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How has the extent of institutional mental health care changed in Western Europe? Analysis of data since 1990

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3 **Title: How has the extent of institutional mental health care changed in Western**
4 **Europe? Analysis of data since 1990**
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52 **Keywords:** mental health services, institutional care, de-institutionalisation, re-
53 institutionalization, psychiatric beds, prison populations, crime rate, Penrose
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Abstract (Word count 291)

Objectives

It has been suggested that since 1990 de-institutionalisation of mental health care in Western Europe has been reversed into re-institutionalisation with more forensic beds, places in protected housing services and people with mental disorders in prisons. This study aimed to identify changes in the numbers of places in built institutions providing mental health care in Western Europe from 1990 to 2012, and to explore association between changes in psychiatric bed numbers and changes in other institutions.

Settings

Data were identified from 11 countries on psychiatric hospital beds, forensic beds, protected housing places and prison populations.

Outcomes

Number of places in different institutions and their changes over time; fixed-effects regression models tested the associations between psychiatric hospital beds with other institutions.

Results

The number of psychiatric hospital beds decreased, whilst forensic beds, places in protected housing and prison populations increased. Overall, the number of reduced beds exceeded additional places in other institutions. There was no evidence for an association of changes in bed numbers with changes in forensic beds and protected housing places. Panel data regression analysis showed that changes in psychiatric bed numbers were negatively associated with rising prison populations, but the significant association disappeared once adjusted for gross domestic product as a potential covariate.

Conclusions

Institutional mental health care has substantially changed across Western Europe since 1990. There are ongoing overall trends of a decrease in the number of psychiatric hospital beds and an increase in the number of places in other institutions,

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3 including prisons. The exact association between these trends and their drivers remain
4 unclear. More reliable data, information on the characteristics of patients in different
5 institutions, long-term pathway analyses, and effectiveness studies are required to
6 arrive at evidence-based policies for the provision of institutional mental health care.
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10 11 12 13 **Strengths**

- 14 • This is a large longitudinal study on different types of institutional mental
15 health care, including prisons populations, forensic beds and protected housing
16 places, in Western Europe over a period of 22 years.
- 17 • The study includes countries from different regions within Western Europe
18 and used what are arguably the best available data.
- 19 • The analysis of associations between hospital beds and prison places
20 considered gross domestic product as a covariate representing other societal
21 time trends.
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30 **Limitations**

- 31 • The accuracy of some of the data remains questionable, and data on forensic
32 beds and protected housing places were incomplete.
- 33 • Definitions of the different categories of institutions vary across countries.
- 34 • The number of data points is too small for reliable time series analyses.
- 35 • There is no data on the characteristics of patients in the different institutions.
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3 **Text: 3161 words**
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6 **BACKGROUND**
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9 Since the 1950s, major reforms have changed mental health care across Western
10 Europe. These reforms were characterised by the process of ‘de-institutionalisation’.¹
11 Although the term ‘de-institutionalisation’ has been used inconsistently in the
12 literature, it usually refers to the closure or downsizing of former large asylums and
13 the development of various services in the community.^{2,3} These community services
14 are intended to provide care for people with mental disorders, including those with
15 severe mental illnesses who would have been long-term hospitalised before ‘de-
16 institutionalisation’. Psychiatric in-patient treatment was provided in smaller units,⁴
17 often linked to general district hospitals, with a focus on short-term acute care.
18 Various forms of protected housing services should support those patients who could
19 not – or not yet – live independently, whilst all other patients were supposed to live
20 outside mental health care institutions. Reasons for these reforms included the
21 concern that asylums were therapeutically ineffective and even detrimental, and the
22 attitude that civil rights entitled patients to a life as autonomous as possible.^{5,6}
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26 Although the political context, drivers, timing, pace and exact outcomes of de-
27 institutionalisation varied across countries, changes were implemented everywhere,
28 often supported by substantially increased funding for mental health care.⁷
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34 However, previous analyses of changes in the provision of institutional mental health
35 care in Europe suggested that the trend might have been reversed. Since 1990 –
36 according to historians the end of the post-war period in Europe – the number of
37 conventional psychiatric beds decreased further. Yet, in most studied countries the
38 places in protected housing services and of forensic psychiatric beds increased as did
39 the prison population, which may be assumed to include a large and possibly rising
40 number of prisoners with mental illnesses. Considering this increase of institutions
41 accommodating people with mental disorders, previous analyses suggested that ‘de-
42 institutionalisation’ of mental health care might have been superseded by ‘re-
43 institutionalisation’.⁸⁻¹⁴ This leads to the questions as to whether the trend continued,
44 and – if so - whether the total number of additional places in alternative institutions
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3 (i.e. protected housing facilities, forensic hospitals, prisons) was greater than the
4 reduction of hospital beds so that – overall – there has indeed been a re-
5 institutionalisation.
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10 A further question is whether changes in different forms of institutional care are
11 associated, e.g. whether drastic reductions in bed numbers are associated with a more
12 marked increase in protected housing places or in the prison populations. The latter
13 association, i.e. an inverse relationship between psychiatric hospital beds and the size
14 of the prison populations, was first suggested by Penrose in 1939, based on a cross-
15 sectional observational study in 18 European countries.¹⁵ He concluded that a fixed
16 proportion of people were required to be kept in institutions and that the provision of
17 more psychiatric hospital beds could help to reduce the prison populations.
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22 Cross-sectional and longitudinal studies have tried to test the Penrose hypothesis with
23 inconsistent conclusions.¹⁶⁻²¹ Yet, only longitudinal studies can explore whether
24 changes of hospital beds and the prison population are really linked. Kelly found a
25 strong rank correlation in Ireland between 1963 and 2003, namely decline in
26 psychiatric inpatients significantly exceeded the increase of prisoners¹⁶ Replicating
27 the method of Kelly, Mundt et al.²⁰ did not find a correlation in post-communist
28 European countries between 1991 and 2010. In South American countries, a
29 significant association has been identified since 1990 using multivariate regression
30 analysis,²¹ i.e. when and where bed numbers were more reduced the prison population
31 tended to increase more.
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43 Against this background, the present study used longitudinal data from 11 European
44 countries to assess whether on-going trends in institutional care since 1990 are
45 consistent with the notion of re-institutionalisation and in what way changes in
46 psychiatric bed numbers are associated with changes in other forms of institutional
47 care, including the prison population.
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51 52 53 **METHODS**

54 **Sample**

55 We attempted to identify data on institutional mental health care in European
56 countries, excluding the post-communist countries as their data had already been
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3 reported and analysed in a previous study. The selection of countries was largely due
4 to convenience as it was driven by the availability of sufficiently reliable data. We
5 included 11 European countries from different regions: Northern Europe, including
6 the British Isles (United Kingdom and Ireland) and Scandinavia (Denmark); Central
7 Europe (Austria, Belgium, France, Germany, Switzerland, The Netherlands); and
8 Southern Europe (Spain and Italy). Although all of the included countries underwent
9 major mental health reforms with de-institutionalisation since the 1950s, they
10 represent different traditions of mental health care, different social and judicial
11 systems, and health care systems with different funding arrangements and
12 organisations.⁸
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21 **Data sources and Variables**

22 Data on psychiatric hospital bed numbers were retrieved from the European Health
23 for All Database (HFA-DB). According to the HFA-DB, 'psychiatric hospital beds'
24 are defined as hospital beds accommodating patients with mental health problems, a
25 definition harmonised with EUROSTAT and OECD in 2006. Prison population data
26 were extracted from the statistical office of the European Union (EUROSTAT).
27 According to EUROSTAT, 'prison population' is defined as the total number of adult
28 and juvenile prisoners (including pre-trial detainees) at September 1st (or nearest
29 available date) of a given year. The numbers for forensic beds and protected housing
30 places were obtained from national annual reports and websites of Ministries of
31 Health, Ministries of Social Welfare, Ministries of Justice, and National Statistical
32 Offices of the studied countries. Authors also sought help from collaborators in
33 several countries to access appropriate sources of information. Where the number of
34 forensic beds was not available, the number of forensic treatment cases was used as
35 proxy if available. Similarly, where numbers of protected housing places were
36 unavailable, the number of residents in supported places was used if available.
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49 As macro-economic factors have been suggested to influence the number of
50 psychiatric hospital beds,^{18,21,22} we also obtained data on the Gross Domestic Product
51 (GDP). Data on GDP per capita were obtained from the World Bank
52 (www.worldbank.org). For GDP per capita, data in constant 2005 U.S. dollars were
53 used to exclude any effect of fluctuating exchange rates.
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Statistical analysis

The official data were first set up as panel data where a given sample of individuals was followed over time²³ (i.e. repeated observations from 11 countries observed at 22 different time periods) and analysed using STATA statistical software version 12. For all analyses, $p < 0.05$ was taken to indicate statistical significance.

First, descriptive statistics (time series graphs and overall magnitude of changes) were generated to explore the development of alternative institutional care and prison populations over time. Next, in order to assess the associations between psychiatric hospital beds and other forms of institutional care, i.e. forensic beds, places in protected housing, and prison populations, panel data linear regression models were used. For all variables, numbers per 100,000 inhabitants rather than absolute figures were used in order to avoid a bias arising from differences in population size and growth between the countries.

In all analyses of associations, the number of psychiatric hospital beds was used as the independent variable and other forms of care as dependent. This was to test whether changes in psychiatric hospital bed numbers may have influenced the provision of other institutions, which for the association of psychiatric beds with the prison populations reflects the hypothesis of Penrose.

We first computed univariate fixed-effects analyses individually with prison populations, forensic beds, and protected housing places as dependent and psychiatric hospital beds as the independent variables. To explore the potential association between hospital beds and prison populations further, we then conducted multivariate regression analyses, in which independent variable (e.g. GDP) was added separately as a potential covariate.

Fixed-effects models were used to control for all time-invariant differences between the countries in the sample, and the resulting estimation is not biased by omitted time-invariant characteristics.²⁴ Furthermore, robust sandwich estimators were used because they produce estimates of the standard errors that are robust to the detected heteroskedasticity and autocorrelation in our panel data.

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3 Due to the long coverage of data over the 22-year period, time units were also
4 accounted for in addition to country-specific effects. To cross check the
5 appropriateness of time-fixed effects, a joint test was conducted across the
6 multivariate analyses.²⁵ Time fixed-effects control for omitted variables that vary over
7 time but are constant over units.²⁶ In this case, the joint test showed that time fixed-
8 effects are needed, so that these analyses were also conducted with joint fixed-effects
9 (country and year).
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15 16 17 **RESULTS**

18 **Trends in psychiatric beds, forensic beds, residential supported places, and** 19 **prison populations**

20 Data on psychiatric hospital beds and prison populations were obtained in all 11
21 countries. As shown in Figure 1, the overall number of psychiatric hospital beds per
22 100,000 inhabitants fell in all countries over time. At the same time, the prison
23 population increased in all countries (Figure 2). The number of forensic beds per
24 100,000 inhabitants rose in almost all countries (Figure 3), whilst changes in
25 protected housing were inconsistent across countries (Figure 4). For instance, there
26 was a steady increase in Germany, the Netherlands, and Belgium, whilst data show a
27 reduction in Denmark, Italy, and Ireland. Dashed lines in Figures indicate
28 extrapolation of missing data between years.
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41 The magnitude of changes varies across countries. When analysing average changes
42 over time in different forms of institutional care, the averages refer only to those
43 countries for which data for the given form of institutional care is available, which
44 varies.
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48 From 1990 to 2000, the average decrease of psychiatric hospital beds was 42.5 beds
49 per 100,000 inhabitants, and from 2000 to 2012 it was 22.44. During the same two
50 periods, prison populations rose by an average of 21.82 and 17.05 respectively.
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52 Forensic beds rose by an average of 0.49 between 1990 and 2000 and of 0.76 between
53 2000 and 2012. For protected housing places, there were too few data for an estimate
54 of average changes between 1990 and 2000. For the period from 2000 to 2012, there
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3 was an average increase of 5.03 places per 100,000 inhabitants, although some
4 countries showed a reduction during this time.
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9 10 **Results of univariate and multivariate analyses**

11 Table 1 shows the results of associations between the psychiatric hospital beds and
12 other forms of institutional care.
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20 The number of observations in each model varied (Table 1), as data were not
21 available for all countries and years for the different main study variables, in
22 particular data on forensic beds and protected housing places. The number of
23 available data points for these two variables is lower than for the variables where data
24 was available from international sources. The univariate fixed-effects regression
25 analyses showed a significant negative association between psychiatric hospital beds
26 and prison populations, and non-significant coefficients for the associations with
27 forensic beds and protected housing places.
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35 The significant association between psychiatric hospital beds and prison populations
36 was then further explored in multivariate regressions adjusting for overall time effects
37 and potential covariates to account for spurious relationship. There was a positive
38 significant relationship between GDP and prison populations, i.e. a higher GDP was
39 linked with a larger prison population (0.001; 95% CI, 0.00001 to 0.0027; $p=0.032$).
40 When GDP was included as a covariate in the multivariate regression analysis, the
41 association between bed numbers and prison population was no longer significant (-
42 0.024; 95% CI, -0.189 to 0.141; $p=0.756$). The same happened when year fixed-
43 effects were considered: bed numbers and prison population were not significantly
44 associated anymore (-0.003; 95% CI, -0.123 to 0.118; $p=0.958$).
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52 **DISCUSSION**

53 **Main findings**

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55 The provision of institutional forms of mental health care has changed in Western
56 Europe since 1990 and the changes appear to continue. The number of psychiatric
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3 hospital beds has been falling substantially. At the same time, the number of forensic
4 beds and prison populations have increased, whilst changes in protected housing have
5 been inconsistent across countries with a tendency to increase too.
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10 Overall, the number of reduced psychiatric hospitals is larger than the total number of
11 additional places in other forms of institutional care combined. The precise figures
12 vary between countries, but the overall difference is substantial if one assumes that
13 only a proportion of additional prisoners are likely to have a mental disorder. If one
14 excludes the prison populations from this analysis, because it is debatable as to
15 whether prisons can be seen as forms of care, the number of reduced beds exceeds the
16 additionally established places even more clearly. So, the total number of institutional
17 places in mental health care has rather decreased, and this applies – although to a
18 different extent – to the period from 1990 to 2000 and the following period until
19 2012. However, according to these findings, there has been further de-
20 institutionalisation in terms of psychiatric hospital beds in addition to an ongoing
21 trend towards re-institutionalisation, namely forensic beds and prison populations.
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31 The data of this study cannot reveal the historical and societal drivers behind the
32 decrease of psychiatric beds and increase of prison populations. The reduction of
33 hospital beds and the increase of other forms of institutional care happened over the
34 same period of time, and both phenomena are likely to be linked as part of overall
35 historical changes in European societies. Societal processes leading to an increase of
36 prison populations are complex. Data as presented in this study cannot identify the
37 real influence of anticipated or experienced bed closures within these processes.
38 However, the data did allow to explore a quantitative association of the extent of the
39 two phenomena, i.e. whether there were fewer beds when and where there were
40 overall more prisoners. We did find such an association, which was statistically
41 significant. However, once adjusted for overall time trends (years as fixed effect) or
42 the overall economic activity of a country (GDP), the correlation was no longer
43 significant. Trends other than changes in bed numbers may explain the extent of the
44 increase of prison populations in Western Europe.
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55 56 **Strengths and limitations** 57 58 59 60

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3 To our knowledge, this is the first and largest longitudinal study examining the
4 association between different types of institutional mental health care, including
5 prisons populations, in Western Europe over a period of 22 years. This study included
6 countries from different regions within Western Europe and used what are arguably
7 the best available data. The study included forensic beds and protected housing places
8 to have a more comprehensive picture of institutional care as far as such institutions
9 are defined by bricks and mortar. In the analysis of associations, we considered non-
10 specific time effects and GDP as a potential covariate representing other important
11 societal time trends.
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20 The study also has several major limitations, thus the results should be interpreted
21 with caution. Firstly, the accuracy of some data remains questionable. We tried and
22 took the most reliable data by cross-checking between reports. Yet, some of the data
23 had been collected for administrative purposes rather than for research, and
24 definitions and reporting procedures were inconsistent. In particular, figures for
25 forensic beds and protected housing places referred to varying and sometimes vague
26 definitions. Secondly, we included only 11 countries, and for some forms of
27 institutional care, in particular protected housing, the number was even smaller. As a
28 result, the overall number of observations is rather small for a panel data analysis, and
29 too small to conduct more complex analyses such as a co-integration analysis as a
30 method for identifying influences in time series.
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38 Thirdly, comparisons of absolute numbers across countries should be done only with
39 great caution, as the definitions of settings and samples vary significantly. Within
40 each country however definitions are likely to have been consistent so that changes
41 over time can be interpreted with more confidence.
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And finally, the data are only total figures of patients in each type of institution
without any breakdown of diagnosis or other patient characteristics. These total
figures cannot reveal whether there is ongoing de-institutionalisation or re-
institutionalisation for specific patient groups such as those with severe and chronic
disorders.

Comparisons against the literature

Comparisons against findings in other regions in the world and other historical
contexts are problematic. Mundt et al.²¹ have provided data from South American

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3 countries since 1990. They suggested an association between psychiatric hospital beds
4 and the prison population in line with the Penrose hypothesis, although – unlike
5 Penrose - they explicitly did not assume a direct causal relationship. However, the
6 numbers involved were very different from those in Europe. Whilst in South America
7 there were five more prisoners since 1990 for every reduced psychiatric bed, in
8 Western Europe there were more beds reduced than additional prison places
9 established. A similar study of changes of institutional care in post-communist
10 countries in Eastern Europe analysed data from a period of drastic reductions of the
11 prison population in some countries during that time²⁰, a historically rather unusual
12 phenomenon.
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21 It appears questionable as to whether generalized hypotheses – like the Penrose
22 hypothesis – can be applied across so different contexts.
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24 The analysis of mere numbers of places in institutions does not show the
25 characteristics of people in them. In 1939, Penrose had patients with severe mental
26 illness in mind, who would be either in a hospital or in a prison. Recent studies show
27 indeed an overlap of people who over time can be in a type of revolving door between
28 prison and psychiatric hospital care.²⁷ Yet, the predominant diagnosis of these people
29 is a substance abuse disorder, sometimes but not always linked with a severe mental
30 illness.²⁸⁻³⁰ People with severe mental illness are the dominant group in different
31 forms of protected housing and in forensic beds,³¹ whilst the clientele of in-patient
32 care may vary more depending on the number of beds available and the organisation
33 of care in each country. Since there has been a tendency for shorter lengths of stay of
34 in-patient care since 1990, the reduced bed number does not mean that the number of
35 patients who get hospitalised at some point of time has similarly decreased. In all
36 institutions the length of stay is essential to estimate the number of people who are
37 affected over time.
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49 **CONCLUSION**

50 The trends towards decreasing psychiatric bed numbers and overall increasing forms
51 of other forms of institutions for people with mental disorders in Western Europe –
52 first described in 2005 – appear to continue, although the drivers for these changes
53 and the precise relationships between them remain poorly understood.
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3 The places in institutional mental health care may reflect the approach of a society to
4 people with mental disorders, and certainly involve substantial costs to the health,
5 social and judicial systems. This study underlines the need for more complete and
6 reliable data from more countries, and for more detailed research on the potential
7 drivers for establishing or reducing institutions in mental healthcare. Analyses of the
8 exact characteristics of people in these different institutions and – most importantly –
9 studies of long-term pathways of people moving between them are required to
10 understand the potential interplay of these institutions as well as of other services in
11 the community.³²
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20 And finally, evidence is required on how effective and cost-effective care in
21 psychiatric hospitals, in forensic beds and in protected housing for different patient
22 groups is, e.g. as compared to out-patient care, so that policies and funding for
23 institutional care can be based on evidence about their costs and benefits.
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30 **AUTHORS' CONTRIBUTION**

31 Study concept and design were developed by Chow and Priebe in collaboration.
32 Chow did the literature search, gathered the data, conducted the statistical analysis
33 and drafted the manuscript. The manuscript was then further developed and edited by
34 Priebe. Both authors critically revised the manuscript for important intellectual
35 content and approved of the final version.
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41 **DECLARATION OF INTERESTS**

42 We declare no competing interests.
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46 **ROLE OF THE FUNDING SOURCE**

47 The East London NHS Foundation Trust had no role in the design and conduct of the
48 study: collection, management, analysis, or interpretation of the data; preparation,
49 review or approval of the manuscript; and decision to submit the manuscript for
50 publication. The authors had full access to all data in the study and had final
51 responsibility for decision to submit for publication.
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DATA SHARING STATEMENT

No additional data are available.

For peer review only

REFERENCES

1. Thornicroft G, Bebbington P. Deinstitutionalisation – from hospital closure to service development. *Br J Psychiatry* 1989; 155: 739-753.
2. Chow WS, Priebe S. Understanding psychiatric institutionalization: A conceptual review. *BMC Psychiatry* 2013; 13: 169. doi:10.1186/1471-244X-13-169
3. Lamb HR, Bachrach LL. Some perspectives on deinstitutionalization. *Psychiatr Serv*. 2001; 52(8): 1039-1045.
4. Muijen M. Focus on mental health care reforms in Europe. Mental health services in Europe: an overview. *Psychiatr Serv* 2008; 59(5): 479-82. doi: 10.1176/appi.ps.59.5.479
5. Fakhoury W, Priebe S. The process of deinstitutionalization: An international overview. *Curr Opin Psychiatry* 2002; 15(2): 187-92.
6. Fakhoury W, Priebe S. Deinstitutionalization and reinstitutionalization: Major changes in the provision of mental healthcare. *Psychiatry* 2007; 6(8): 313-316.
7. Department of Health. Mental health ten years on: progress on mental health care reform. DH; 2007.
8. Priebe S, Badesconyi A, Fioritti A, et al. Reinstitutionalisation in mental health care: comparison of data on service provision from six European countries. *BMJ* 2005; 330 (7483): 123-126. doi 10.1136/bmj.38296.611215.AE
9. Priebe S, Frottier P, Gaddini A, et al. Mental health care institutions in nine European countries, 2002 to 2006. *Psychiatr Serv* 2008; 59(5): 570-573. doi: 10.1176/appi.ps.59.5.570
10. Fazel S, Danesh J. Serious mental disorder in 23 000 prisoners: a systematic review of 62 surveys. *Lancet* 2002; 359: 545-50.
11. Konard N. Prisons as new asylums. *Curr Opin Psychiatry* 2002; 15: 583-587.
12. Lamb HR, Weinberger LE. The shift of psychiatric inpatient care from hospitals to jails and prisons. *J Am Acad Psychiatry Law* 2005; 33: 529-34.
13. Dressing H, Kief C, Salize HJ. Prisoners with mental disorders in Europe. *Br J Psychiatry* 2009; 194: 88.
14. Fazel S, Seewald K. Severe mental illness in 33,588 prisoners worldwide: systematic review and meta-regression analyses. *Br J Psychiatry* 2012; 200(5): 364-373. doi: 10.1192/bjp.bp.111.096370
15. Penrose LS. Mental disease and crime: outline of a comparative study of European statistics. *Br J of Medical Psychology* 1939; 18(1): 1-15.
16. Kelly BD. Penrose's Law in Ireland: An ecological analysis of psychiatric inpatients and prisoners. *Ir Med J*. 2007; 100(2): 373-4
17. Hartvig P, Kjelsberg E. Penrose's Law revisited: The relationship between mental institution beds, prison population and crime rate. *Nord J Psychiatry* 2009; 63(1): 51- 6. doi: 10.1080/08039480802298697
18. Large MM, Nielssen O. The Penrose hypothesis in 2004: Patient and prisoner numbers are positively correlated in low-and-middle income countries but are unrelated in high-income countries. *Psychol and Psychother*. 2009; 82(1): 113-9. doi: 10.1348/147608308X320099
19. Prins S.J. Does transinstitutionalization explain the overrepresentation of people with serious mental illnesses in the criminal justice system? *Community Ment Health J* 2011; 47(6): 716-722. doi: 10.1007/s10597-011-9420-y
20. Mundt AP, Frančišković T, Gurovich I, et al. Changes in the provision of institutionalized mental health care in post-communist countries. *PLoS One* 2012; 7(6):e38490. doi: 10.1371/journal.pone.0038490

21. Mundt AP, Chow WS, Arduino M, et al. Psychiatric hospital beds and prison populations in South America since 1990 does the Penrose hypothesis apply? *JAMA Psychiatry* 2015; 72(2): 112-8.13. doi: 10.1001/jamapsychiatry.2014.2433
22. Ceccherini-Nelli A, Priebe S. Economic factors and psychiatric hospital beds—an analysis of historical trends. *Int J Soc Econ* 2007; 34(11): 788-810.
23. Hsiao, C. *Analysis of Panel Data*. 2nd ed. Cambridge University Press; 2003
24. Rabe-Hesketh S, Skrondal A. *Multilevel and Longitudinal Modeling Using Stata*. College Station, TX: Stata Press; 2012.
25. Greene W. *Econometric Analysis*. 5th ed. Upper Saddle River, NJ: Prentice Hall; 2003.
26. Wooldridge JM. *Econometric Data of Cross Section and Panel Data*. Cambridge, MA: MIT Press; 2002.
27. Mundt AP, Kastner S, Mir J, et al. Did female prisoners with mental disorders receive psychiatric treatment before imprisonment? *BMC Psychiatry* 2015; 15: 5. Doi: 10.1186/s12888-015-0387-z
28. Gunn J. Future directions for treatment in forensic psychiatry. *Br J Psychiatry* 2000; 176: 332-338.
29. Farrel M, Boys A, Bebbington P, et al. Psychosis and drug dependence: results from a national survey of prisoners. *Br J of Psychiatry* 2002; 181: 393-398.
30. Fazel S, Bains P, Doll H. Substance abuse and dependence in prisoners: a systematic review. *Addiction* 2006; 101(2): 181–91. Doi: 10.1111/j.1360-0443.2006.01316.x
31. Priebe S, Saidi M, Want A, et al. Housing services for people with mental disorders in England: patient characteristics, care provision and costs. *Soc Psychiat Epidemiol* 2009; 44:805-81. doi: 10.1007/s00127-009-0001-0
32. Munk-Jørgensen P. Has deinstitutionalization gone too far? *Eur Arch Psychiatry Clin Neurosci*. 1999; 249(3): 136-43.

Figure 1. Psychiatric hospital beds per 100,000 inhabitants from 1990-2012

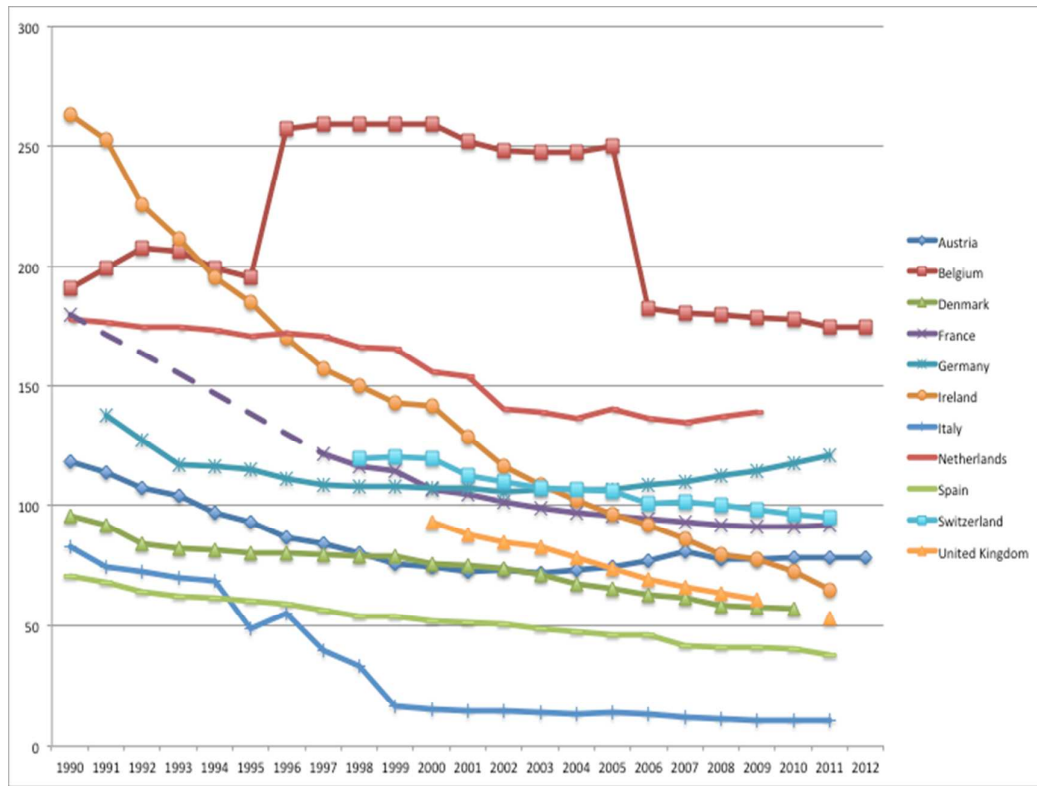
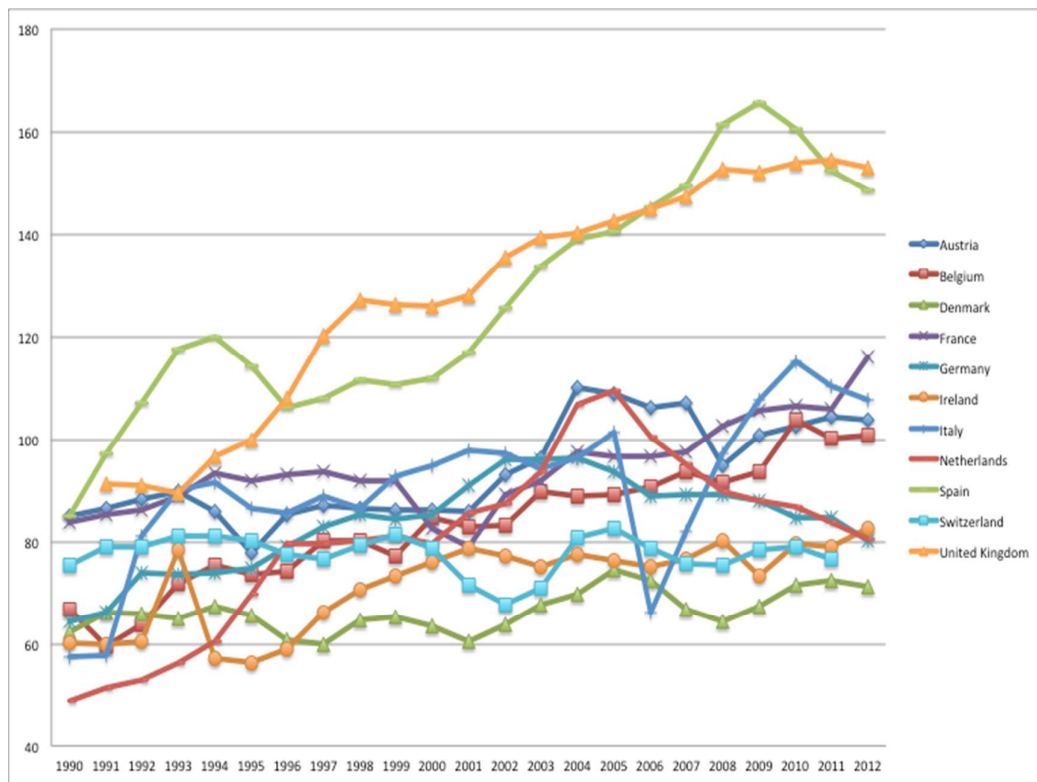


Figure 2. Prison Population per 100, 000 inhabitants from 1990-2012



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Figure 3. Forensic beds per 100, 000 inhabitants from 1990-2012

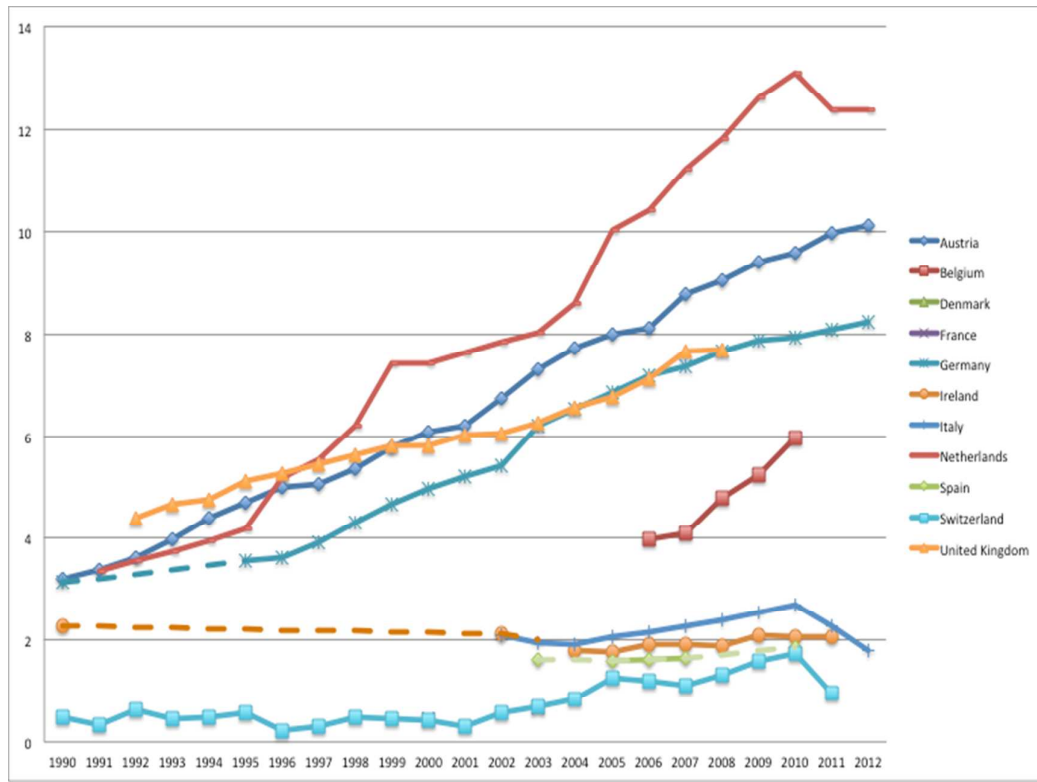
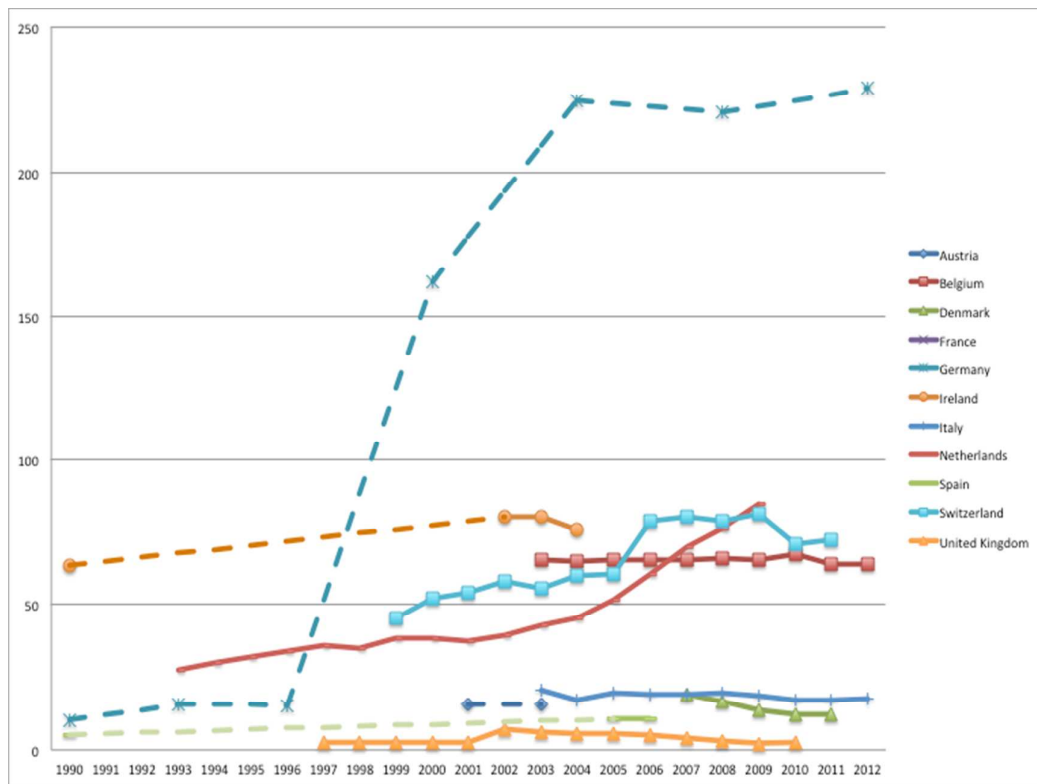


Figure 4. Places in protecting housing per 100,000 inhabitants from 1990-2012



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Table 1. Results of univariate regression using psychiatric beds per 100,000 inhabitants as independent variables (with country fixed-effects)

	N (Observations)	Fixed-effects	P value	95% CI
Dependent variables				
1. Prison population per 100,000 inhabitants	215	-0.216	0.021	-0.392 to -0.040
2. Forensic beds per 100,000 inhabitants	125	-0.033	0.316	-0.104 to 0.037
3. Residential beds per 100,000 inhabitants	76	-0.184	0.108	-0.417 to 0.049

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STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract - done (b) Provide in the abstract an informative and balanced summary of what was done and what was found - done
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported - done
Objectives	3	State specific objectives, including any prespecified hypotheses – done, including a reference to the Penrose hypothesis
Methods		
Study design	4	Present key elements of study design early in the paper - done
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection – the data were existing data from different sources which have been specified
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls <i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants (b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed <i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case – we explain that we analysed places in different institutions, so strictly speaking not participants, but cohorts of institutional places
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable - done
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group - done
Bias	9	Describe any efforts to address potential sources of bias - done
Study size	10	Explain how the study size was arrived at – done, it was determined by the availability of data
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why - done
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding - data (b) Describe any methods used to examine subgroups and interactions – not applicable (c) Explain how missing data were addressed -done (d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed – we explain how we dealt with the varying availability of data at different time points

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Case-control study—If applicable, explain how matching of cases and controls was addressed

Cross-sectional study—If applicable, describe analytical methods taking account of sampling strategy

(e) Describe any sensitivity analyses – not applicable

Continued on next page

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Results

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed - done (b) Give reasons for non-participation at each stage (c) Consider use of a flow diagram
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders – explained that such data is not available, also repeatedly addressed in discussion (b) Indicate number of participants with missing data for each variable of interest (c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)
Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time - done <i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure <i>Cross-sectional study</i> —Report numbers of outcome events or summary measures
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included – not applicable (b) Report category boundaries when continuous variables were categorized – not applicable (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period – not applicable
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses – done

Discussion

Key results	18	Summarise key results with reference to study objectives - done
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias - done
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence - done
Generalisability	21	Discuss the generalisability (external validity) of the study results - done

Other information

Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based - done
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*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

How has the extent of institutional mental health care changed in Western Europe? Analysis of data since 1990

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Primary Subject Heading:	Mental health
Secondary Subject Heading:	Mental health
Keywords:	mental health services, institutional care, de-institutionalisation, re-institutionalization, psychiatric beds, prison populations

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3 **Title: How has the extent of institutional mental health care changed in Western**
4 **Europe? Analysis of data since 1990**
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7 Winnie S. Chow, MSc*¹, Stefan Priebe, FRCPsych¹
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52 **Keywords:** mental health services, institutional care, de-institutionalisation, re-
53 institutionalization, psychiatric beds, prison populations, crime rate, Penrose
54 hypothesis
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Abstract (Word count 279)

Objectives

It has been suggested that since 1990 de-institutionalisation of mental health care in Western Europe has been reversed into re-institutionalisation with more forensic beds, places in protected housing services and people with mental disorders in prisons. This study aimed to identify changes in the numbers of places in built institutions providing mental health care in Western Europe from 1990 to 2012, and to explore association between changes in psychiatric bed numbers and changes in other institutions.

Settings and data

Data were identified from 11 countries on psychiatric hospital beds, forensic beds, protected housing places and prison populations. Fixed-effects regression models tested the associations between psychiatric hospital beds with other institutions.

Results

The number of psychiatric hospital beds decreased, whilst forensic beds, places in protected housing and prison populations increased. Overall, the number of reduced beds exceeded additional places in other institutions. There was no evidence for an association of changes in bed numbers with changes in forensic beds and protected housing places. Panel data regression analysis showed that changes in psychiatric bed numbers were negatively associated with rising prison populations, but the significant association disappeared once adjusted for gross domestic product as a potential covariate.

Conclusions

Institutional mental health care has substantially changed across Western Europe since 1990. There are ongoing overall trends of a decrease in the number of psychiatric hospital beds and an increase in the number of places in other institutions, including prisons. The exact association between these trends and their drivers remain unclear. More reliable data, information on the characteristics of patients in different institutions, long-term pathway analyses, and effectiveness studies are required to arrive at evidence-based policies for the provision of institutional mental health care.

Strengths

- This is a large longitudinal study on different types of institutional mental health care, including prisons populations, forensic beds and protected housing places, in Western Europe over a period of 22 years.
- The study includes countries from different regions within Western Europe and used what are arguably the best available data.
- The analysis of associations between hospital beds and prison places considered gross domestic product as a covariate representing other societal time trends.

Limitations

- The accuracy of some of the data remains questionable, and data on forensic beds and protected housing places were incomplete.
- Definitions of the different categories of institutions vary across countries.
- The number of data points is too small for reliable time series analyses.
- There is no data on the characteristics of patients in the different institutions.

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6 **BACKGROUND**
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9 Since the 1950s, major reforms have changed mental health care across Western
10 Europe. These reforms were characterised by the process of ‘de-institutionalisation’.¹
11 Although the term ‘de-institutionalisation’ has been used inconsistently in the
12 literature, it usually refers to the closure or downsizing of former large asylums and
13 the development of various services in the community.^{2,3} These community services
14 are intended to provide care for people with mental disorders, including those with
15 severe mental illnesses who would have been long-term hospitalised before ‘de-
16 institutionalisation’. Psychiatric in-patient treatment was provided in smaller units,⁴
17 often linked to general district hospitals, with a focus on short-term acute care.
18 Various forms of protected housing services should support those patients who could
19 not – or not yet – live independently, whilst all other patients were supposed to live
20 outside mental health care institutions. Reasons for these reforms included the
21 concern that asylums were therapeutically ineffective and even detrimental, and the
22 attitude that civil rights entitled patients to a life as autonomous as possible.^{5,6}
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26 Although the political context, drivers, timing, pace and exact outcomes of de-
27 institutionalisation varied across countries, changes were implemented everywhere,
28 often supported by substantially increased funding for mental health care.⁷
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32 However, previous analyses of changes in the provision of institutional mental health
33 care in Europe suggested that the trend might have been reversed. Since 1990 –
34 according to historians the end of the post-war period in Europe – the number of
35 conventional psychiatric beds decreased further. Yet, in most studied countries the
36 places in protected housing services and of forensic psychiatric beds increased as did
37 the prison population, which may be assumed to include a large and possibly rising
38 number of prisoners with mental illnesses. Considering this increase of institutions
39 accommodating people with mental disorders, previous analyses suggested that ‘de-
40 institutionalisation’ of mental health care might have been superseded by ‘re-
41 institutionalisation’.⁸⁻¹⁴ This leads to questions as to whether the trend continued, and
42 – if so - whether the total number of additional places in alternative institutions (i.e.
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protected housing facilities, forensic hospitals, prisons) was greater than the reduction of hospital beds so that – overall – there has indeed been a re-institutionalisation.

A further question is whether changes in different forms of institutional care are associated, e.g. whether drastic reductions in bed numbers are associated with a more marked increase in protected housing places or in the prison populations. The latter association, i.e. an inverse relationship between psychiatric hospital beds and the size of the prison populations, was first suggested by Penrose in 1939, based on a cross-sectional observational study in 18 European countries.¹⁵ He concluded that a fixed proportion of people were required to be kept in institutions and that the provision of more psychiatric hospital beds could help to reduce the prison populations.

Cross-sectional and longitudinal studies have tried to test the Penrose hypothesis with inconsistent conclusions.¹⁶⁻²¹ Yet, only longitudinal studies can explore whether changes of hospital beds and the prison population are really linked. Kelly found a strong rank correlation in Ireland between 1963 and 2003, namely decline in psychiatric inpatients significantly exceeded the increase of prisoners¹⁶. Replicating the method of Kelly, Mundt et al.²⁰ did not find a correlation in post-communist European countries between 1991 and 2010. In South American countries, a significant association has been identified since 1990 using multivariate regression analysis,²¹ i.e. when and where bed numbers were more reduced the prison population tended to increase more.

Against this background, the present study used longitudinal data from 11 European countries to assess whether on-going trends in institutional care since 1990 are consistent with the notion of re-institutionalisation and in what way changes in psychiatric bed numbers are associated with changes in other forms of institutional care, including the prison population.

METHODS

Sample

We attempted to identify data on institutional mental health care in European countries, excluding the post-communist countries as their data had already been reported and analysed in a previous study. The selection of countries was largely due

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3 to convenience as it was driven by the availability of sufficiently reliable data. We
4 included 11 European countries from different regions: Northern Europe, including
5 the British Isles (United Kingdom and Ireland) and Scandinavia (Denmark); Central
6 Europe (Austria, Belgium, France, Germany, Switzerland, The Netherlands); and
7 Southern Europe (Spain and Italy). Although all of the included countries underwent
8 major mental health reforms with de-institutionalisation since the 1950s, they
9 represent different traditions of mental health care, different social and judicial
10 systems, and health care systems with different funding arrangements and
11 organisations.⁸
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20 **Data sources and Variables**

21 Data on psychiatric hospital bed numbers were retrieved from the European Health
22 for All Database (HFA-DB). According to the HFA-DB, 'psychiatric hospital beds'
23 are defined as hospital beds accommodating patients with mental health problems, a
24 definition harmonised with EUROSTAT and OECD in 2006. Prison population data
25 were extracted from the statistical office of the European Union (EUROSTAT).
26 According to EUROSTAT, 'prison population' is defined as the total number of adult
27 and juvenile prisoners (including pre-trial detainees) at September 1st (or nearest
28 available date) of a given year. The numbers for forensic beds, , including all forms
29 forensic in-patient care, and protected housing places were obtained from national
30 annual reports and websites of Ministries of Health, Ministries of Social Welfare,
31 Ministries of Justice, and National Statistical Offices of the studied countries.
32 Protected housing was used as an umbrella term for all forms of supported housing,
33 including residential care. Authors also sought help from collaborators in several
34 countries to access appropriate sources of information. Where the number of forensic
35 beds was not available, the number of forensic treatment cases was used as proxy if
36 available. Similarly, where numbers of protected housing places were unavailable,
37 the number of residents in supported places was used if available.
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51 As macro-economic factors have been suggested to influence the number of
52 psychiatric hospital beds,^{18,21,22} we also obtained data on the Gross Domestic Product
53 (GDP). Data on GDP per capita were obtained from the World Bank
54 (www.worldbank.org). For GDP per capita, data in constant 2005 U.S. dollars were
55 used to exclude any effect of fluctuating exchange rates.
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Statistical analysis

The official data were first set up as panel data where a given sample of individuals was followed over time²³ (i.e. repeated observations from 11 countries observed at 22 different time periods) and analysed using STATA statistical software version 12. For all analyses, $p < 0.05$ was taken to indicate statistical significance.

First, descriptive statistics (time series graphs and overall magnitude of changes) were generated to explore the development of alternative institutional care and prison populations over time. Next, in order to assess the associations between psychiatric hospital beds and other forms of institutional care, i.e. forensic beds, places in protected housing, and prison populations, panel data linear regression models were used. For all variables, numbers per 100,000 inhabitants rather than absolute figures were used in order to avoid a bias arising from differences in population size and growth between the countries.

In all analyses of associations, the number of psychiatric hospital beds was used as the independent variable and other forms of care as dependent. This was to test whether changes in psychiatric hospital bed numbers may have influenced the provision of other institutions, which for the association of psychiatric beds with the prison populations reflects the hypothesis of Penrose.

We first computed univariate fixed-effects analyses individually with prison populations, forensic beds, and protected housing places as dependent and psychiatric hospital beds as the independent variables. To explore the potential association between hospital beds and prison populations further, we then conducted multivariate regression analyses, in which independent variable (e.g GDP) was added separately as a potential covariate.

Fixed-effects models were used to control for all time-invariant differences between the countries in the sample, and the resulting estimation is not biased by omitted time-invariant characteristics.²⁴ Furthermore, robust sandwich estimators were used because they produce estimates of the standard errors that are robust to the detected heteroskedasticity and autocorrelation in our panel data.

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Due to the long coverage of data over the 22-year period, time units were also accounted for in addition to country-specific effects. To cross check the appropriateness of time-fixed effects, a joint test was conducted across the multivariate analyses.²⁵ Time fixed-effects control for omitted variables that vary over time but are constant over units.²⁶ In this case, the joint test showed that time fixed-effects are needed, so that these analyses were also conducted with joint fixed-effects (country and year).

RESULTS

Trends in psychiatric beds, forensic beds, residential supported places, and prison populations

Data on psychiatric hospital beds and prison populations were obtained in all 11 countries. As shown in Figure 1, the overall number of psychiatric hospital beds per 100,000 inhabitants fell in all countries over time. At the same time, the prison population increased in all countries (Figure 2). The number of forensic beds per 100,000 inhabitants rose in almost all countries (Figure 3), whilst changes in protected housing were inconsistent across countries (Figure 4). For instance, there was a steady increase in Germany, the Netherlands, and Belgium, whilst data show a reduction in Denmark, Italy, and Ireland. Dashed lines in Figures indicate extrapolation of missing data between years.

Insert figures 1 to 4 about here

The magnitude of changes varies across countries. When analysing average changes over time in different forms of institutional care, the averages refer only to those countries for which data for the given form of institutional care is available, which varies.

From 1990 to 2000, the average decrease of psychiatric hospital beds was 42.5 beds per 100,000 inhabitants, and from 2000 to 2012 it was 22.44. During the same two periods, prison populations rose by an average of 21.82 and 17.05 respectively.

Forensic beds rose by an average of 0.49 between 1990 and 2000 and of 0.76 between 2000 and 2012. For protected housing places, there were too few data for an estimate of average changes between 1990 and 2000. For the period from 2000 to 2012, there

was an average increase of 5.03 places per 100,000 inhabitants, although some countries showed a reduction during this time.

Results of univariate and multivariate analyses

Table 1 shows the results of associations between the psychiatric hospital beds and other forms of institutional care.

Table 1. Results of univariate regression using psychiatric beds per 100,000 inhabitants as independent variables (with country fixed-effects)

	N (Observations)	Fixed-effects	P value	95% CI
Dependent variables				
1. Prison population per 100,000 inhabitants	215	-0.216	0.021	-0.392 to -0.040
2. Forensic beds per 100,000 inhabitants	125	-0.033	0.316	-0.104 to 0.037
3. Residential beds per 100,000 inhabitants	76	-0.184	0.108	-0.417 to 0.049

The number of observations in each model varied (Table 1), as data were not available for all countries and years for the different main study variables, in particular data on forensic beds and protected housing places. The number of available data points for these two variables is lower than for the variables where data was available from international sources. The univariate fixed-effects regression analyses showed a significant negative association between psychiatric hospital beds and prison populations, and non-significant coefficients for the associations with forensic beds and protected housing places.

The significant association between psychiatric hospital beds and prison populations was then further explored in multivariate regressions adjusting for overall time effects and potential covariates to account for spurious relationship. There was a positive significant relationship between GDP and prison populations, i.e. a higher GDP was

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3 linked with a larger prison population (0.001; 95% CI, 0.00001 to 0.0027; p= 0.032).
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5 When GDP was included as a covariate in the multivariate regression analysis, the
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7 association between bed numbers and prison population was no longer significant (-
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9 0.024; 95% CI, -0.189 to 0.141; p=0.756). The same happened when year fixed-
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11 effects were considered: bed numbers and prison population were not significantly
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13 associated anymore (-0.003; 95% CI, -0.123 to 0.118; p=0.958).

14 15 **DISCUSSION**

16 17 **Main findings**

18 The provision of institutional forms of mental health care has changed in Western
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20 Europe since 1990 and the changes appear to continue. The number of psychiatric
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22 hospital beds has been falling substantially. At the same time, the number of forensic
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24 beds and prison populations have increased, whilst changes in protected housing have
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26 been inconsistent across countries with a tendency to increase too.

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28 Overall, the number of reduced psychiatric hospitals is larger than the total number of
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30 additional places in other forms of institutional care combined. The precise figures
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32 vary between countries, but the overall difference is substantial if one assumes that
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34 only a proportion of additional prisoners are likely to have a mental disorder. If one
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36 excludes the prison populations from this analysis, because it is debatable as to
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38 whether prisons can be seen as forms of care, the number of reduced beds exceeds the
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40 additionally established places even more clearly. So, the total number of institutional
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42 places in mental health care has rather decreased, and this applies – although to a
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44 different extent – to the period from 1990 to 2000 and the following period until
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46 2012. However, according to these findings, there has been further de-
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48 institutionalisation in terms of psychiatric hospital beds in addition to an ongoing
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50 trend towards re-institutionalisation, namely forensic beds and prison populations.

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52 The data of this study cannot reveal the historical and societal drivers behind the
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54 decrease of psychiatric beds and increase of prison populations. The reduction of
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56 hospital beds and the increase of other forms of institutional care happened over the
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58 same period of time, and both phenomena are likely to be linked as part of overall
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60 historical changes in European societies. Societal processes leading to an increase of
prison populations are complex. Data as presented in this study cannot identify the

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3 real influence of anticipated or experienced bed closures within these processes.
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5 However, the data did allow to explore a quantitative association of the extent of the
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7 two phenomena, i.e. whether there were fewer beds when and where there were
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9 overall more prisoners. We did find such an association, which was statistically
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11 significant. However, once adjusted for overall time trends (years as fixed effect) or
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13 the overall economic activity of a country (GDP), the correlation was no longer
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15 significant. Thus, falling bed numbers and rising prison populations appear to go
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17 together, but they are not necessarily causally linked. Wider political and social
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19 changes in a society, as reflected by the GDP and potentially other indicators, are the
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21 drivers for the changes, and trends other than changes in bed numbers may explain the
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23 extent of the increase of prison populations in Western Europe.

24 **Strengths and limitations**

25 To our knowledge, this is the first and largest longitudinal study examining the
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27 association between different types of institutional mental health care, including
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29 prisons populations, in Western Europe over a period of 22 years. This study included
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31 countries from different regions within Western Europe and used what are arguably
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33 the best available data. The study included forensic beds and protected housing places
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35 to have a more comprehensive picture of institutional care as far as such institutions
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37 are defined by bricks and mortar. In the analysis of associations, we considered non-
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39 specific time effects and GDP as a potential covariate. The association between bed
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41 numbers and prison population was no longer significant representing other important
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43 societal time trends.

44 The study also has several major limitations, thus the results should be interpreted
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46 with caution. Firstly, the accuracy of some data remains questionable. We tried and
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48 took the most reliable data by cross-checking between reports. Yet, some of the data
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50 had been collected for administrative purposes rather than for research, and
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52 definitions and reporting procedures were inconsistent. In particular, figures for
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54 forensic beds and protected housing places referred to varying and sometimes vague
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56 definitions. Secondly, we included only 11 countries, and for some forms of
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58 institutional care, in particular protected housing, the number was even smaller. As a
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60 result, the overall number of observations is rather small for a panel data analysis, and

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3 too small to conduct more complex analyses such as a co-integration analysis as a
4 method for identifying influences in time series.

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6 Thirdly, comparisons of absolute numbers across countries should be done only with
7 great caution, as the definitions of settings and samples vary significantly. Within
8 each country however definitions are likely to have been consistent so that changes
9 over time can be interpreted with more confidence.

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11 And finally, the data are only total figures of patients in each type of institution
12 without any breakdown of diagnosis or other patient characteristics. These total
13 figures cannot reveal whether there is ongoing de-institutionalisation or re-
14 institutionalisation for specific patient groups such as those with severe and chronic
15 disorders.
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22 **Comparisons against the literature**

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24 Comparisons against findings in other regions in the world and other historical
25 contexts are problematic. Mundt et al.²¹ have provided data from South American
26 countries since 1990. They suggested an association between psychiatric hospital beds
27 and the prison population in line with the Penrose hypothesis, although – unlike
28 Penrose - they explicitly did not assume a direct causal relationship. However, the
29 numbers involved were very different from those in Europe. Whilst in South America
30 there were five more prisoners since 1990 for every reduced psychiatric bed, in
31 Western Europe there were more beds reduced than additional prison places
32 established. A similar study of changes of institutional care in post-communist
33 countries in Eastern Europe analysed data from a period of drastic reductions of the
34 prison population in some countries during that time²⁰, a historically rather unusual
35 phenomenon.
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46 It appears questionable as to whether generalized hypotheses – like the Penrose
47 hypothesis – can be applied across so different contexts.

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49 The analysis of mere numbers of places in institutions does not show the
50 characteristics of people in them. In 1939, Penrose had patients with severe mental
51 illness in mind, who would be either in a hospital or in a prison. Recent studies show
52 indeed an overlap of people who over time can be in a type of revolving door between
53 prison and psychiatric hospital care.²⁷ Yet, the predominant diagnosis of these people
54 is a substance abuse disorder, sometimes but not always linked with a severe mental
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3 illness.²⁸⁻³⁰ People with severe mental illness are the dominant group in different
4 forms of protected housing and in forensic beds,³¹ whilst the clientele of in-patient
5 care may vary more depending on the number of beds available and the organisation
6 of care in each country. Since there has been a tendency for shorter lengths of stay of
7 in-patient care since 1990, the reduced bed number does not mean that the number of
8 patients who get hospitalised at some point of time has similarly decreased. In all
9 institutions the length of stay is essential to estimate the number of people who are
10 affected over time.
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18 CONCLUSION

19 The trends towards decreasing psychiatric bed numbers and overall increasing forms
20 of other forms of institutions for people with mental disorders in Western Europe –
21 first described in 2005 – appear to continue, although the drivers for these changes
22 and the precise relationships between them remain poorly understood.
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26 The places in institutional mental health care may reflect the approach of a society to
27 people with mental disorders, and certainly involve substantial costs to the health,
28 social and judicial systems. This study underlines the need for more complete and
29 reliable data from more countries. Better data would allow more reliable time series
30 analyses. However, statistical analyses of places in institutions alone will not provide
31 conclusive evidence on the causes for changes, and various potential economic, social
32 and political drives may have to be analysed as potential drivers for changes in
33 different forms of institutions.
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41 Data are needed not only on the number of places in institutions, but also on the
42 precise characteristics and histories of people with mental disorders in these
43 institutions. Whilst routine data are largely available for the characteristics of patients
44 in hospital beds, less is known about people with mental disorders in prisons^{10,13,14,27,}
45^{29,30} and even less about patients in protected housing services^{31,32}. Most importantly,
46 studies of long-term pathways of people moving between these institutions are
47 required to understand their potential interplay. The aim of such wider research
48 should be to explore how the institutions included in this study, as well as other
49 community-based and out-patient services, are linked and influence each other. This
50 will require complex analyses of whole mental health care systems, which an
51 increasing availability of comprehensive routine data may allow in the future.³³
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4 And finally, evidence is required on how effective and cost-effective care in
5 psychiatric hospitals, in forensic beds and in protected housing for different patient
6 groups is, e.g. as compared to out-patient care, so that policies and funding for
7 institutional care can be based on evidence about their costs and benefits.
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11 12 13 14 15 **AUTHORS' CONTRIBUTION**

16 Study concept and design were developed by Chow and Priebe in collaboration.
17 Chow did the literature search, gathered the data, conducted the statistical analysis
18 and drafted the manuscript. The manuscript was then further developed and edited by
19 Priebe. Both authors critically revised the manuscript for important intellectual
20 content and approved of the final version.
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25 26 **DECLARATION OF INTERESTS**

27 We declare no competing interests.
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31 32 **ROLE OF THE FUNDING SOURCE**

33 The East London NHS Foundation Trust had no role in the design and conduct of the
34 study: collection, management, analysis, or interpretation of the data; preparation,
35 review or approval of the manuscript; and decision to submit the manuscript for
36 publication. The authors had full access to all data in the study and had final
37 responsibility for decision to submit for publication.
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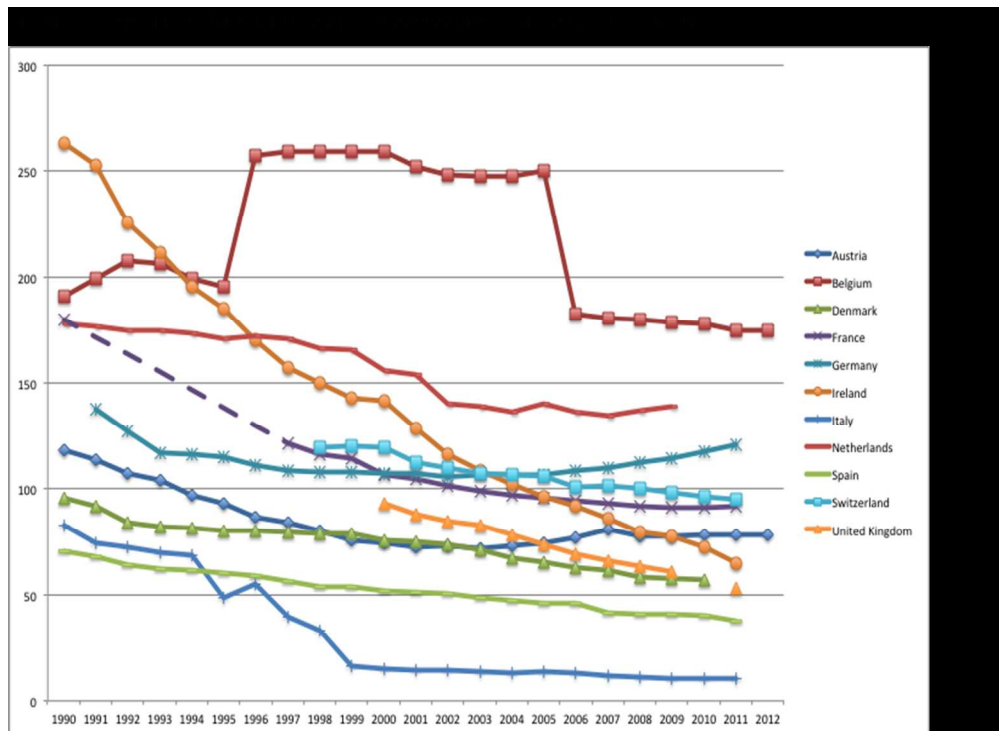
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REFERENCES

1. Thornicroft G, Bebbington P. Deinstitutionalisation – from hospital closure to service development. *Br J Psychiatry* 1989; 155: 739-753.
2. Chow WS, Priebe S. Understanding psychiatric institutionalization: A conceptual review. *BMC Psychiatry* 2013; 13: 169. doi:10.1186/1471-244X-13-169
3. Lamb HR, Bachrach LL. Some perspectives on deinstitutionalization. *Psychiatr Serv*. 2001; 52(8): 1039-1045.
4. Muijen M. Focus on mental health care reforms in Europe. Mental health services in Europe: an overview. *Psychiatr Serv* 2008; 59(5): 479-82. doi: 10.1176/appi.ps.59.5.479
5. Fakhoury W, Priebe S. The process of deinstitutionalization: An international overview. *Curr Opin Psychiatry* 2002; 15(2): 187-92.
6. Fakhoury W, Priebe S. Deinstitutionalization and reinstitutionalization: Major changes in the provision of mental healthcare. *Psychiatry* 2007; 6(8): 313-316.
7. Department of Health. Mental health ten years on: progress on mental health care reform. DH; 2007.
8. Priebe S, Badesconyi A, Fioritti A, et al. Reinstitutionalisation in mental health care: comparison of data on service provision from six European countries. *BMJ* 2005; 330 (7483): 123-126. doi 10.1136/bmj.38296.611215.AE
9. Priebe S, Frottier P, Gaddini A, et al. Mental health care institutions in nine European countries, 2002 to 2006. *Psychiatr Serv* 2008; 59(5): 570-573. doi: 10.1176/appi.ps.59.5.570
10. Fazel S, Danesh J. Serious mental disorder in 23 000 prisoners: a systematic review of 62 surveys. *Lancet* 2002; 359: 545-50.
11. Konard N. Prisons as new asylums. *Curr Opin Psychiatry* 2002; 15: 583-587.
12. Lamb HR, Weinberger LE. The shift of psychiatric inpatient care from hospitals to jails and prisons. *J Am Acad Psychiatry Law* 2005; 33: 529-34.
13. Dressing H, Kief C, Salize HJ. Prisoners with mental disorders in Europe. *Br J Psychiatry* 2009; 194: 88.
14. Fazel S, Seewald K. Severe mental illness in 33,588 prisoners worldwide: systematic review and meta-regression analyses. *Br J Psychiatry* 2012; 200(5): 364-373. doi: 10.1192/bjp.bp.111.096370
15. Penrose LS. Mental disease and crime: outline of a comparative study of European statistics. *Br J of Medical Psychology* 1939; 18(1): 1-15.
16. Kelly BD. Penrose's Law in Ireland: An ecological analysis of psychiatric inpatients and prisoners. *Ir Med J*. 2007; 100(2): 373-4
17. Hartvig P, Kjelsberg E. Penrose's Law revisited: The relationship between mental institution beds, prison population and crime rate. *Nord J Psychiatry* 2009; 63(1): 51- 6. doi: 10.1080/08039480802298697
18. Large MM, Nielssen O. The Penrose hypothesis in 2004: Patient and prisoner numbers are positively correlated in low-and-middle income countries but are unrelated in high-income countries. *Psychol and Psychother*. 2009; 82(1): 113-9. doi: 10.1348/147608308X320099
19. Prins S.J. Does transinstitutionalization explain the overrepresentation of people with serious mental illnesses in the criminal justice system? *Community Ment Health J* 2011; 47(6): 716-722. doi: 10.1007/s10597-011-9420-y
20. Mundt AP, Frančišković T, Gurovich I, et al. Changes in the provision of institutionalized mental health care in post-communist countries. *PLoS One* 2012; 7(6):e38490. doi: 10.1371/journal.pone.0038490

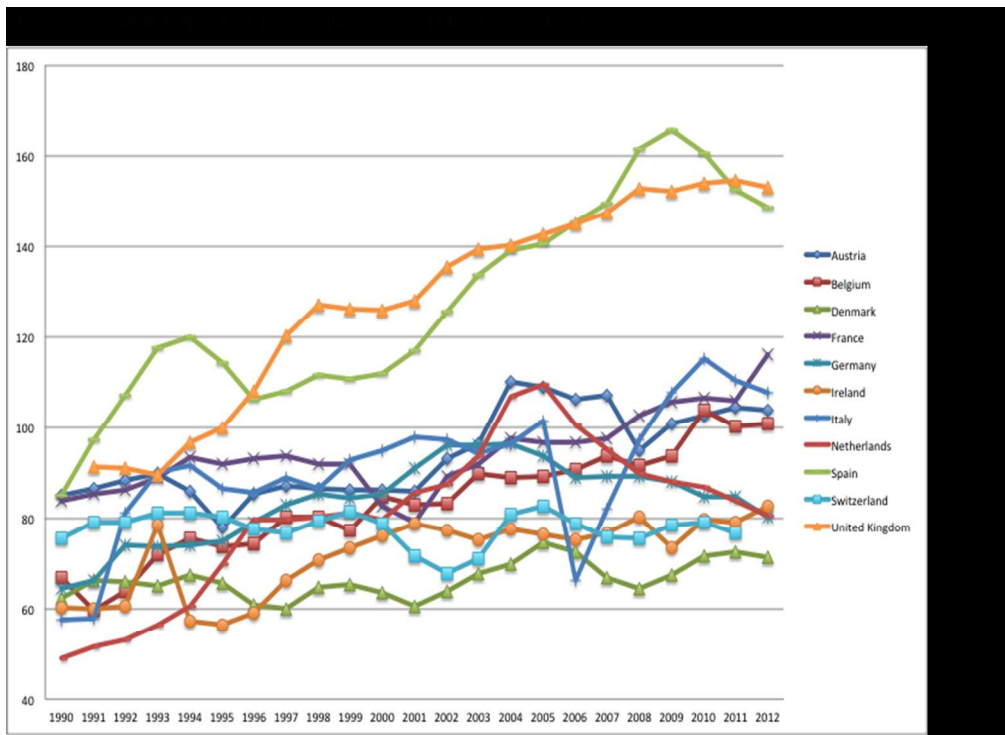
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21. Mundt AP, Chow WS, Arduino M, et al. Psychiatric hospital beds and prison populations in South America since 1990 does the Penrose hypothesis apply? *JAMA Psychiatry* 2015; 72(2): 112-8.13. doi: 10.1001/jamapsychiatry.2014.2433
22. Ceccherini-Nelli A, Priebe S. Economic factors and psychiatric hospital beds—an analysis of historical trends. *Int J Soc Econ* 2007; 34(11): 788-810.
23. Hsiao, C. *Analysis of Panel Data*. 2nd ed. Cambridge University Press; 2003
24. Rabe-Hesketh S, Skrondal A. *Multilevel and Longitudinal Modeling Using Stata*. College Station, TX: Stata Press; 2012.
25. Greene W. *Econometric Analysis*. 5th ed. Upper Saddle River, NJ: Prentice Hall; 2003.
26. Wooldridge JM. *Econometric Data of Cross Section and Panel Data*. Cambridge, MA: MIT Press; 2002.
27. Mundt AP, Kastner S, Mir J, et al. Did female prisoners with mental disorders receive psychiatric treatment before imprisonment? *BMC Psychiatry* 2015; 15: 5. Doi: 10.1186/s12888-015-0387-z
28. Gunn J. Future directions for treatment in forensic psychiatry. *Br J Psychiatry* 2000; 176: 332-338.
29. Farrel M, Boys A, Bebbington P, et al. Psychosis and drug dependence: results from a national survey of prisoners. *Br J of Psychiatry* 2002; 181: 393-398.
30. Fazel S, Bains P, Doll H. Substance abuse and dependence in prisoners: a systematic review. *Addiction* 2006; 101(2): 181–91. Doi: 10.1111/j.1360-0443.2006.01316.x
31. Priebe S, Saidi M, Want A, et al. Housing services for people with mental disorders in England: patient characteristics, care provision and costs. *Soc Psychiat Epidemiol* 2009; 44:805-81. doi: 10.1007/s00127-009-0001-0
32. De Girolamo G, Picardi A, Micciolo R. et al. Residential care in Italy. A national survey on non-hospital facilities. *Br J Psychiatr* 2002, 181:220-225. doi: 10.1192/bjp.181.3.220
33. Munk-Jørgensen P. Has deinstitutionalization gone too far? *Eur Arch Psychiatry Clin Neurosci*. 1999; 249(3): 136-43.



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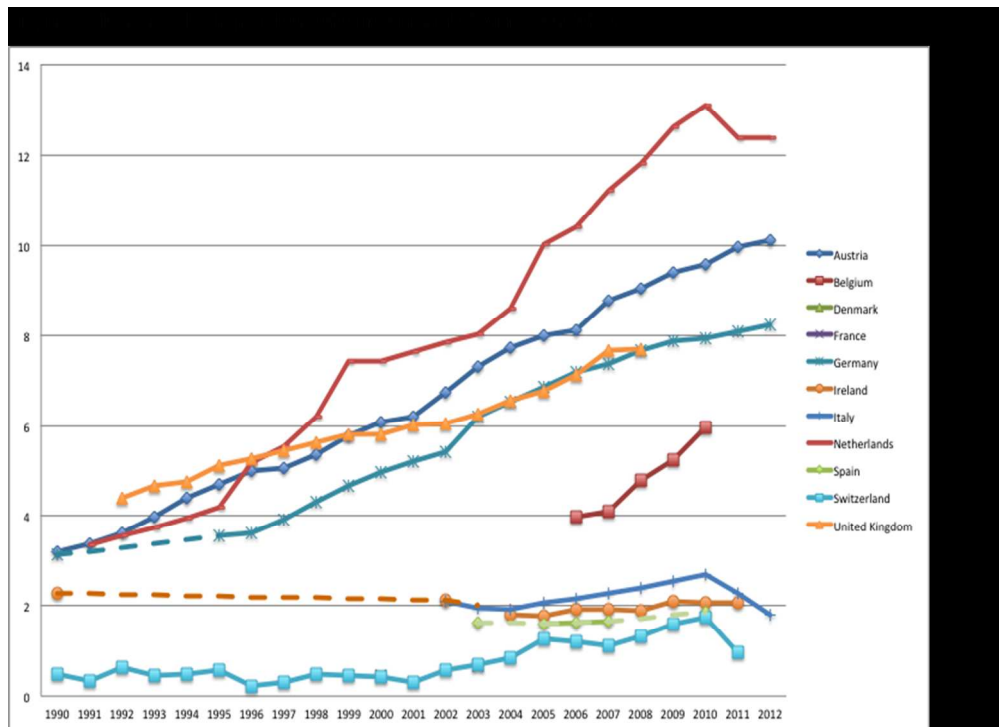
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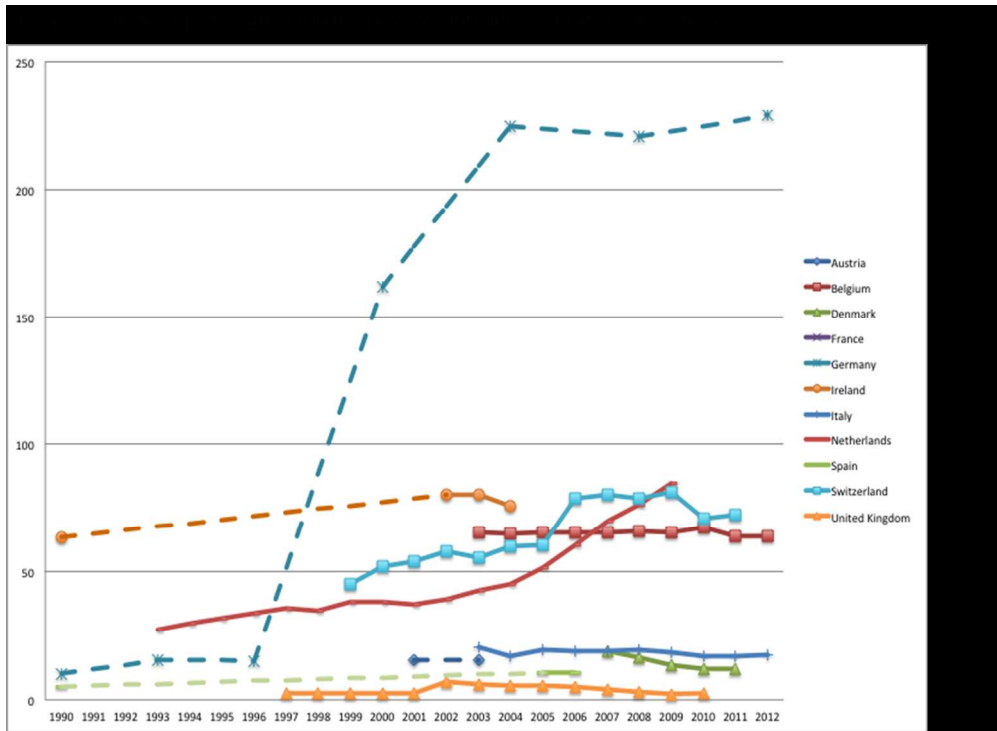
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STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation
Title and abstract Page 1 and 2	1	(a) Indicate the study's design with a commonly used term in the title or the abstract - done (b) Provide in the abstract an informative and balanced summary of what was done and what was found - done
Introduction Page 3		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported - done
Objectives	3	State specific objectives, including any prespecified hypotheses – done, including a reference to the Penrose hypothesis
Methods Page 5		
Study design	4	Present key elements of study design early in the paper - done
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection – the data were existing data from different sources which have been specified
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls <i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants (b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed <i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case – we explain that we analysed places in different institutions, so strictly speaking not participants, but cohorts of institutional places
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable - done
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group - done
Bias	9	Describe any efforts to address potential sources of bias - done
Study size	10	Explain how the study size was arrived at – done, it was determined by the availability of data
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why - done
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding - data (b) Describe any methods used to examine subgroups and interactions – not applicable (c) Explain how missing data were addressed -done (d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed – we explain how we dealt with the varying availability of data at different time points

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Case-control study—If applicable, explain how matching of cases and controls was addressed

Cross-sectional study—If applicable, describe analytical methods taking account of sampling strategy

(e) Describe any sensitivity analyses – not applicable

Continued on next page

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Results Page 8

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed - done (b) Give reasons for non-participation at each stage (c) Consider use of a flow diagram
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders – explained that such data is not available, also repeatedly addressed in discussion (b) Indicate number of participants with missing data for each variable of interest (c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)
Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time - done <i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure <i>Cross-sectional study</i> —Report numbers of outcome events or summary measures
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included – not applicable (b) Report category boundaries when continuous variables were categorized – not applicable (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period – not applicable
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses – done

Discussion Page 10

Key results	18	Summarise key results with reference to study objectives - done
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias - done
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence - done
Generalisability	21	Discuss the generalisability (external validity) of the study results - done

Other information Page 14

Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based - done
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*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.