The Networked Data Lab: Analysis plan for Topic 2 on inequalities in children & young peoples’ access to mental health care

Satellite analysis for Aberdeen Centre for Health Data Science

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## Background and Research Question

* Poverty and inequality are known drivers of poor mental health (Gould, 2006). Areas of higher deprivation have increased referrals to Specialist Child and Adolescent Mental Health Services (CAMHS). There is a social gradient in prevalence of serious mental illness and psychiatric admission rates in young people (Handley, Oakley and Saville, 2020).
* Equitable access to CAMHS has been a long-term policy priority for the Scottish Government (Scottish Government, 2012). It remains an important aspect of the Scottish Government Mental Health Strategy for 2017-2027 (Scottish Government, 2017).
* Efforts to reduce geographic variation include reduced National referral-to-treatment wait time targets and guidelines for standardisation of practice.

This work seeks to answer the following research question:

***What insights can routinely available healthcare administrative data give us about social inequalities in access to mental health services or care for mental health problems?***

## Aims

To answer the research question, we aim to:

* Describe baseline characteristics for people with mental health needs.
* Describe socioeconomic and demographic inequalities which may exist in young people referred to specialist CAMHS or other Psychological Therapies as well as alternative care pathways for mental health, which include community dispensed prescriptions, outpatient, inpatient and accident & emergency attendances
* Quantify inequalities in mental health care service metrics including referral wait time, time in treatment, severity at point of first contact with secondary care services, and crisis outcomes.
* Assess the relationship between area deprivation and mental health crisis outcomes.

## Methods

### Study Design

This study is a database analysis of routinely available healthcare administrative records.

The analysis is in three parts:

1. Description of the baseline characteristics of the cohort
2. Measurement of socioeconomic and demographic inequalities in outcomes
3. Case-Control study to determine the relationship between area deprivation and mental health crisis outcomes.

### Data and Data Linkages

This project consists of linkage of individual-level data from several sources. Data sources include electronic hospital records, information about prescriptions, certified deaths and area deprivation.

The datasets to be used for analysis are:

|  |  |
| --- | --- |
| **Dataset** | **Description of Variables** |
| CAMHS and Adult Psychological Therapies Referrals | Variables include date and source of referral, date of 1st & 2nd appointments, date of discharge, wait time (derived), time in treatment (derived) |
| PIS – Community dispensed prescriptions | Variables include prescriber source, location and profession, medication item code, date of prescription/dispensed, dispensary location and type. |
| Hospital Records – Including Inpatient/Day-case, Outpatient and Emergency episodes | Variables include date of episode, specialty code, diagnostic code. |
| National Records of Scotland Death Certificates | Variables include date of death, main cause and contributary causes |
| TrakCare | Variables include more detailed clinical information related to inpatient and emergency episodes of care |
| Scottish Index of Multiple Deprivation (SIMD) | Variables include deprivation score, rank, quintile as well as domain-specific scores |

Where available we will request the following variables to allow for linkage of the above datasets and data quality checks:

* Unique Identifier (Community Health Index for processing, pseudonymised unique ID for analysis)
* Date of Birth (raw DoB for processing, derived into month of birth to derive age at episode)
* Postcode/Data Zone of residence (For processing of linkage to SIMD)
* Ethnicity (where available)
* Sex/Gender

### Setting and Study Population

The setting for this study is the NHS Grampian Health Board region in the North-East of Scotland. Individuals will join the study population if they meet the following inclusion criteria:

1. They received a community dispensed prescription for medications ordinarily used to treat mental health conditions, identified from the PIS dataset using British National Formulary (BNF) medicines codes (*see Appendix 1*) **OR**
2. They were referred to or attended specialist CAMHS or Psychological Therapies **OR**
3. They received a mental health diagnosis related to an outpatient, inpatient or emergency hospital attendance/admission, identified from hospital records via International Classification of Diseases, Tenth Revision (ICD-10) diagnostic codes (*see Appendix 1*) **OR**
4. They died and a mental health ICD-10 diagnostic code (*see Appendix 1*) is recorded on their death certificate as a main or contributary cause of death **AND**
5. They were aged between 11 and 24 (inclusive) at the time they met conditions a), b), c) or d).

### Key Variables

The primary exposure of this study is Area Deprivation. This will be measured using Scottish Index of Multiple Deprivation (2020 v2) ranked quintiles linked to individual records using datazone.

In parts one and two of this study, we will report on the following outcomes:

* Rates of referral to CAMHS/PT
* Rates of rejection of referral
* Number of referrals per individual
* Length of wait following CAMHS/PT referral
* Length of CAMHS/PT treatment
* Rates of community prescription for treatment of mental health conditions
* Rates of inpatient, outpatient and emergency hospital attendance related to mental health
* Number of admissions or emergency attendances per individual
* Mortality rates where a mental health condition is listed as a main or contributing cause of death

The main outcome for part three is the presence of a mental health crisis outcome. This is defined as 1) An A&E attendance with a mental health related diagnosis, 2) Compulsory inpatient admission (i.e. ‘formal’ admission) and 3) Death where a mental health diagnosis is a main or contributary cause.

Covariates for analysis which compares differences between groups will include:

* Age
* Sex
* Non-mental health related comorbidity
* Urban/rural classification

### Statistical Methods

Parts One and Two will include analysis of both the pre-COVID and pandemic periods. Part Three will only include the study population where events occurred in the pre-COVID period.

**Part One – Study Population summary**

Descriptive statistics will include reporting of baseline socioeconomic and demographic characteristics for the total study population and stratified by SIMD quintile. Outcomes will be reported stratified by SIMD quintile and as rates for the NHS Grampian Health Board. Rates will be calculated using official population estimates by SIMD quintile and age.

**Part Two – Measuring Inequalities**

To quantify inequalities in outcomes we will assess absolute and relative ranges of outcome rates between the most and least deprived quintiles. In addition, we will calculate Slope Index of Inequality (SII) and Relative Index of Inequality (RII) for these outcomes.

**Part Three – Case-Control Design**

We will perform a population-based case-control study where those seeking treatment for mental health care will be the study population (outlined in cohort inclusion criteria above).

***Cases***

Cases will be defined as individuals who have **their first contact** with healthcare services outside of scheduled mental health care i.e., in crisis. We adopt the broad definition of a mental health crisis proposed by the National Collaborating Centre for Mental Health & Positive Practice in Mental Health:

*“A mental health crisis is a situation that is believed by the person experiencing the crisis or anyone else (an adult, child, young person, family member or carer) to require immediate support, assistance and care from a statutory or voluntary mental health crisis care service. This includes where there is significant intent or risk of harm to the person or others. A mental health crisis can have many underlying causes, diagnoses and triggers, some of which may be longstanding, that can culminate in a deterioration of an individual’s mental state to the point that they require an immediate response from mental health services.”* (2020)

For the purposes of this research a crisis event/outcome will include records of A&E attendance (e.g. for intentional self-harm), compulsory inpatient admission or death where a mental health related diagnostic code has been recorded.

ICD-10 diagnostic codes related to episodes of care will be extracted from A&E records, NRS Death Certificates and SMR04 (Mental Health Inpatient & Day Case) datasets to identify cases.

A&E records in NHS Grampian have only a single ICD-10 diagnostic code associated with an episode. Additional diagnostic information is available from two free-text fields which list presenting complaint and an episode description. Free text searches for terms associated with crisis outcomes will be used to identify further records.

Compulsory admission can be identified from the ‘Status on Admission’ variable in SMR04. Where the status on admission is ‘formal’, an admission relates to a patient who has been detained under the provisions of the Mental Health (Care and Treatment) (Scotland) Act of 2003. Formal admission which lasts <72 hours will be excluded from case definition, as this may flag an individual brought to a place of safety for short-term assessment under the act, rather than a true admission (Weich *et al.*, 2017). These individuals will be eligible to become controls from the study population.

The criteria for identification of cases (including codes) are listed in full in Appendix 1. Cases will be identified where the above criteria are met within the two study periods (pre-COVID and early 2020 onwards) and for their first crisis episode only, discounting any subsequent episodes.

***Controls***

Controls are those individuals remaining in the study population who do not meet the case definition i.e. where their first contact with Mental Healthcare services is not a crisis event/outcome. Cases and controls will not be matched. A logistic regression model will be built (including covariates) to calculate odds ratios. Adjustment sets for regression modelling will be identified through a process of creating Directed Acyclic Graphs (DAGs), in line with current guidance (Tennant *et al.*, 2020).

## Local audience

Our intended audience is NHS and local authority policymakers, clinician groups, and patient groups in the short-term, as well as the wider academic community in the long-term.

* We have close links to the regional NHS CAMHS clinical leadership team with regular meetings scheduled for project updates, as well as inclusion of the Clinical Lead within the research team.
* We have engaged with a local Public and Patient Involvement group with an interest in data science and will continue to do so. This will involve presentation of results and discussion around interpretation of results.
* The PPIE team are developing another engagement group for children & young people who have lived experience of mental health care.

## Dissemination and Outputs

We will provide interim outputs from this project for the local CAMHS clinical leadership team, the NHS Grampian Executive Board, patient groups, as well as being made available online for the Grampian public. These outputs will focus on study population summaries, and the measurement of inequalities for various outcomes. They will take the form of brief reports, presentations & dashboards.

Interim results will be combined with the results of the case-control study in an academic journal article. We will also present findings at relevant conferences. We will submit the manuscript and all analysis code to a pre-print server, present findings at our public ACHDS seminar series, write a blog on the ACHDS website, and send a digest to the local press.

In addition, we will circulate results within the Networked Data Lab partnership and contribute to central Health Foundation publications on Phase 2 projects. This plan and code used for analysis, or the production of other outputs will be shared on GitHub for review and reuse from other analysts.

**Interim Output 1 – PIS Dashboard & Short Report**

The first planned interim output will consist of an interactive dashboard which summarises community dispensed prescriptions records (PIS dataset) for the study population.

Tables will include descriptive summary statistics of all records for key demographic and socioeconomic variables including age, sex, deprivation and rurality. Summaries will also be grouped by deprivation and age group and for a subgroup of records of mental health related medications only.

Interactive tables will list the most prescribed items (including repeat prescriptions), most common BNF Chapter, Section and most widely prescribed items (most people prescribed a single item). These tables will allow the user to select to display results by age group, sex and area deprivation, as well as for specific BNF chapters.

In addition, time trends for prescriptions (total), BNF chapters and Sections will be displayed using plots.

***Short Report***

A short written report will summarise the key findings related to community dispensed prescriptions for the study population. This will accompany the PIS Dashboard.

***Audience***

The dashboard will initially be presented to the local CAMHS clinical leadership and NHS Grampian Health Intelligence teams.

## References

Gould, N. (2006) *Mental health and child poverty*. York: Joseph Rowntree Foundation.

Handley, C.E., Oakley, D. and Saville, C.W.N. (2020) ‘Residential churn moderates the relationship between economic deprivation and psychiatric admission: evidence from Wales’, *Journal of Epidemiology and Community Health*, 74(7), p. 560. doi:10.1136/jech-2019-213351.

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Scottish Government (2012) *Mental Health Strategy for Scotland: 2012-2015*. Edinburgh: Scottish Government, p. 61.

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Tennant, P.W.G. *et al.* (2020) ‘Use of directed acyclic graphs (DAGs) to identify confounders in applied health research: review and recommendations’, *Int J Epidemiol* [Preprint]. 2020/12/18 edn. doi:10.1093/ije/dyaa213.

Weich, S. *et al.* (2017) ‘Variation in compulsory psychiatric inpatient admission in England: a cross-classified, multilevel analysis’, *The Lancet Psychiatry*, 4(8), pp. 619–626. doi:10.1016/S2215-0366(17)30207-9.

## Appendix 1: Diagnostic and BNF Codes

1. ICD-10 Codes for study population definition. Presence of codes related to a hospital episode of care (Data relating to inpatient, day-case, outpatient, A&E or death).

|  |  |
| --- | --- |
| **Code** | **Description** |
| F00-09 | Organic, including symptomatic, mental disorders |
| F10-19 | Mental and behavioural disorders due to psychoactive substance use |
| F20-29 | Schizophrenia, schizotypal, delusional, and other non-mood psychotic disorders |
| F30-39 | Mood [affective] disorders |
| F40-48 | Anxiety, dissociative, stress-related, somatoform and other nonpsychotic mental disorders |
| F50-59 | Behavioural syndromes associated with physiological disturbances and physical factors |
| F60-69 | Disorders of adult personality and behaviour |
| F70-79 | Intellectual Disabilities |
| F80-89 | Pervasive and specific developmental disorders |
| F90-98 | Behavioural and emotional disorders with onset usually occurring in childhood and adolescence |
| F99 | Unspecified mental disorder |
| X60-84 | Intentional self-harm |
| Y10-34 | Event of undetermined intent |
| Y87.0 | Sequelae of intentional self-harm |

Additional diagnostic information in A&E records will be identified by free-text searches within the ‘presenting complaint’ and episode ‘description’ fields. Search terms include: xxxxxx

1. BNF Section Codes for study population definition. Presence of medications listed in PIS data linked to an individual.

|  |  |
| --- | --- |
| **BNF Section** | **Description** |
| 4.1 | Hypnotics and Anxiolytics (including Barbiturates) |
| 4.2 | Drugs used in psychoses and related disorders: antipsychotic drugs, antipsychotic depot injections, drugs used for mania and hypomania |
| 4.3 | Antidepressant drugs: tricyclic and related antidepressants, monoamine-oxidase inhibitors, selective serotonin re-uptake inhibitors, other antidepressants |
| 4.4 | Central Nervous System stimulants and drugs used for ADHD |
| 4.10 | Drugs used in substance dependence: alcohol, nicotine and opioid |

1. Case definition in Case-Control Study. Inclusion criteria for each aspect of case definition.

|  |  |
| --- | --- |
| **Aspect** | **Description** |
| A&E attendance | Episode of care where ICD-10 codes F00-99 (Mental or Behavioural Disorder), X60-84 (Intentional Self-Harm), Y10-34 (Event of undetermined intent) or Y87.0 (Sequelae of intentional self-harm) are listed as a diagnosis in A&E dataset.  Additionally ‘presenting complaint’ or ‘episode description’ where the terms xxxxxx appear. |
| Compulsory Inpatient Admission | Inpatient admission lasting 72hrs or longer where ‘Status on Admission’ is recorded as ‘formal’, recorded in SMR04 (Mental Health Inpatient & Day case) dataset |
| Death | Main or contributing cause of death ICD-10 codes F00-99, X60-84, Y10-34 or Y87.0 in NRS Death Certification dataset |

## Appendix 2: Potential Future Analysis

1. Description of temporal trends in:
2. specialist CAMHS and adult Psychological Therapies referrals
3. Community dispensed medications related to MH
4. crisis outcomes (A&E attendance, inpatient admission or death)

Time Series, including pre-/peri-COVID pandemic.

1. Time to event analysis related to CAMHS/PT referrals, rejection, wait to treatment, duration of treatment.
2. Cluster analysis of care pathways and point of presentation to services – Clustered on ‘flow’ through services e.g.
3. Prescription Only
4. Prescription -> CAMHS/PT referral
5. Prescription -> A&E/Inpatient
6. Prescription -> CAMHS/PT -> A&E/Inpatient
7. CAMHS/PT referral only
8. CAMHS/PT -> Prescription
9. CAMHS/PT -> A&E/Inpatient
10. etc
11. Risk factors for A&E attendance (e.g. related to self-harm)