FULL TITLE OF PROJECT

Understanding the Increasing Rate of Involuntary Admissions in NHS Mental Health Care

AIMS AND OBJECTIVES

Involuntary admissions under the Mental Health Act in England have increased dramatically in the last 20 years, and coincide with an equally stark reduction in mental health bed numbers. It is also recognised that people from black and minority ethnic communities are consistently over-represented among those detained in psychiatric hospitals and in secure settings. Bed reductions may disproportionately affect their detention rates as well as the detention rates of other groups that share the same mediating characteristics, for example residing in urban and/or deprived areas.

Our aims will be to explore variation between places in England in rates of involuntary admission and to identify factors that might explain this, including socio-economic context (eg area deprivation), features of local services (including level of investment by commissioners), and characteristics of service users (especially socio-economic status and ethnicity). Interpretation of the study findings and their translation into actionable conclusions for the NHS will be aided by consultation with mental health service users and senior NHS managers.

Research questions

1) To what extent are national rates of involuntary admission applicable to lower level health administrative areas? In other words, how variable are rates of involuntary admission across different places, namely Strategic Health Authorities (SHAs), NHS Trusts and independent sector hospitals, and Primary Care Trusts (PCTs) in England?
2) What proportion of the total variance in rates of involuntary admissions occurs between SHAs, trusts/hospitals and PCTs, respectively?
3) To what extent is variance in rates of involuntary admission explained by local factors, such as small area socio-economic deprivation, urbanicity, ethnic density, PCT investment in mental health services, and by features of local mental health services and the experiences of those who use them?
4) To what extent is variance in rates of involuntary admission explained by the characteristics of people using services, including socio-economic status and ethnicity?
5) After taking into account characteristics of areas, services, commissioner (PCT) investment and individual service users, to what extent can the variance in involuntary admissions be attributed to the availability and occupancy of NHS mental illness beds?

Our original proposal included two additional research questions:
6) Is there evidence of geographical variation in the use of Community Treatment Orders (CTOs), and if so, how is this associated with bed numbers and occupancy, length of stay, area-level factors (like deprivation and PCT investment), experience and quality of local services, and rates of involuntary admission?
7) Using the model of best fit based on local services and settings and including historical data on trends in bed numbers, can we predict the future need for involuntary treatment with sufficient accuracy to support commissioners and NHS managers in determining optimal local bed numbers?

Given our knowledge and experience with the MHMDS at this stage in the project, it is not feasible to explore these two research questions due to data quality issues. The complexities of the MHMDS structure and issues with data quality will be outlined throughout this revised protocol and have already been provided in detail in our interim progress reports submitted in September 2012 and February 2013.

BACKGROUND

Increasing rates of involuntary psychiatric in-patient admission and falling bed numbers

Rates of involuntary admission to psychiatric in-patient beds have been rising in many Western European countries (1), including in England since the introduction of the Mental Health Act (MHA) in 1983 (2, 3). The reasons for this remain unclear, particularly since this trend has continued despite the development of a range of community-based services such as Community Mental Health Teams, Assertive Outreach, Crisis Resolution Home Treatment and Early Intervention service. Despite being patient- and carer-centred, responsive to need, recovery-focused, timely and popular (4, 5), none of the developments in community mental health services has been shown to reliably reduce involuntary admissions (6-9).

The upward trend in rates of detention appears to have accelerated since the introduction of the Mental Health Act (2007). Formal admissions alone (ie patients admitted to hospital under the Act as opposed to those detained after removal to a place of safety, or subsequent to informal admission) increased by 7.3% from 2008/9 to 2009/10, the largest increase in three years (10). This increase was due solely to increased rates of formal admission to NHS facilities and concealed a decline in numbers of formal admissions to private sector units (11). Formal admissions to NHS facilities under Section 2 of the Act (the most commonly used section, which allows for assessment rather than treatment) increased by almost 15% in 2009/10. By comparison, this number fell by 10% in the private sector over the same period.

The increasing rate of compulsory admission in England has coincided with an equally dramatic reduction in the number of mental illness beds (12). Analysis for England shows that the number of NHS involuntary admissions increased by over 80% between 1988 and 2008, while the number of mental illness beds fell by around 60% during the same period (Keown et al., personal communication based on submitted manuscript, attached). While closure of mental illness beds has been part of the deinstitutionalisation of care for the mentally ill for decades in high income countries (13), the United Kingdom has taken this further than its neighbours and most other developed economies. There are substantially fewer psychiatric in-patient beds in the UK (5.8 per 10,000 population in 2005) than the median for Europe (8.0 per 10,000 population) or high income countries as a whole (7.5 per 10,000 population) (14). These figures should be seen in the context of high overall levels of funding for mental health services in the UK, which currently account for 10% of the total health budget (15). The United Kingdom has greater numbers of psychiatrists (11 per 100,000 population) and psychiatric nurses (104 per 100,000 population) than the medians for Europe (9.8 and 24.8, respectively) and high income countries as a whole (10.5 and 33.0, respectively).

People from black and minority ethnic groups experience poorer mental health services compared to the rest of population in the UK (16-23). Disparities in rates of admission, including compulsory detention (19, 20) and more coercive pathways to acute psychiatric care, involving the police and criminal justice system disadvantage black service users in particular (18, 22, 24). These inequalities have persisted despite major policy initiatives (25-27), additional investment, workforce developments and the general improvements in the coverage and quality of mental health services over the last decade (18, 26, 28).

Supervised Community Treatment (SCT) in the form of Community Treatment Orders (CTOs) was introduced as part of the new Mental Act in 2007. Since November 2008 it has been possible for patients detained under Section 3 of the Act to be discharged from hospital by means of a CTO, subject to the possibility of recall to hospital if necessary. This order requires the patient to adhere to specific conditions, most often including taking their medication. In the first full year of operation, 4103 such orders were made – significantly greater numbers than anticipated - while only 1789 were revoked suggesting that some people are being kept on these order for long periods of time (11). SCT remains controversial, and its effect on and associations with bed numbers, occupancy, detention rates and therapeutic outcomes remain unknown. It has been suggested that SCT is both a means to ensure early discharge where beds are scarce (particularly where therapeutic to medication are restricted or unavailable), and a defensive and alienating response to managing risk (29).

The increase in the use of compulsory detention sits uneasily with most professionals, who have spent two decades attempting to improve engagement with care and to reduce the fear and stigma associated with mental health services. (4, 20, 30-32). It is also a source of concern to commissioners and service providers, given the high costs of in-patient care. The increasing rate of involuntary treatment represents a major financial obstacle to investment in community services, particularly at times of austerity. The acute care pathway in adult mental health services (the most expensive of all service areas) is particularly vulnerable to budgetary pressures. The growing strain on these services may explain recent acceleration detention rates. Understanding the determinants of this trend - and how to identify and therefore prevent potentially catastrophic disinvestment - is therefore imperative.

Different explanations for the increase in involuntary admissions have been proposed, including secular increases in the use of illicit drugs and alcohol (2). But empirical evidence is extremely limited. An alternative hypothesis is that the rise in involuntary admissions is due to bed shortages arising from reductions in mental health bed numbers (and especially long stay or 'rehabilitation' beds) dating back to the 1950s in England (33). It has been suggested that fewer beds results in greater pressure to discharge patients from hospital, leading to relapse and readmission (2).

An ecological study across eight hospital trusts in England provided some support for this view, finding that the rate of involuntary admission was associated with delays in accessing in-patient beds (as well as with and socio-economic deprivation and the size of minority ethnic populations) (34). More recently, our own research based on time-series analysis of national data on mental illness beds and detentions for England between 1988 and 2008 found the strongest association between these variables was observed when a time lag of one year was introduced, with bed reductions preceding increases in involuntary admissions. This association increased in magnitude when analyses were restricted to civil (non-forensic) involuntary admissions and non-secure beds. Our findings support the view that that the annual reduction in mental illness bed numbers is directly associated with the number of involuntary admissions over the short to medium term. We have estimated that for every two mental illness beds that are closed there will be one additional involuntary admission in the following year (Keown and Weich, personal communication based on submitted manuscript). This research has also highlighted differential rates of bed closure by type of bed: while long stay bed numbers have fallen dramatically, there has been a small but steady increase in secure beds (ie beds in specialist forensic mental health units, sometimes referred to as 'medium secure units').

Despite these important findings, there are limitations to this type of ecological analysis based on national-level data. Not only can this overlook informative local variations occurring over smaller areas, but correlation at a national level may be confounded by controlling for other associations at the level of region, trust or even hospital. The most obvious potential confounder is (area-level) socio-economic deprivation. This has never been fully explored.

Studying the geography of involuntary admission

There is an urgent need to understand the determinants of the persistent and seemingly irrevocable trend towards ever higher rates of involuntary psychiatric admission in the UK. This is even more imperative in the light of evidence that this trend may have accelerated following changes to the Mental Health Act in 2007 (10, 11). Studying the geography of involuntary admission offers the opportunity to explore variations in this trend at local level and therefore to identify factors associated with higher and lower rates of involuntary admission. It therefore represents the logical next step towards achieving the aim of understanding the causes of the upward national trend.

Preliminary investigation reveals marked variation in rates of involuntary admission between regions of England. In 2009/10, there was a two-fold difference between regions with the highest (London SHA, 146 detentions per 100,000 population) and lowest (South Central SHA, 70 per 100,000) rates of formal detention, after excluding Place of Safety orders (11).

There is substantial variation in investment by PCTs on mental health services per head of population. It was estimated that the crude ratio between the PCTs with the highest and lowest mental health spend was 4.6 in 2007, falling slightly to 2.9 after weighting for age, population need and overall PCT spending allocations (35). It is not yet known whether and how this variation is associated with differences in mental health bed numbers, occupancy, length of stay, detention rates, and access to services or patient experiences of care.

We suggest that urbanicity (ie population density and settlement size), ethnic density, socio-economic deprivation and the availability (or otherwise) of in-patient beds are likely to be the most important local factors that contribute to needs for involuntary treatment. While there is now limited evidence of a direct association with (fewer) mental health beds, we propose to test the hypothesis that detention under the Mental Health Act is also related to the availability and quality of community mental health services, as well as the lack of barriers to using these (as indicated by area-level deprivation). One key hypothesis is that the gains associated with improved community services have not been enjoyed equally by all, and that rates of involuntary admission may be growing fastest in those places where social networks are weakest and community services are the hardest to deliver, namely the deprived inner cities with large minority ethnic populations.

We will also explore the extent to which urbanicity and ethnic composition interact (as opposed to acting independently of one another) in their associations with rates of involuntary admission. The rate of involuntary admission may be higher in areas with diverse minority populations than in places with greater ethnic density (ie concentrations of people of the same ethnicity), where social networks might be stronger. By establishing linkages to Census data, we will assess the independent and interactive effects of ethnic diversity and density, and urbanicity on rates of involuntary admission.

How the proposed research will add to the body of knowledge with reference to current NHS policy and practice

In the present economic climate, further closure of in-patient beds appears the most likely strategy for funding improvements in community-based mental health services. While this is in keeping with providing care in the least restrictive setting and near to home, there is little evidence to guide the relative and absolute provision of short stay, long stay and secure forensic) mental illness beds in the NHS. The current imperative for efficiency savings is also leading commissioners and service providers to consider disinvesting in a number of specialist community-based services. This could have a counter-productive effect by increasing the pressure on beds *and* the cost base on which services are delivered, particularly as there is evidence that fewer beds (and greater occupancy) delays admission and makes involuntary admission more likely. In this scenario there will be ever-diminishing scope for new investment in community-based services, with consequences for the quality and experience of care. The recent addition of Community Treatment Orders (CTOs), driven by a desire to reduce risk albeit at the risk of increased coercion, may represent a recipe for accelerating involuntary admission rates.

This project will add to knowledge in this area and help in future decisions about the provision and balance of inpatient and community psychiatric services in England. An important aim of this research will be to derive comprehensive and sophisticated, multivariate predictive models (based on a validated methodology pioneered by one of the applicants) that will allow individual NHS Trusts (and their commissioners) to estimate the numbers of involuntary admissions they might expect over time, and what impact further bed closures would have on this number.

Importance of the proposed research

Patients are clear about their dislike for in-patient treatment, which is frightening and undermining of autonomy and choice (4, 31, 32). Involuntary admission to hospital is even more distressing for patients and their carers, and typically results in longer lengths of stay in hospital. Involuntary admissions are more common in some groups (especially among black and minority ethnic groups), and in some places. Though often necessary to prevent immediate harm, involuntary admission impairs longer term therapeutic relationships, increases stigma and reduces confidence in and subsequent engagement with services.

Despite a decade or more of investment in more patient-centred, community-based treatments the rate of involuntary admission continues to rise and have coincided with reductions in mental illness bed numbers. There is also evidence that this may have increased further since the introduction of Supervised Community Treatment in 2008. But other, as yet unstudied factors may also be important, including ethnicity, urbanicity, and socio-economic status and diagnosis (patients with psychosis are more likely to be detained). The original protocol outlined that the project would examine the association between diagnosis and involuntary admission rates. At this stage in the project, our team is now aware that the MHMDS only has reliable diagnostic information for ~19% of all patients. This level of missing data is extremely high and was unexpected; we are not able to include psychiatric diagnosis in our analytical plan for this project. The rate of involuntary admission is of interest to many groups and is likely to remain highly relevant for a number of reasons (clinical effectiveness, ethical, and health economic reasons).

At a time of austerity, tough decisions are being made about the shape of mental health care for the next decade. One important decision concerns the optimal balance between inpatient and community services. Understanding the relationship between bed numbers and involuntary admission is an important part of this. But including measures of the configuration, quality and experience of community service *at the same time* as analysing the association between bed numbers (and occupancy) and involuntary admission means that the proposed research will result in usable evidence about how to improve acute care pathways in all settings across England. Identifying and quantifying the wider societal and service-level determinants of the rise in involuntary admission, and modelling the impact of further bed closures are all vitally important for the commissioning and delivery of services.

By working with service users (through the mental Health Foundation) and senior NHS managers (with the support of the NHS Confederation), we will ensure that our scientifically robust findings are translated into actionable conclusions for the NHS. These will allow NHS Trusts to anticipate the impact of bed closures on the rate of involuntary admissions to those beds and the consequent impact on psychiatric admission wards. The results of this study will have a major bearing on the commissioning of mental health services, which in the current economic climate are highly dependent on the release of resource from (very costly) in-patient services to support further development of community-based treatments.

RESEARCH METHODS

Design

Secondary analysis of routinely collected data. Data will be organised to permit analysis as cross-sectional survey, cohort and (nested) case control studies.

Data sources

As the time the original protocol was submitted, the main data sources were to be obtained from the NHS Information Centre. In 2013, the NHS IC was re-organised to be the NHS Health and Social Care Information Centre, or the HSCIC (http://www.hscic.gov.uk/). As a result, many of the services (and corresponding webpage links) we outlined in our original protocol are no longer available and we have updated this section of the protocol accordingly.

The HSCIC is responsible for collecting and collating national health and social care data in the UK. The HSCIC ensures appropriate governance checks for the use of these data, to protect the confidentiality of those on whom data is collected, through the National information Governance Board for Health and Social Care (NIGB). It also collates geographical data, including deprivation and other neighbourhood statistics, and provides support in ensuring appropriate linkage to other datasets. The significant investment on the part of the NHS in software resources and staffing to support secondary users through the HSCIC represents a major strength of the proposed research. Although the proposed data linkages will be methodologically challenging, we are confident that the study aims are achievable.

The datasets which we propose to access and link are set out below in Table 1, followed by more detailed descriptions about each of these. Since the original protocol was submitted, our research team has become very familiar with the structure, content, and capabilities of the datasets we proposed to analyse to achieve the aims of this project. In light of this, a number of amendments and additions have been made to the data sources we aim to work with in this project. Specifically, we will focus on the Mental Health Minimum Dataset (MHMDS) as our main data source to derive the outcome variable for the study, and link in information from the Hospital Episode Statistics (HES) data as well as other data sources to provide additional contextual information relevant to the study of psychiatric admission rates. Table 1 below, which was included in the original protocol, has been modified to reflect these changes. As outlined previously (and in our interim reports submitted in September 2012 and February 2013), the quality and reliability of the MHMDS is of a relatively high quality from 2010/11 onwards but poor from 2007-2009. Given that the project will focus on comprehensive cross-sectional analyses of the most comprehensive data available, additional data sources relevant to this recent annual period (2010/11) and to the study of psychiatric admissions have been sourced for linkage to the MHMDS (see Table 1 for details).

Table 1: Datasets to be used (sources of outcome variables **in bold**).

	Dataset	Key variables	Smallest data level	Level of proposed linkage	Time frame
1	**Mental Health Minimum Dataset (MHMDS)**	**Patients admitted involuntarily**; patient characteristics inc ethnicity, age, and gender. In our original protocol, we had hoped to include other individual-level characteristics such SES, HoNOS, and diagnosis; due to high levels of missing data and inconsistencies in recording data by the Providers submitting to the MHMDS, this is not now possible.	Individual	PCT	2010-11
2	**Hospital Episode Statistics (HES)**	All admissions, inc **involuntary admissions**; diagnosis, length of stay; patient characteristics inc ethnicity and SES. In our original protocol, we outlined that it might be possible to link patient-level HES data to the MHMDS. At this stage in the project, however, we believe that a more appropriate use of the HES data is to obtain access to relevant Provider Trust level data to help us characterise the Trusts delivering the mental health care to patients in the MHMDS. HES has important information on number of admissions and discharges, median length of hospital stay by consultant speciality, number of occupied and available beds by consultant speciality, and number of finished consultant episodes.	Individual	Provider Trust	2010/11
3	**Census & other geographical data**	Area-level features (eg urbanicity, socio-economic deprivation) and population composition	Lower-layer super output area level	Lower-layer super output area; PCT	2009-2011 (inc mid-year estimates)
4	**Beds Open Overnight (BOO) - previously Hospital Activity Statistics**	Bed numbers inc availability and occupancy	Provider (Trust or independent hospital)	Provider	2010/11
5	**Patient Environment and Action Team (PEAT)** *(This is a newly-sourced database and was not included in the original protocol.)*	Summary scores for performance in patient safety in the following areas: environment, food, and dignity and respect	Provider	Provider	2011
6	**Community Mental Health**	Provider performance on a variety of domains including health and social care	Provider	Provider	2011

	Services Survey *(This is a newly-sourced database and was not included in the original protocol.)*	workers, medication, helpfulness of talking therapies, care plan management, crisis care, and day-to-day living			
7	**Inpatient Service User Survey** *(This is a new data source and was not included in the original protocol.)*	Provider performance on a variety of domains including ward accommodation, staff communication, medications and treatment , and patient rights	Provider	Provider	2009
8	**NHS Staff Survey** *(This is a newly-sourced database and was not included in the original protocol.)*	Workplace related indicators including workloads, training, staff communication, health and wellbeing etc.	Provider	Provider	2010/11
9	**Investment in Adult Mental Health Services (IMHS)**	Spend per person on mental health care for adults of working age	PCT	PCT	2010/11
	Community Mental Health Activities (CMHA) ***This data source has been replaced by the Community and Inpatient Service Surveys***				
	National Patient Survey (NPS) ***This data source has been replaced by the Community and Inpatient Service Surveys***				

1. Mental Health Minimum Dataset (MHMDS)

As previously mentioned, the Mental Health Minimum Dataset will be our primary data source for the analyses in this study, by virtue of the detail recorded at the individual patient level. The MHMDS comprises anonymised record-level (ie individual patient-level) data about adults and older people using secondary mental health services. Each record in the MHMDS represents the complete, continuous spell of care for an individual, from initial referral to final discharge (referred to as a mental health care spell – or 'care spell' for short). Each care spell contains information relating to voluntary and involuntary in-patient admissions, out-patient attendances, day treatment and all other episodes of care. The MHMDS data is reported quarterly and describes complete spells of care for an individual, from initial referral to final discharge. Quarterly data are aggregated into an annual database which is released by the NHS Health and Social Care Information centre to registered users of the data.

Although (limited) MHMDS data are available from 2003, the data quality has been quite poor (i.e. high levels of missing data and inconsistent recording of patient care by Provider Trusts) until very recently. Our project team have gained access to data from 2007/08 and are confident that the most comprehensive data on service use are available from 2010/11. Details of these data exploration tasks have been documented in detail in our interim reports (submitted September 2012 and February 2013). This means that only data from the 2010/11 annual reporting period will be used to investigate this study's research questions. Whilst longitudinal analysis will be feasible as time progress (i.e. from 2010/11 onwards), earlier years of the MHMDS are simply too poor to be able to confidently link patient records across years for the purposes of longitudinal analyses. No other more recent data (i.e. 2011/12) is available at the present time. Thus, we will focus on the most recent and comprehensive data available to use (i.e. 2010/11 MHMDS) but we also make use of 2009/10 MHMDS database for quality assurance purposes. We will seek NHS Research Ethics approval for our research, and will apply to the NHS Information Centre through its Security and Confidentiality Advisory Group for access to anonymised, patient-level MHMDS data. Data from independent sector providers will be available for the first time with the 2010/11 MHMDS release in January 2012. The advantage of MHMDS over other datasets, and especially Hospital Episode Statistics (HES), is that it comprises all episodes of mental health treatment regardless of setting. By contrast, HES is restricted to in-patient admissions. Therefore the reference group for analyses based on these data are people using local mental health services but who have not been admitted to hospital involuntarily in a specified period. The findings will therefore be generalizable to people who use mental health services.

Rather than counting uses of the Mental Health Act, MHMDS counts people subject to the Act and provides opportunity for analysis by age and ethnic group. Involuntary admissions are denoted by recording legal status at end of reporting period, coded using the most restrictive legal status (ie whether detained or treated informally) that applied during the mental health care spell). Community Treatment Orders (CTOs) and their revocation and recall to hospital are also recorded in MHMDS. As mentioned earlier, however, the CTOs data are not currently sufficient to permit a through exploration of this data in our current study. After much interrogation of the MHMDS over the course of this project, our team now has a clear understanding of what is capable in terms of determining the number of patients who were admitted to hospital under the MHA during the time frame under study (2010/11). This has not been without difficulties, and we have documented these stages in our interim progress reports. Nevertheless, we have been successful in navigating the MHMDS to derive the outcome variable for the study and our estimates of the number of patients detained are very consistent with those published by the HSCIC.

Having derived our outcome variable for the study, the next task involved understanding the different levels within the MHMDS that could be used to explore what regions of the country have different rates of psychiatric detentions and what factors contribute to this variation. In addition to recording detailed information on the patient's medical history, the MHMDS care spell records contain information about where the patient lives, where their GP is located, and where they receive their mental health care. This type of information is very useful for trying to build a picture of the type of environments in which patients live, which may uncover the reasons for variation in involuntary admission rates in different areas across England. There are numerous discrete and identifiable spatial levels in the MHMDS at which variance in rates of involuntary admissions might occur:

i. **Patient-level**: each patient record (n=1,287,730) in the MHMDS contains detailed information about the patient's contact with mental health services

ii. **Lower layer super output area-level** (LSOA): The LSOA is a geographical area comprising of a minimum of 1000 people. There are approximately 33,000 LSOAs in England. Knowing the LSOA in which a person lives can provide a lot of information about the type of area they inhabit (e.g. population density, ethnic density, and socio-economic deprivation). Importantly, it allows us to link in other pertinent datasets such as the UK Census and the Index of Multiple Deprivation.

iii. **GP Practice-level:** GP Practices, of which there are approximately 8000 in England, deliver primary care services. This will include delivering some mental health services, but also covering referrals to more specialist secondary care mental health services.

iv. **Primary Care Trust-level** (PCTs): PCTs were in charge of primary care and had a major role around commissioning secondary care, providing community care services.

v. **Provider Trust-level**: Patients receive mental health care from Providers, mainly NHS Trusts but also some Independent sector Providers. There are 58 specialist NHS Mental Health Trusts in England. These Trusts deliver specialist mental health care services. In total, there are 72 Providers (both NHS and Independent sector) in the 2010/11 MHMDS.

vi. **Strategic Health Authority**-level (SHA): There are currently 10 SHAs in England. SHAs are responsible for, amongst other things, improving health services in their local area and ensuring local health services are of a high quality and are performing well.

2. Hospital Episode Statistics (HES)

HES contains details of all admissions (including those under the Mental Health Act) to NHS hospitals and independent hospitals in England funded by the NHS. HES also contains details of all NHS outpatient appointments in England and is available from 1998 to the present. HES comprises patient-level records and contains data on diagnosis, length of stay, age, gender and ethnicity. It also includes information about where treatment was delivered and place of residence. It also provides very useful information about the characteristics of Provider Trusts and PCTs. In our original protocol, we envisaged that patient-level data would be required for this project but we actually now required Provider Trust and PCT-level admissions-related data. Specifically, we will seek NHS Research Ethics approval for our research, and will apply to the HSCIC through its Security and Confidentiality Advisory Group for access to hospital admission data for linkage to the MHMDS. This will include data on median length of hospital stay, number of available and occupied beds by consultant speciality, and number of finished consultant episodes, to create a more comprehensive picture of the Trusts who are delivering mental health services (and PCTs who are commissioning these services) to patients in the MHMDS. We are currently awaiting delivery of this data from the HSCIC.

3. Census and other geographical data

We will use area-level deprivation indices to characterise the places in which services are delivered. In the original protocol, we envisaged that it would be necessary to make do with area-level population estimates from the 2001 Census data, supplemented with more recent mid-year estimates, due to lack of availability of more recent data. We are pleased to report that we have been able to access the 2011 Census population statistics to determine ethnic composition and population density for different areas, and across different spatial levels (supplemented by mid-2009/2010 estimates where necessary when this is the most recent available data). We will also obtain details on urbanicity classification for England and Wales from the Office for National Statistics (http://www.ons.gov.uk/ons/guide-method/geography/products/area-classifications/rural-urban-definition-and-la/index.html).

4. Beds Open Overnight (BOO) - previously *Hospital Activity Statistics*

The number of available and occupied NHS mental illness and learning disability beds are available via the Department of Health, and comprise aggregated quarterly KH03 returns by each provider. Data are available for 2010 (http://transparency.dh.gov.uk/2012/07/05/bed-availability-and-occupancy-overnight/). We have source detailed information on the average annual number of available and occupied beds for each consultant speciality treatment patients with mental illness.

5. Patient Environment and Action Team (PEAT)

PEAT is an annual assessment of inpatient healthcare sites in England that have more than 10 beds. It is a benchmarking tool to ensure improvements are made in the non-clinical aspects of patient care including environment, food, privacy and dignity. The scores demonstrate how well individual healthcare providers believe they are performing in key areas including food, cleanliness, infection control and patient environment (including bathroom areas, décor, lighting, floors and patient areas. Data are managed by the NHS Health and Social Care Information Centre and are available for 2010 (http://www.nrls.npsa.nhs.uk/patient-safety-data/peat/). This is a newly-sourced database and was not included in the original protocol.

6. Community Mental Health Services Survey

The Community Mental Health Services Survey is conducted by the Care Quality Commission (http://www.nhssurveys.org/surveys/515). The 2010 survey comprises a sample of service users aged 16 and over who had been in contact with NHS mental health services in the three month period 1 July 2009 to 30 September 2009 and who were receiving specialist-help for a mental health condition. The survey aimed to find out about the experiences of people using mental health services in the community. These services provide care and treatment to people who have been referred to a psychiatric outpatient clinic, local community mental health team, or other community-based mental health services. The survey compares the performance of Trusts on a variety of issues, including care plan reviews, use of care coordinators, medications, talking therapies, etc. Data will be linked to the MHMDS at Trust level. This is a newly-sourced database and was not included in the original protocol.

7. Inpatient Service User Survey

The Inpatient Service User Survey is conducted by the Care Quality Commission (http://www.nhssurveys.org/survey/1016). Over 69,000 adult patients from 162 acute and specialist NHS trusts in England responded to the survey, a response rate of 52%. The survey was carried out between September 2009 and January 2010 and gathered the views of patients who were discharged from hospital before the end of August 2009. The survey aimed to find out about the experiences of people using inpatient mental health services and covered a wide range of topics including, ward accommodation, medication, staff communication etc. This is a newly-sourced database and was not included in the original protocol.

8. NHS Staff Survey

The 2010 NHS Staff Survey is the eighth annual survey of NHS staff. The results of this survey help Trusts to review and improve the experiences of their staff, enabling them to provide better care to patients. The survey covers a wide range of work related domains including work load, staff health and wellbeing, staff satisfaction with job, job performance and communication among staff within the NHS. Data will be linked at Trust level. This is a newly-sourced database and was not included in the original protocol.

9. Investment in Mental Health Services (IMHS)

The Department of health sponsors the annual National Survey of Investment in Adult Mental Health Services, an annual finance mapping exercise regarding spending on mental health services in England (https://www.gov.uk/government/publications/2010-11-working-age-adult-and-older-adult-national-survey-of-investment-in-mental-health-services). Data from 2010 are relevant to this project's timeframe and provide details of investment in mental health services for working age adults (aged 18-64) in England, by PCT (commissioner).

Participants

Although there will be no primary data collection (field work), our subjects will be people who have used NHS and independent sector mental health services in England, about whom data is collected routinely during episodes of care. Other analyses will be undertaken at the level of service provider (NHS Trusts and independent sector providers) and commissioning Primary Care Trusts (PCTs).

Setting

The proposed research will be conducted in England, and will include analysis of data covering all Strategic Health Authorities (SHAs), Primary Care Trusts (PCTs) and all NHS and independent sector providers of in-patient mental health care.

"Independent sector providers" are those units that are registered with the Healthcare Commission to accept patients detained under the Mental Health Act 1983 (as amended by the Mental Health Act 2007), as specified under S. 2(3) (b) of the Care Standards Act 2000. These independent Hospitals that are registered to receive detained patients are considered to be "hospitals" for the purposes of the Mental Health Act.

Data preparation

Primary outcome

As previously described, a great deal of time and effort has been spent on deriving the main outcome for the study, that is, categorising patients in terms of their admission to hospital under the Mental Health Act 2007 (MHA) during the 2010/11 reporting period. Details of this process have been documented in our interim progress reports. Briefly, the outcome variable is dichotomous: patients who were admitted to hospital under the MHA during 2010/11 versus all other patients who received any other type of care (including voluntary admission to hospital, community treatment only, or no care). This categorisation will also permit us to determine the rate of involuntary compulsory admissions to hospital at, for example, Provider Trust and PCT level (as outlined in our original protocol).

Data linkage

The next main task will be to link the MHMDS to a wide variety of relevant external data sources. The purpose of data linkage is to create a dataset that will specify multiple distinct levels at which variance in detention rates might be quantified and explained, including geography (e.g. physical environment and demographic composition), service provider (most commonly NHS Trust), commissioner (PCT) and General Practice. Creating such linkages is complex and involves finding suitable data sources and appropriate methods for linkage to the MHMDS. This linkage will take place at the smallest possible spatial scale: as indicated above in Table 1, the most common linkages will be by provider Trust and (commissioning) PCT.

Data analysis

The primary statistical technique employed will be multilevel modelling, which mirrors the structure of the data to be analysed and allows explanation to be correctly assigned to the various ‘levels’ within the dataset (i.e. individual or area) and is therefore a widely used method for analysing nested (or clustered) data.

Strategy of analysis

This section was included in the original protocol but has been redrafted to provide greater clarity and to describe the refocused emphasis on conducting details and robust cross-sectional analysis of the best data sources available to our team: the 2010/11 MHMDS linked to contextually-rich external data sources. Linking the MHMDS to external data sources will enable us (for example) to explore the effects of age, sex, ethnicity (at the individual level), bed numbers (and types of available beds), overall bed occupancy rates, average length of in-patient stay (at Trust level), investment in services (at PCT level) and socio-economic deprivation, urbanicity and ethnic composition (at area level) on the likelihood that a user of mental health services will be admitted to hospital involuntarily. As well as assessing the main effects of these risk factors, we will explore variance at different spatial scales and test for cross-level interactions, ie the extent to which associations vary between places.

Multilevel modelling (MLM)

Testing of the study hypotheses will be undertaken using multilevel modelling (MLM) (36). Multilevel models will be developed using MLwiN software (37). MLM enables variances at different spatial levels to be modelled simultaneously and accurately, and in a way that reflects the structure of the data (ie ensuring that standard errors are adjusted to reflect spatial clustering within the hierarchical data). We will estimate how much of the observed variation is explained by individual and/or ‘compositional’ factors (such as the age, gender and ethnic composition of the local population), and how much is due to area characteristics, otherwise known as 'contextual' factors such as area deprivation or service investment. Multilevel approaches will also allow us to test for independent cross-level interactions, ie the extent to which individual level associations with involuntary admission vary between types of places (ie in terms of service investment, quality, socio-economic deprivation etc).

In a multilevel model, it is important to structure the data correctly. In a classic MLM, the various spatial levels nest neatly within one another and, in this sense, we can create a nested hierarchy - i.e. individuals (level 1) nested within LSOAs (level 2) within Provider Trusts (level 3). The structure of the MHMDS is quite complex and the data are not nested neatly. If we were to run a MLM that assumed the data were nested neatly then the resultant estimates of variance across the different geographies would not be correct. Therefore, rather than regard the geographical areas as 'levels' within a hierarchy, they are instead regarded as 'classifications' and for each individual within the dataset, the classification structure is recorded, allowing for a non-nested, cross-classified data structure. Markov chain Monte Carlo (MCMC) estimation methods are available in MLwiN estimate the variance of our outcome variable across these geographic classifications (i.e. LSOA, Commissioner, Provider Trust etc.), within these types of multilevel models.

Our first aim was is to estimate how much of the observed variation in involuntary admission rates across England is explained by individual factors such as gender and age and how much is due to factors operating at these different spatial levels. The most basic MLM is the null model, which estimates the total unexplained variance in involuntary detentions in the study sample (this is equal to the sum of the unexplained variances at the different spatial levels). Given the size of the database (~1.2 million patients), estimating models with more than three spatial levels would be difficult due to problems with model stability and computing power. We a series of three-level models will be estimated, varying the structure of the spatial levels in an attempt to identify where the largest variance in involuntary admissions might be occurring, and in order to guide us in populating more definitive models. Subsequent modelling will be used to explore the extent to which this variance is explained by factors such that include individual characteristics (like age, sex, and ethnicity, where these are available) and area-level exposures such as urbanicity, socio-economic deprivation and the size of minority ethnic populations.

Sample size
It is not possible to derive precise sample size estimates for our analyses, and nor are these needed in the design of our research since no new data are to be collected. The datasets at our disposal are extremely large, and are arguably the most comprehensive population-based sources of data on the use of mental health services anywhere in the world. This reflects both the nature of nationalised health care provision in the UK, and high levels of investment in the collection and collation of routine activity data.

Our analyses will cover all of England, and will include information from NHS and independent sector providers of in-patient mental health care (as previously earlier, these independent sector providers are coded by the service provider (company) and not by individual units or according to geographical location). In 2009/10 this comprised 10 Strategic Health Authorities (signifying region), 151 Primary Care Trusts (as commissioners), 58 NHS Mental Health Trusts (including Care Trusts and Mental Health Foundation Trusts) and 211 registered independent mental hospitals. In 2009/10 more than 1.25m people accessed mental health services in England (2.7% of the population) (38). In the same year, 107,765 people were in-patients during the year and 42,479 were detained in hospital under the MHA (39.4% of all admissions). Of these, 2717 (4.8% of all detentions) were in independent mental hospitals and 760 (1.8% of all detentions) were under court or prison disposal orders.

Whilst sample size is unlikely to be a problem for the multilevel rates analyses, the individual logistic analyses may have relatively few observations nested within small areas. To overcome this problem, parameters will be estimated using second-order Taylor expansion with predictive quasi likelihood (PQL). This estimation procedure is considered superior to first or second order marginal quasi-likelihood (MQL) when observations within clusters, such as individuals within small areas are small (39). Markov chain Monte Carlo (MCMC) methods will further improve the accuracy of such estimates (40).

Dissemination and projected outputs

Our strategy for dissemination is built around two key partnerships. In undertaking this project, we shall be working closely with the Mental Health Foundation and the Mental Health Network (which is part of the NHS Confederation) from the outset. These partnerships will help ensure that our analyses focus on the outcomes and associations of greatest importance to service users, NHS managers and commissioners, and that the findings are translated into actionable conclusions. Both partners have well established and effective communications strategies which we shall utilise so that our results reach the widest possible audience. This will involve Briefing Papers (available on line and in hard copy), hyperlinks to our reports via MHF and NHS Confederation web pages and press releases. We will explore opportunities for other dissemination events, including hosting stakeholder workshops.

We will also pursue more traditional modes of academic dissemination by submitting our findings to high impact journals, and by presenting these at national and international scientific conferences. Finally, we also propose to hold workshop for key stakeholders in each of the three regions from which the clinical academic applicants are drawn: London, the Midlands and the North East.

PLAN OF INVESTIGATION TIMETABLE

This project was granted a no-cost time extension to extend the project end date from 31/05/2013 to 31/08/2013. The reasons for this extension were outlined in our interim reports (September 2012 and February 2013) and were largely due to administrative delays in hiring the Research Fellow to the project on a full-time basis. This section has been amended accordingly to reflect this extension.

Months -3 to 0: Applications for (a) research ethics and NIGB approval and (b) permission for access to anonymised patient-level data from the NHS Information Centre’s Security and Confidentiality Advisory Group; further data and software acquisition. Research Fellow will begin on-line training in multilevel modelling through the Centre for Multilevel Modelling (University of Bristol). First meeting of full study team.

Months 1 to 3: Induction of Research Fellow and completion of on-line multilevel modelling training; secure NIGB and NRES permissions and finalise acquisition of all study data; liaison with NHS Information Centre Secondary Uses Service to support data linkage. Plan & execute data management. Further meeting of the full study team.

Months 4 to 15: Data analysis. Regular study team meetings; regular supervision of Research Fellow (Warwick and Portsmouth). Initial meetings with service users (via Mental Health Foundation, MHF), and with NHS mental health service clinicians and managers (via Mental Health Network, MHN).

Months 16 to 18: Interpretation of findings, final meetings of full study team. Further consultation event with service users (facilitated by Mental Health Foundation) NHS mental health service Chief Executives (facilitated by Mental Health Network); report writing and dissemination (including formal briefing reports to be published by MHF and the NHS Confederation (governing body of the MHN).

PROJECT MANAGEMENT

Management of the project is of the utmost importance, given that the research team will be spread out across five sites within the UK. As we describe below, this project has arisen from strong research partnerships and collaborations that span the past decade. We have an established track record of working together very productively, and this is further evidenced by the significant research outputs that have accrued between the time of the outline submission and the present. We have published numerous papers together in high impact scientific journals, including several notable publications in the last year alone. We are a tried and tested collaborative of like-minded and committed academics who know one another very well, and we have established an effective modus operandi over many years.

SW, who is based at the University of Warwick, will be the Chief Investigator and Project Manager, and will have day to day responsibility for all aspects of the project. His time is budgeted at 10%. SW has considerable management experience, and is also Clinical Director of West Midlands (South) CLRN, where he is responsible for an annual budget of £6.7m. He is also chair of the Psychological and Community Therapies Panel at the NIHR Health Technology Assessment programme.

PK (in Newcastle) will be Deputy Project Manager, and his time has also been costed at 10%. He has a wealth of experience of using a number of the study datasets, and of liaising with the NHS Information Centre.

There will frequent communication between members of the research team, and we have scheduled regular face-to-face meetings every two months at rotating venues. We will hold a teleconference (assisted where appropriate by Skype) between these meetings, to ensure that the full study team discuss progress at least once a month. These meetings will be minuted and will be used to monitor progress and to identify any necessary action points.

The proposed Research Fellow, Dr McBride, has a proven record of academic achievement and a well-deserved reputation for being able to work independently. Her CV (which we attach) testifies to her drive and ambition, as well as her expertise. She has undertaken very productive visiting fellowships overseas, where she has increased her knowledge and learning but has also produced significant research outputs. She has worked and published previously with SW, and the physical separation is unlikely to be a hindrance. We have budgeted for her to travel regularly to England where she will be supervised both by SW but also by Dr Twigg in Portsmouth, by Liz Twigg. Dr Twigg has worked extensively with SW and has been recruited to the project for her experience as a senior health geographer and her considerable expertise in multilevel statistical modelling.

We have also set out our proposals for working with our two partners, the Mental Health Foundation and the Mental Health Network below. The former will be enhanced by the David Crepaz-Keay's membership of the project steering group.

Approval by ethics committees

Although this is secondary research and we will not be collecting any new data, we will require research ethics approval for specific aspects of the proposed research.

We will seek NHS Research Ethics approval for our research, and will apply to the NHS Information Centre through its Security and Confidentiality Advisory Group for access to anonymised, patient-level HES data. The Information Centre and its associated Secondary Uses Service and Medical Research Information Service have been very helpful to date in signposting processes for securing the necessary permissions and approvals, and we will follow their direction in these matters.

Most of the other data that we will be using will be aggregated at the PCT or Trust level, and is in the public domain. Nevertheless, our research ethics application will address the issue of data linkage, since in theory it might be possible to identify someone by triangulated the multiple area-level indicators in a linked dataset.

SERVICE USERS/PUBLIC INVOLVEMENT

We propose to engage two sets of 'users': users of mental health services, and senior NHS mental health service managers and clinicians.

We will involve mental health service users through our partnership with the Mental Health Foundation (MHF) (http://www.mentalhealth.org.uk), the UK's leading mental health research, policy and service improvement charity. Service user involvement will be coordinated by David Crepaz-Keay, Head of Empowerment and Social Inclusion at the MHF and a co-application on this proposal. The main aim of this partnership is to ensure that the service user perspective shapes the research questions, influences analysis and interpretation and assists in disseminating the findings.

Working through and with the MHF, we propose to circulate a summary of the study aims and methods to a network of mental health service users for comment. We will also seek feedback from service users on our preliminary findings.

We have also established a partnership with representatives of another key 'user' group, namely senior NHS mental health service managers. We will work with the Mental Health Network (part of the NHS Confederation) to recruit participants to two consultation events. The NHS Confederation represents more than 90% of the organisations that make up the NHS. Its members include the majority of NHS acute trusts, ambulance trusts, foundation trusts, mental health trusts, primary care trusts, special health authorities and strategic health authorities in England; trusts and local health boards in Wales; and health and social service trusts and boards in Northern Ireland

Both mental health service users and NHS mental health managers (and chief executives) will be asked to comment on our research aims, hypotheses at the start of the project, and their views on how best to interpret our findings will be solicited at the end, but before formal dissemination. This will ensure that the research questions are framed to address key concerns of those responsible for delivering mental health care in the UK as well as those on the receiving end. Feedback from both sets of consultations will enable us to present our findings in the form of actionable conclusions.

EXPERTISE AND JUSTIFICATION OF SUPPORT REQUIRED

Project team

The project team is based at Warwick, Newcastle, London and Portsmouth. All members of the group have worked together on several prior studies over 10 years (SW and LT), demonstrating effective collaboration and numerous research outputs. SW, PK, JS and KB are all Consultant Psychiatrists with long experience of developing, leading and delivering adult mental health services in the UK. SW and PK will assume responsibility for delivering the project, and together with LT will supervise the Research Fellow. LT will provide specialist statistical expertise. All applicants will contribute to the formulation of study aims, monitoring progress, interpreting findings and supporting dissemination.

Scott Weich is a psychiatric epidemiologist with extensive experience of secondary analysis using complex datasets in the study of social, geographical, ethnic and gender inequalities in rates of mental disorder. He has published widely on these, including work with Liz Twigg using multilevel modelling (MLM). He and Kam Bhui have worked together on studies of ethnic inequality in the experience of mental health care. He has also worked with Orla McBride (Research Fellow) on two recent publications. He will have overall responsibility for project management.

Patrick Keown has detailed knowledge of the relevant data sets and has experience in evaluating the impact of service innovations at a local level as well as changes across England. He was the lead author on the 2008 BMJ paper documenting increased detention rates, and is first author on the time series analysis (using HES data) that is being considered by the BMJ.

Jan Scott has a track record in clinical service developments (eg Longbenton community service cited as an example of good practice in the Key Areas Handbook) and was previously an Honorary SMO at the Department of Health working on mental health policy. She has expertise in the analysis of large and complex data sets such as process and outcome research in psychotherapy. She chaired a workshop on the European Mental Health Programme at the EU in Brussels in 2009 and with John Bowis (EuroMP) led a similar initiative in 2009 at the European Health Conference in Gastein. These meetings compared cross-national resource utilisation and voluntary and involuntary admissions rates. She is currently involved in a multi-national project on barriers to service use and engagement in young adults with severe mental disorders, including how stigma delays help-seeking.

Kam Bhui is an epidemiologist and cultural psychiatrist and has experience of working with large data sets to assess inequalities. He has worked extensively on different aspects of the national race equality programme using complex qualitative and quantitative data. Tother with Scott weich, he undertook a national evaluation of the Focused Implementation Site programme, the flagship for Delivering Race Equality.

Liz Twigg is a senior health geographer who specialises in the analysis of large and complex spatially referenced datasets using multilevel modelling methods. She has used MLM techniques to look at geographical variation in a number of health outcomes (including common mental disorders) and health related behaviours and has much experience of using the results of such models to produce small area estimates of health outcomes.

David-Crepaz-Keay is Head of Empowerment and Social Inclusion at the Mental Health Foundation. He has over 20 years' experience in service user involvement, and was previously chief executive of Mental Health Media, former board member and vice-chair for the Commission for Patient and Public Involvement in Health, founding member of National Survivor User Network (NSUN), and former chair and treasurer of Survivors Speak Out. I am also a member of the All Wales Mental Health Promotion Board and an advisor to World Health Organisation (WHO) Europe on empowerment. He has personal experience of using mental health services and of involuntary admission.

Justification of support requested

We note that the project budget has increased since the outline submissions. The main reasons for this were to (i) ensure appointment of a Research Fellow capable of undertaking the work; (ii) include expertise in health geography and multilevel modelling; (iii) increase the time commitment of the applicants to ensure successful delivery of the study; (iv) secure effective patient and public involvement and (v) ensure that the study findings are translated into actionable conclusions for NHS managers and commissioners.

We are seeking support for a 15-month project. The main challenge of this project will be collating, merging and managing a complex dataset, and therefore it is imperative that the project researcher is capable of undertaking this. Past experience shows that recruiting someone with the necessary skill set, and who is also a capable statistical analyst, is difficult. At the behest of the Reviewers we have budgeted for a Research Fellow rather than a Research Associate. The largest cost associated with this project is the salary of an experienced Research Fellow (Dr Orla McBride, CV attached). Dr McBride is shortly to take up a post at the University of Ulster, from where (if our application is successful) we shall second her to this project. She has collaborated previously with the Chief Investigator, and has extensive experience of analysing complex datasets used a range of advanced statistical methods. She has a background in psychology and clinical experience in mental health settings. An honorary contract will also be sought for Dr McBride at Warwick University (for which there are no cost implications). We are seeking a limited training budget to support Dr McBride in developing her skills in multi-level modelling. We note that the centre for Multilevel Modelling at Bristol University, the leading centre of its kind in the UK, now delivers its renowned training on-line: http://www.bristol.ac.uk/cmm/learning/course.html.

In response to the Reviewers' comments, we have expanded the project team in three ways, (i) to ensure robust PPI involvement; (ii) to engage another key set of 'users', namely senior NHS managers, and finally (iii) to secure expertise in health geography multilevel statistical modelling (Dr Liz Twigg). We are delighted to report that both the Mental Health Foundation (MHF) and the Mental Health Network of the NHS Confederation have agreed to join us partners, and to help us facilitate consultation events with service users and NHS managers and clinicians, respectively. David Crepaz-Keay, the Head of Empowerment and Social Inclusion at the MHF has agreed to become an applicant on this proposal. We have also noted the Reviewers' concerns about the collective time to be spent by the applicants on the project and have increased this so that the project lead (SW), deputy lead (PK) and LT will all spend 10% of their time on this, and JS and KB 5% each. We have requested support for the involvement of DC-K (2 days per month for the duration of the project) and a small amount of time for the MHF's Director of Research, Dr Eva Cyhlarova.

The budget includes requests to support consultation events (two each) hosted by the Mental Health Foundation (mental health service users) and the Mental Health Network (senior NHS managers and clinicians). Each of these meetings will comprise 8-10 participants plus members of the research team.

We have applied for travel funds to enable regular meetings of the project team, and for Dr McBride to travel to England (Portsmouth and Warwick) for supervision. We have allowed a modest amount in the budget for software, data acquisition, consumables and dissemination.

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