

# Variation in compulsory psychiatric inpatient admission in England: a cross-sectional, multilevel analysis

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## Scientific summary

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# Scientific summary

## Background

Rates of compulsory admission to psychiatric inpatient beds remain high in many Western European countries despite well-resourced, specialist community-based services. Rates have risen steadily for over two decades in England and now appear to be accelerating. The numbers of people subject to the Mental Health Act (MHA) have risen dramatically since 2008, and increased by more than 5% in each of 2010/11 and 2011/12.

The reasons are unclear, but possible explanations include secular increases in drug and alcohol use, changes in social support networks and bed shortages. Increases in compulsory admission in England have coincided with an equally dramatic reduction in the number of mental illness beds: 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. Fewer beds means delays in admission, increased illness severity thresholds for admission, inpatient units that are more disturbed and frightening, and early discharge resulting in relapse and readmission.

Clues to understanding increasing compulsory admission rates may lie in variation in use of the MHA between people and places, including understanding differences in local service organisation. People from black and minority ethnic groups have different experiences of mental health services from the rest of the population in the UK. These groups experience significantly greater rates of admission, including compulsory detention. Black mental health service users experience pathways to acute psychiatric care that are more coercive and more likely to involve referral for MHA assessment and the police and criminal justice system. These inequalities have persisted despite major policy initiatives, additional investment, workforce developments and general improvements in the coverage and quality of mental health services over the last decade. There are also significant geographical differences in use of the MHA. This may reflect the threefold variation in investment in mental health services by commissioners. Gains associated with improved community services may not be experienced equally, and compulsory admission rates may be increasing disproportionately in more deprived, highly urban and/or very remote places.

## Objectives

We had two main aims: (1) to establish if and to what extent compulsory admission rates vary between people and places, including providers and commissioners of mental health care in England; and (2) to explore and quantify the extent to which variance in the rate of compulsory admission can be explained by the characteristics of people using mental health services, local area socioeconomic and sociodemographic factors, and features of the commissioning and delivery of local mental health services.

The first objective was to use multilevel statistical models to measure and compare variance in the rate of compulsory admission across England at each of these levels. Since there were likely to be many factors that influence the risk of compulsory admission, we undertook linkages to routine (secondary) data sources to create models that incorporate information about people, places and health-care organisations. Our second objective was to use multilevel statistical models to examine the effect of specific risk factors at each spatial level within the Mental Health Minimum Data Set (MHMDS) for England in 2010/11, simultaneously, on variance in the rate of compulsory admission across England.

## Methods

### *Design, setting and data source*

This was an observational, secondary study based on cross-sectional analysis of the 2010/11 MHMDS, the mandatory data return for all providers of NHS-funded specialist mental health services in England. The study setting was England, and the data set included 1,238,188 patients who received mental health care in 2010/11.

We identified six spatial levels in the MHMDS: individual, Census lower layer super output area (LSOA), general practitioner (GP) practice, primary care trust (PCT, service commissioner at the time), provider trust and strategic health authority. We made use of the facility that this data structure offered for linking to external data sets. Data coverage included 98.1% of LSOAs, 93.0% of general practices, 95.4% of commissioning PCTs and all 69 NHS providers of secondary care mental health services in England.

The study outcome was compulsory admission, defined as time spent in an inpatient mental illness bed subject to the MHA (2007) during the 2010/11 reporting period. We did not include patients who were detained only under sections of the MHA (2007) that apply only to conveyance to, and assessment in, a place of safety (S135 and S136), or for the purposes of assessment only [e.g. Sections 4 and 5(2)] where detention for longer than 72 hours does not occur. Likewise (because it does not relate to inpatient admission per se) we did not include sections of the Act relating only to Guardianship or the supervision of community treatment. The control group comprised people who either were admitted voluntarily or received only community-based mental health care during the same period.

Data on explanatory variables, characterising each of the spatial levels in the data set, were obtained from a wide range of publicly available sources, and were linked using MHMDS identifiers.

Multilevel modelling (MLM) was used to estimate variances (and standard errors) occurring at different spatial levels. The structure of the MHMDS is complex and overlapping (referred to as cross-classified), as the different spatial groupings did not nest or cluster neatly within each other. Markov chain Monte Carlo methods were used to estimate the variance in the study outcome across the different spatial levels. Binary logistic MLMs with random effects were estimated to model the risk of being compulsorily admitted during the 2010/11 reporting period versus all other care.

We began our analyses with null models, in which total variance in compulsory admission in the study sample is estimated without the inclusion of any explanatory or potentially confounding variables. Given the size and complexity of the data set, models with more than four spatial levels proved unstable. We therefore ran all permutations of four-level null models to identify consistent cross-model patterns and compare goodness of fit using the Bayesian deviance information criterion goodness-of-fit statistic. After selecting the optimal four-level null model we controlled for basic demographic characteristics of the patient population served by the provider trust (i.e. individual age and sex) and examined the provider trust-level residual using 'caterpillar' plots and by mapping the normal score of the residual. This exercise was repeated for the fully adjusted, final model. Mapping was done for exploratory purposes: if negative residuals are clustered together and positive residuals clustered together (i.e. model residuals are positively spatially auto-correlated) this would suggest a missing spatially clustered explanatory variable. The absence of auto-correlation would direct us away from a search for a 'missing' explanatory spatial variable.

We extended null MLM to include explanatory variables at different spatial levels in order to quantify the proportion of variance in the study outcome that could be explained. This involved modelling the predicted value of the (assumed) underlying continuous latent variable by using an equation with both fixed (intercept plus regression coefficients for explanatory variables) and random parts.

### User involvement

Two groups of users were involved and consulted in the course of the study: users of mental health services and those with experience of caring for people with serious mental illness (through partnership with the Mental Health Foundation), and potential users of the evidence arising from the research, in the form of senior NHS mental health service managers and clinicians (via the Mental Health Network of the NHS Confederation).

### Results

The choice of an optimal four-level, cross-classified null model was complicated, and involved careful comparison of competing models (including model fit statistics) and further examination of the data structure in respect of PCTs and provider trusts. The final model comprised individuals, LSOA, general practice and provider trust. While around 85% of the (unexplained) variance in compulsory admission in this model occurred between individuals, substantial and statistically significant variance (circa 7% in both instances) was found between areas (LSOA) and between provider trusts. Provider trust-level residuals differed from the modelled average to a statistically significant extent for 45 out of 64 (70%) provider trusts even after adjusting for patients' age and sex. Mapped residuals did not suggest positive spatial auto-correlation, with the possible exception of London.

To maintain model stability when introducing explanatory variables, we restricted the adjusted model to three spatial levels (individual, LSOA and provider trust). Overall, area- and trust-level variance in compulsory admission rates was not explained by adjusting for a wide range of potential confounders. Individual-level variables explained 8.0% of the risk of being compulsorily admitted, while LSOA- and provider trust-level variables each explained 1.1% of the total variance in the study outcome. The number of provider trusts whose observed compulsory admission rate differed from the model average to a statistically significant extent fell from 45 in the null model to 20 in the fully adjusted model. Mapping of these residuals did not reveal any striking spatial auto-correlation.

In the adjusted models, patients of black, Asian and mixed ethnicity all had significantly higher rates of compulsory admission than white patients. Patients of black ethnicity were almost three times more likely to be admitted compulsorily than their white counterparts. Compulsory admission was most common in patients aged 18–35 years, and fell with age thereafter. The lowest rate was observed in those aged under 18 years. We found statistically significant associations with area-level deprivation (which appeared to show a dose–response effect) and ethnic density, but not with population density. The risk of compulsory admission was inversely associated with the proportion of white British LSOA residents.

We found very little evidence of significant associations between compulsory admission and provider trust-level factors. Only one such covariate was a statistically significant predictor of compulsory admission: patients receiving care in provider trusts with community mental health services rated as average ('same as other trusts') had a significantly higher risk of being admitted compulsorily than in those rated as poor ('worse than other trusts') on the survey of patient experience.

Before adjusting for other covariates (and potential confounders), we found a statistically significant association between (higher) average annual trust-level mental illness bed occupancy and compulsory admission. However, this association no longer reached statistical significance after adjusting for the other covariates in the model. Although there was a trend towards lower rates of compulsory admission in trusts outside London (compared with those in the capital), this association did not reach statistical significance in the fully adjusted model.

We carried out separate analyses to examine associations between PCT investment in mental health services and rates of compulsory admission. Inclusion of these variables explained almost no additional variance in the rate of compulsory admission after adjusting for individual- and LSOA-level variables.

No statistically significant association was found between total investment in mental health services and compulsory admission in adjusted models. A small but statistically significant association was, however, found for investment in community mental health teams, but not with investment in assertive outreach or crisis resolution teams.

## Conclusions

Of people using specialist secondary care mental health services, 3.5% experienced at least one compulsory admission in 2010/11, defined as time spent in an inpatient mental illness bed under the MHA (2007). Cross-classified multilevel statistical models revealed that 84.5% of the variance in compulsory admission rates occurred between individuals, 6.7% between local areas (LSOAs), 2.7% between GP practices and 6.9% between provider trusts. All of these estimates of variance were statistically significant.

Although we adjusted for a large number of individual-, area- and trust-level variables (including individual age, sex and ethnicity, area-level deprivation and mental illness bed occupancy), these explained only around 10% of the total variance in the study outcome. People of black ethnicity experienced compulsory admission rates almost three times greater than those of white patients, and compulsory admission rates increased with area-level deprivation and the proportion of non-white residents in local areas. There was a small but statistically significant association between (higher) bed occupancy and compulsory admission, but this was confounded by adjusting for other study covariates. Levels of PCT (commissioner) investment in mental health services (whether in total or by specific community) did not add to the model fit after adjusting for individual- and area-level characteristics.

This was the largest and most complete study of its kind, and the representativeness of the data set was a major strength. However, as it was a secondary and cross-sectional study, we were constrained by the nature, quality and completeness of the (routine) data available to us. We were unable to consider many of the very salient hypotheses suggested to us by the service users and mental health professionals we consulted as part of the project, which have influenced our research recommendations.

The MHMDS is complex and had some data quality issues. However, this remains an unrivalled resource for studying compulsory admission, particularly since data quality is improving rapidly. Usable longitudinal MHMDS data should be available shortly, enabling research to be undertaken on chronological trends in use of the MHA.

It is imperative to develop and evaluate interventions to reduce compulsory admission rates, but this will depend in part on further observational studies, designed to further our understanding of the reasons why these rates remain so high.

## Recommendations for future research

Future research will require a mixed-methods approach to (1) undertake longitudinal analysis and (2) generate and test hypotheses about the causes of observed variance in compulsory admission rates. There is a need for in-depth qualitative research to explore factors that underlie local variation in compulsory admission, for which there are no existing data. There is also an imperative to move towards developing and evaluating interventions to reduce compulsory admission rates.

Key questions include:

1. What are the rates and chronological patterns of repeat compulsory admission, and what proportion of these are accounted for by the same individuals?
2. What effect do the characteristics of individual patients, especially diagnosis, previous treatment experiences, length of illness, engagement with care and socioeconomic status, have on the likelihood of compulsory admission?
3. Given that most of the variance in compulsory admission rates remains unexplained, what effect do other service characteristics, including the physical, social and therapeutic environments on inpatient units, and continuity of care, have on compulsory admission rates?
4. To what extent do longitudinal trends in compulsory admission rates vary between places? Are there areas and health-care providers where the rates of increase has been halted or reversed, and are there places where rates are accelerating? Can these differences be explained?
5. What effect do Community Treatment Orders have on compulsory admission rates, over the long term, and can longitudinal analysis reveal any evidence that these result in fewer patients being readmitted under the MHA (2007)?
6. Around 15% of the variance in compulsory admission occurs between places, mental health-care providers, GP practices and commissioners. In addition, some of the individual-level variance may reflect personal experience of local services. Is it feasible to develop and deliver interventions at the level of local health-care systems that could reduce compulsory admissions, and would this prove effective?

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