing mental health care for these young people, hindering their successful reintegration into society.

By investigating the factors that contribute to post-release hospitalizations, this research can better identify those at higher risk of serious mental health morbidity and guide improvements in the youth justice system. The findings can inform policy and practice decisions that better address the mental health needs of these young people, reducing the risk of recidivism and promoting positive long-term outcomes. The research can also determine the most effective time for interventions to improve mental health outcomes.

2.2 Broad aims/objectives of the paper and/or analysis

Primary objective

Among young people involved with the youth justice system in NSW:

- 1) Calculate the incidence rates for the first occurrence of psychiatric hospitalisation within a 2-year post-release period.

Secondary objective

- 2) Identify predictors of psychiatric hospitalisation within a 2-year post-release period.

3. Initial data analysis

The following steps will be deployed to examine the data before the research questions are finalised.

Assessing quality of data linkage

The quality of data linkage in the Centre of Health Record Linkage (CHeReL) report will be evaluated. The report's data sources will be checked to make sure that all necessary datasets for analysis have been included. The linkage method used (probabilistic or deterministic) and the rate of linkage errors will also be noted. The proportion of the survey cohort that was successfully linked to individual datasets will be determined by reviewing the summary of records. The number of unique individuals linked will be recorded from the report and verified by reviewing the datasets.

Consultation and documentation of data workflow

Once the linkage process is confirmed to be successful, a discussion with supervisors and other team members will take place to identify the most important variables for the study. An Excel sheet will be created to document the data screening and cleaning process, providing a roadmap for execution and a record of performed steps.

The data cleaning plan will include: 1) Predetermined data ranges for continuous and categorical variables based on the data dictionary, 2) The identification of primary and secondary outcome variables, and 3) Essential variables needed to establish criteria for outcome and exposure variables.

Data quality assessment and cleaning

The assessment and cleaning of the data will be conducted using SAS procedures, which will entail the following steps:

1. Inspection of continuous variables for values outside of the expected range: A PROC UNIVARIATE statement will be used to identify any continuous variables that are beyond the defined range. This statement will provide information on the mean, median, mode, IQR, minimum, and maximum values.
2. Examination of categorical variables for unexpected values: A PROC FREQ will be utilized to produce a list of unique values for each categorical variable, along with their frequency and percentage of occurrence.
3. Detection of missing values: A combination of PROC PRINT and a "WHERE" statement will be used to locate missing values in numeric and character variables.
4. Validation of date ranges against study event dates: Incorrect date ranges will be identified through a flagging system created using IF/THEN statements in a SAS DATA STEP. These flags will indicate dates that precede or follow the study dates incorrectly, and they will be further investigated.

5. Identification of duplicate records: Duplicates will be detected using FIRST./LAST. variables, and a PROC SORT and a NODUPKEY with a DUPOUT= statement will be utilized to output the duplicates to a new dataset.
6. Assessment of character variables with leading zeros: Character variables will be reviewed for any leading zeros, and if present, these will be eliminated using an INPUT statement and an INDEXC function in a data step.
7. Verification of consistency between numeric and character variables: In cases of inconsistency between numeric and character variables, the TRANSLATE function will be utilized in the DATA step to make necessary changes.
8. Confirmation of consistency in the identifying variable (ppn) through visual inspection of all datasets.

Preparing the Analytic Dataset

Each dataset will be prepared for analysis after data cleaning has been completed. Missing coded values identified will be replaced with analytic missing values (".") in each analytic dataset. A series of IF/THEN statements will be used to recode data inconsistencies into standard responses. Once the quality and completeness of each dataset is satisfactory, they will be exported for analysis.

Determining the survey cohort

The survey cohort will be determined based on datasets shared by CHeReL for the 2003-2006 Young People on Community Orders Health Survey, 2003 Young People in Custody Health Survey, 2009 Young People in Custody Health Survey and 2015 Young People in Custody Health Survey.

Determining the outcome variable

The outcome of this study is time to first mental health hospitalization within 2 years of release from custody or supervision after a final court appearance for a proven offense. This will be determined through a linkage of the survey cohort, Reoffending Database (ROD) and Admitted Patients Data Collection (APDC) datasets. The ROD will provide court finalization dates and penalty duration, used to calculate the release date. The APDC will provide mental health hospitalizations, identified using the International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification Coding (ICD-10) system, with overlapping and nested transfers aggregated into a single event. The first mental health hospitalization will be used as the outcome variable.

Determining the exposure variables

The exposure variables will be extracted from the datasets based on literature review, expert consultation, and dataset assessment. They will include demographic, justice-related, family-related, peer-group related, and mental health-related variables. The linked datasets will determine previous exposures, including previous mental health hospitalisations from the Admitted Patients Data Collection and previous contact with mental health services from the Mental Health Ambulatory Data Collection.

4. Research question(s):

Specific research question(s)	Type of research question (Select one only for each question. See examples below.)		
	Descriptive	Prediction	Causal
1. What is the incidence rate for the first occurrence of mental health hospitalisation within a 2-year post-release period?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. What are the predictors of mental health hospitalisation within a 2-year post-release period?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

5. Analysis plan

5.1 Study design

A retrospective data linkage study using data from 4 NSW justice health surveys linked to 4 NSW administrative databases. The surveys evaluated physical and mental health, risk behaviours and lifestyle factors among young people involved in the youth justice. This provides a rich source of baseline information about exposures among the survey participants. Data linkage will be undertaken to examine post-release mental health hospitalisations and associated factors as a cohort study.

5.2 Study population

The study population comprises 1556 young people (aged 14 - 22 years) involved with the NSW youth justice system who participated in 4 NSW justice health surveys in 2003(2 surveys), 2009 and 2015. Of the 4 surveys, 3 were conducted among young people supervised in custody and 1 for young people supervised in the community. These surveys include: 2003-2006 Young People on Community Orders Health Survey (YPoCoHS, n=800), 2003 Young People in Custody Health Survey (YPiCHS, n=242), 2009 YPiCHS (n=361) and the 2015 YPiCHS (n=227).

The 2003 YPiCHS was conducted between January-March 2003 in 9 youth justice centres in NSW among young people who were detained or remanded in custody. The 2003 YPoCOHS was conducted between October 2003-December 2005 among young people who were supervised on community orders in NSW. The 2009 YPiCHS was conducted between August-October 2009 in 9 youth justice centres and 1 maximum security centre in NSW among young people who were

detained or remanded in custody. The 2015 YPiCHS was conducted between September–December 2015 in 7 youth justice centres in NSW among young people who were detained or remanded in custody.

All 4 surveys utilised a total population sampling method with differential response rates (2003 YPiCHS – 76%, 2003–2006 YPoCOHS – 67%, 2009 YPiCHS – 95% and 2015 YPiCHS – 90%). This study population is representative of young people involved with the youth justice system during the respective survey periods with a few exceptions. First, the proportion of young people less than 14 years varied with each survey year (2% in 2003 YPiCHS, 3.9% in 2009 YPiCHS and none in 2003 and 2015 YPiCHS respectively). Second, there was an intentional over-sampling of females supervised in custody at different timepoints (beginning, middle and end) of the 2009 YPiCHS period.

5.3 Outcome assessment, definitions and key variables of interest

Outcome assessment

The primary outcome is the incidence of the first mental health hospitalisation within 2 years after release from custody or community-based supervision. The secondary outcomes are factors associated with the first occurrence of any mental health hospitalisation within 2 years after release from supervision.

The primary and secondary outcomes will be assessed by linkage of data from individual YPiCHS and YPoCOHS surveys to 4 NSW administrative data sources namely: NSW Bureau of Crime Statistics and Research (BOCSAR) Reoffending Database (ROD), NSW Admitted Patient Data Collection (APDC), NSW Registry of Births, Deaths and Marriages (RBDM) and the NSW mental Health Ambulatory Data Collection (MH-AMB).

A mental health disorder is defined according to the World Health Organisation¹³ as a ‘clinically significant disturbance in an individual’s cognition, emotional regulation, or behaviour’. An episode of hospitalisation for a mental health disorder is defined as diagnostic in the APDC database according to the standard classification of mental health disorders in the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification (ICD-10 AM). For this study, follow-up period is defined as the timeline from baseline (first day of release) until the earliest of the following dates: first occurrence of any mental health hospitalisation, death, reincarceration, and 2 years after date of release.

Key variables of interest

The main exposure of interest is involvement with the youth justice system defined as supervision in custody or in the community for a proven offence which has a finalised court appearance. Other variables of interest are classified into: demographic, justice-related, family-related, and mental health related.

Demographic variables include: sex (male/female), age at baseline, Indigenous status (Indigenous, non-Indigenous).

Justice-related variables include: previous incarceration (0 - 1 episode, 2 – 3 episodes, ≥ 4 episodes).

Family-related variables include: parental incarceration (0, ≥ 1 episode), parental death (0, ≥ 1 parent), out-of-home care (OOHC) placements (0, ≥ 1 placement).

Mental health related variables include: psychosis, mood disorders, anxiety disorders, personality disorders, alcohol and substance use disorders, intellectual disability, and history of head injury (yes/no).

5.4 Statistical analyses

Post-stratification weighting of survey subcohorts

Sampling weights will be computed for each participant based on the sampling scheme and then post-stratified to the New South Wales youth justice population in custody and community in the respective survey years. This will be done by age (14-17, 18+) and gender (male, female). Post-stratified weights will then be applied to adjust for differential response rates from the sample distribution based on age and gender.

Analysis of the primary outcome: incidence rates of post-release mental health hospitalisations within a 2-year period

Descriptive statistics (number and percentage, median and interquartile range [IQR]) will be used to summarise patient characteristics at baseline (first day of release) overall, and by sex and Aboriginal status for each survey cohort. Incidence rate of the first occurrence of mental health hospitalisation within 2 years post-release will be calculated by dividing the number of first mental health hospitalisations within a 2-year post-release period by the person-years at risk.

Time at risk will be calculated as the time from first day of release until the earliest of the following dates: first occurrence of any mental health hospitalisation, death, reincarceration, and 2 years after date of release. Incidence rates will be calculated overall, and by sex, age and Indigenous status.

Analysis of the secondary outcome: factors associated with post-release mental health hospitalisations within a 2-year period

To identify factors associated with the first occurrence of mental health hospitalisation, univariable and multivariable Cox regression models will be fitted. In the presence of competing events (e.g., death), the Fine and Gray method will be used to provide a better estimation of risk.

The following variables will be included in the univariate analysis: sex, age at baseline, country of birth, remoteness of residence, frequency of previous convictions, frequency of parental incarceration, parental death, frequency of out-of-home care (OOHC) placements, peer group substance use, peer group history of detention, frequency of prior contact with mental health services, frequency of prior mental health hospitalisation, history of head injury.

A backward stepwise approach will be the variable selection method for the multivariable model. The initial multivariate model will include all covariates with a $P < 0.2$ on univariate analysis. Covariates

with a P value of <0.05 will be retained in the final model. Crude and adjusted hazard ratios (aHR) with 95% confidence interval (95%CI) will be reported as measures of association. In the presence of competing events, subdistribution hazard ratios (SHR) and adjusted subdistribution hazard ratios (aSHR) will be reported for univariate and multivariate analysis respectively. To account for heterogeneity of baseline hazards across different survey years, the survey cohort will be added as a covariate and the corresponding hazard ratios determined for each subcohort. Diagnostics necessary to validate the assumptions of the Cox proportional model will be done. These include testing the proportional hazards assumption using the estat phtest in Stata, testing nonlinearity in the relationship between the log hazard and continuous covariates using the testnl test in Stata and examining influential observations by visualizing deviance residuals.

Data will be analysed using SAS Software (Version 9.4 for Windows) and Stata version 17 (Stata Corporation, College Station, Texas, USA).

Strategies for handling missing data

For the purpose of this analysis, missing data will be defined as values that are not available but meaningful for the analysis. As this is a secondary analysis of data that was primarily collected for administrative purposes, preventative strategies such as prospectively ensuring non-missingness will not be practical. To account for missing data across the regression analyses, the missing indicator method will be used. This involves assigning "missing" as a separate category for missing values within the respective variables. This method maximises the use of data available for analysis, thereby restricting loss of statistical power. However, where the mechanism of missingness is completely and random and the proportion of missing values are negligible, a complete case analyses will be used.

5.5 Tables

Table 1: Baseline characteristics of the study population by unweighted and weighted measures, overall and by sex

Table 2: Weighted Incidence rates [per 100 person years] of the first occurrence of mental health hospitalization within 2 years post-release, overall and by supervision status [community vs custody] using harmonised data from four surveys.

Table 3. Predictors of mental health hospitalisation within 2-years post-release, stratified by sex

5.6 Figures

Figure 1: Flowchart of the study population showing population of young people in custody and under community supervision in the respective survey years, sampling frame and data linkage to NSW administrative databases.

Figure 2: Dot and confidence interval figure showing piecewise incidence rates per 100 person years of the first occurrence of mental health hospitalisations within 1-month post-release with point estimates and confidence intervals for standardised incidence rates in Week 1, Week 2, Week 3, and Week 4.

Figure 3: Dot and confidence interval figure showing piecewise incidence rates per 100 person years of the first occurrence of mental health hospitalisations within 2-years post-release, stratified by supervision status (community vs custody) with point estimates and confidence intervals for standardised rates from the second month to two years post-release. (2-3 months, 4-6 months, 7-9 months, 10-12 months, 1-2 years).

Figure 4: Cumulative incidence curves (with risk table) showing estimated cumulative incidence of the first occurrence of mental health hospitalisation by supervision and previous custodial status.

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