

1 An economic rationale for mental health care reform in  
2 the Czech Republic: cost-effectiveness of care for people  
3 with psychosis in the community and psychiatric hospitals  
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## 31 Abstract

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32 **Background** The absence of economic evidence hinders current reforms of hospital based  
33 mental health systems in Central and Eastern Europe. We aimed to assess the cost-  
34 effectiveness of care for people with chronic psychoses in psychiatric hospitals compared to  
35 discharging patients to the community in the Czech Republic.

36 **Methods** We conducted a prospective study of people with chronic psychotic disorders and  
37 evaluated the impact associated with discharge into community services as compared to not  
38 discharging people from psychiatric hospitals at baseline in the Czech Republic. We  
39 measured utilization of services, health related quality of life, met and unmet needs, and  
40 global functioning using an adapted Client Services Receipt Inventory (CSRI), EQ-5D-5L,  
41 Camberwell Assessment of Need (CAN) and General Assessment of Functioning (GAF).  
42 Adjusting for baseline differences between the two groups, we assessed differences in  
43 societal costs in Euros (€) and QALYs over a year-long follow-up which we then used to  
44 estimate the incremental cost-effectiveness ratio (ICER). We conducted multiple sensitivity  
45 analyses to assess the robustness of our results.

46 **Outcomes** In our base case scenario, we included 115 patients who were either inpatient or  
47 community services users at the baseline. The two groups were very similar in terms of their  
48 observed characteristics. The annual QALY was 0.77 and 0.80 in the group discharged to the  
49 community at the baseline compared to not being discharged (difference 0.03 95%  
50 confidence interval -0.04 to 0.1), but costs were €8,503 compared to €16,425 (difference  
51 €7,922, 95% confidence interval 4,371 to 11,472) such that the ICER reached over 250,000 €  
52 per QALY. This is considerably above levels that are conventionally considered to be cost-  
53 effective and the estimated probability that discharge to the community was cost-effective  
54 was very high. None of the sensitivity analyses changed these results qualitatively.

55 **Interpretation** This study provides economic evidence for deinstitutionalization by showing  
56 that discharge to community care is cost-effective when compared to care in psychiatric  
57 hospitals in the Czech Republic. Thus, it adds to the human rights- and clinical- based  
58 arguments for mental health care reforms in Central and Eastern Europe.

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## 63 Keywords

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64 Psychiatric hospital, Community care, Cost-effectiveness, Deinstitutionalization, Schizophrenia, Psychotic  
65 Disorders, Czech Republic

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## 68 Background

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69 Schizophrenia, schizoaffective disorder and other forms of psychosis are associated with  
70 considerable disability. Schizophrenia alone is currently ranked 11th in terms of years lived  
71 with disability (YLD) worldwide<sup>1</sup>. Psychotic disorders are also associated with high societal  
72 costs both in terms of health care costs and productivity losses. A recent systematic review by  
73 Jin and Mosweu<sup>2</sup> reported that, in absolute terms, yearly societal costs for schizophrenia  
74 ranged from US\$ 5,818 per patient in Thailand to US\$ 94,587 in Norway or as share of the GDP  
75 per capita, from 37% in Switzerland to 214% in the UK.

76 None of the studies included in this review, however, came from Central and Eastern Europe  
77 (CEE) where mental health care for people with severe mental illnesses is still predominantly  
78 provided in large psychiatric hospitals with limited community-based alternatives. In the  
79 Czech Republic, for example, people with schizophrenia are in many cases hospitalized for 5,  
80 10 or even 20 years and there are currently more than 8000 psychiatric beds for adults<sup>3,4</sup>.  
81 Historically, this resembles the psychiatric care systems in countries such as England or Finland  
82 which have since successfully undergone a process of deinstitutionalisation. In CEE, to date  
83 such reforms have been proposed but mostly remain in the realms of rhetoric or aspirations<sup>5</sup>.

84 Research has demonstrated that deinstitutionalization is of benefit to people with severe  
85 mental illness and does not bring about serious negative consequences such as increasing  
86 homelessness or criminality<sup>6-8</sup>. Also, studies in a number of European countries have shown  
87 that care in the community is not more expensive than care in psychiatric hospitals when both,  
88 costs and outcomes of care, were considered<sup>9,10</sup>. Economic evaluations have played a  
89 prominent role in the deinstitutionalization processes in England and other countries, both in  
90 terms of providing an impetus for this policy and assisting in its success by means of regular  
91 monitoring of its impact<sup>10-13</sup>.

92 In the last 25 years, almost no full economic evaluation of complex interventions for people  
93 with severe mental illnesses in CEE was published, which presents a challenge to efforts to  
94 reform or improve mental health care systems in the region<sup>5</sup>. Therefore, we aimed to generate  
95 such evidence in the context of the current mental health care reforms in the Czech Republic  
96 both to inform decision making in this country and as a prelude to further research and

107 deliberations on deinstitutionalising in the wider CEE region. To that end, we compared the  
108 quality of life and societal costs among people with psychosis who had been receiving care in  
109 psychiatric hospitals for at least 3 months with patients who had been discharged to the  
100 community care in the Czech Republic over a period of a year.

## 101 Methods

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### 102 Study design and comparators

103 We conducted a prospective study of people with chronic psychotic disorders in the Czech  
104 Republic. In order to approximate the impact of deinstitutionalisation on the cost-  
105 effectiveness of care, we sought to assess what difference it would have made on average if  
106 patients who were long-term psychiatric inpatients (and may eventually be discharged  
107 according to current practice) had instead been discharged to receive community care at the  
108 start of our study (with the risk of being readmitted at a later stage). In our base case analysis  
109 we took societal perspective with respect to measuring costs and a patient perspective with  
110 respect to accounting for health outcomes because this was thought to be the most relevant  
111 to decision makers. We evaluated these treatment strategies over one year which  
112 corresponds to the time horizon over which mental health care services are financed in the  
113 Czech Republic. We obtained an ethical approval for this study from both the ethical  
114 committee of the Prague Psychiatric Centre (currently the National Institute of Mental Health,  
115 Czech Republic) and the ethical committee of Psychiatric hospital Bohnice, Prague, Czech  
116 Republic.

### 117 Participants and data collection

118 For the purposes of this study we combined two separate samples: (1) Patients who were  
119 under inpatient psychiatric care were drawn from the SUPR project, a broader study aimed at  
120 monitoring the current standard of rehabilitative care on long-term wards with a particular  
121 focus on implementation of psychosocial rehabilitation principles and interventions on those  
122 units<sup>14</sup>. For this project, we invited all 17 Czech psychiatric hospitals to participate and, if they  
123 consented, asked them to select one or more wards primarily focused on providing care for  
124 chronic inpatients with psychosis from which study participants could be recruited; (2)  
125 Focussing on multidisciplinary community teams which predominately cared for people with

126 severe mental illness, we chose eight providers of such care from six (out of a total of 14)  
127 Czech administrative regions in an informal attempt to sample services representative in  
128 terms of the structure of mental health care and socio-cultural makeup of the Czech Republic.  
129 We contacted potentially eligible participants among the respective providers in random  
130 order until at least 17 patients per provider consented to participate in the study.

131 To be included in the study, patients in both samples had to be of working age (i.e. between  
132 18 and 64), had to have been given any diagnosis of non-affective psychosis as defined by the  
133 ICD-10 codes F20 to F29, and had to have been in contact with mental health services for at  
134 least three months prior to data collection. The cognitive function of patients in the inpatient  
135 cohort had to exceed 17 points on the Montreal Cognitive Assessment screening test<sup>15</sup>  
136 whereas we assumed that the patients living in the community were of sufficient cognitively  
137 ability if they were thought to be able to give informed consent to study participation. After  
138 data collection, for our base case analysis we further restricted the community sample to  
139 people who had been discharged within less than a year prior to baseline so that our  
140 community sample reflected more closely the treatment strategy of interest, i.e. discharge to  
141 the community at baseline. We assessed all participants at baseline and then followed them  
142 up for a year at approximately 4 month intervals.

### 143 Measure of effectiveness

144 We used the EQ-5D-5L, a self-administered instrument consisting of five dimensions, to assess  
145 respondents' health related quality of life at each assessment. Its predecessor, the three level  
146 EQ-5D-3L, has been extensively used as an outcome measure in health economic evaluations,  
147 particularly in the United Kingdom<sup>16,17,18</sup>. The five level version of this instrument was  
148 developed to improve the sensitivity of this previous three level version, and has been  
149 demonstrated to improve instruments' discriminatory power<sup>16,19</sup>. Although the EQ-5D  
150 descriptive system should be used with caution when measuring the impact of psychosis<sup>20,21</sup>,  
151 its value for cost-effectiveness studies in mental health has been well demonstrated<sup>22</sup>. Each  
152 of the health states measured by the EQ-5D-5L has been assigned a preference-based value,  
153 known as utility score, that summarises how good or bad each of the health states is on scale  
154 anchored by 1 corresponding to full health and 0 corresponding to a state equivalent to  
155 death<sup>23</sup>. Multiplying this utility score by the length of time spent in these health states yields  
156 quality adjusted life years (QALYs) which is a popular measure of health benefit in health

157 economic evaluation because it enables comparison of cost-effectiveness across disease  
158 areas<sup>24</sup>. We chose the UK tariffs to value health states because no Czech EQ-5D-5L tariffs are  
159 available and we deemed UK tariffs to be internationally the most influential<sup>24</sup>. We used the  
160 standard area under the curve method to calculate QALYs<sup>25</sup>.

161 As part of the study, two further instruments were measured: First, respondents were  
162 interviewed by a person belonging to the staff of the mental health care facility that was  
163 trained to administer the Global Assessment of Functioning (GAF) before the beginning of data  
164 collection. The GAF is a rating scale ranging from 0 to 100 reflecting the global impression of  
165 an individual's social, occupation and psychological function and is thought to have good  
166 psychometric properties for a brief instrument after appropriate training in its use<sup>26</sup>. We did  
167 not use GAF scores as a measure of treatment benefit because professionals in psychiatric  
168 hospitals who administered this instrument over the course of the follow-up were often  
169 different from those assessing GAF at the baseline and had thus not been trained in its use.  
170 Second, we assessed clinical and social needs and the degree to which they were met with the  
171 Camberwell Assessment of Needs (CAN), a tool developed both for use in clinical practice and  
172 research<sup>27</sup>. We used a 22-item version of the instrument which is filled by both health care  
173 professional and user. All the professionals who worked on collecting CAN data for this study  
174 had been trained in using this instrument at baseline but again this was not always the case  
175 over the follow-up. For this reason and due to the fact that only 11 post-baseline  
176 measurements were collected in the hospital cohort, we also chose not analyse CAN follow-  
177 up ratings.

### 178 [Estimating service use and costs](#)

179 For the purposes of this study we adapted the commonly used Client Service Receipt Inventory  
180 (CSRI) to identify and measure resource use from a societal perspective in a Czech context  
181 among patients treated for psychosis and calculated unit costs thereof (see Appendix 1 for  
182 details). In short, this involved measuring and costing the use of mental health care services  
183 (i.e. psychiatric inpatient, outpatient use), non-healthcare services (i.e. criminal justice costs  
184 and community-based care which fall under social care in the Czech Republic) and productivity  
185 losses (both to the person with psychosis and their carer). We also collected data on  
186 medication use through the CSRI, but this information was not reliable enough for costing  
187 purposes in the community sample, so we excluded medication costs in our analysis. However,

188 good quality data on the medication costs was routinely collected on inpatient wards which  
189 gave us an idea of the magnitude of the potential difference between the two groups. We  
190 converted all costs in the study to 2016 Euros and, given the time horizon of the study, we  
191 discounted neither costs nor effects. Since the CSRI asked for the amount of service use over  
192 the month or three months preceding each interview, we linearly inflated the data to cover  
193 the entire 4-month period between interviews.

#### 194 Cost-effectiveness analysis

195 We divided differences in costs over the follow-up period between the two groups by  
196 differences in QALYs to estimate the incremental cost-effectiveness ratio (ICER), a commonly  
197 used summary measure of cost-effectiveness. Unless, one of the treatments is both less costly  
198 and more effective, to be able to judge whether a treatment is cost-effective, it is necessary  
199 to put the ICER in relation to a so-called cost-effectiveness threshold, which has either been  
200 regarded to be the willingness to pay for health improvements by the decision maker or what  
201 health benefit could be generated if investments were made in a different health intervention,  
202 the so-called opportunity cost<sup>28</sup>. There is no official cost-effectiveness threshold in the Czech  
203 Republic (and many other countries), but two approaches have been proposed in the  
204 literature to provide some indication regarding their magnitude. The World Health  
205 Organisation suggests that an intervention could be cost-effective if the ICER is lower than one  
206 to three times a country's GDP per capita (in 2016, approximately €17,000 to €50,000 in the  
207 Czech Republic), whereas a more recent approach by Woods et al. implies a threshold  
208 between approximately €8,000 and €22,000<sup>28-30</sup>. We illustrate the uncertainty surrounding  
209 these cost-effectiveness estimates graphically using two approaches. First, we produce a cost-  
210 effectiveness plane (CEP), i.e. a diagram with difference in QALYs on the horizontal axis and  
211 difference in costs on the vertical axis displaying the central cost-effectiveness estimate and  
212 the uncertainty in terms of these two dimensions<sup>31</sup>. Second, we calculate the cost-  
213 effectiveness acceptability curve (CEAC) which, in this case, shows the estimated probability  
214 that discharge to the community is cost-effective given the sampling uncertainty<sup>32</sup>.

#### 215 Potential confounders

216 Particularly in observational studies, it is possible that the treatment groups of interest are  
217 not comparable because of factors that differ between them which are also causally

218 associated with the outcomes of interest. More specifically, in the context of this study, we  
219 had two concerns: (a) people who were in hospital at baseline could be more unwell than  
220 those in the community and this imbalance required reliance on a statistical model to adjust  
221 for these differences; (b) It was possible that some subgroups of patients were only present  
222 in one cohort but not the other, i.e. there would be a so-called 'lack of overlap' in some  
223 variables, such that either extrapolation beyond the observed data would be required or it  
224 was necessary to restrict the eligibility criteria to the study further. For example, it was  
225 conceivable that patients with severe psychotic symptoms or problematic care needs would  
226 only be observed in the hospital sample because this is where adequate care could be  
227 provided for them. To reduce this potential bias, we therefore both checked whether there  
228 was sufficient overlap between the two groups in terms of selected variables that were  
229 measured in the samples and, if necessary, adjusted for these variables in the analysis (see  
230 Appendix 2 for our variable selection strategy). In our base case analysis, we chose to adjust  
231 for (i) baseline EQ-5D-5L utility score, (ii) the baseline GAF score, (iii) age, (iv) gender, (v)  
232 interaction term between the time since discharge from hospital and the community/hospital  
233 group indicator.

## 234 [Statistical analyses](#)

235 For all our analyses, we used a regression approach to address observed confounding. In our  
236 primary analysis, we used a seemingly unrelated regression (SUR) approach to incorporate  
237 potential correlation between costs and QALYs into our statistical model<sup>33</sup>. To account for  
238 missing data, we used a multiple imputation approach which assumes that data was missing  
239 at random (MAR), i.e. missingness was unrelated to the unobserved value conditioning on all  
240 other variables. In addition, we assumed that, once discharged, patients who were in hospital  
241 at baseline had costs of service use equivalent to the community cohort (see Appendix 2 for  
242 details). While it was not possible to do so in our SUR model, when analysing QALYs and cost  
243 data separately (as well as in other secondary analyses), we used cluster robust standard  
244 errors to allow for correlation of outcomes within care facilities and we used a fractional logit  
245 model to model QALYs and EQ-5D-5L utilities since, by definition, these are constrained to be  
246 smaller than 1 in this study. We used a negative binomial regression model to analyse  
247 differences in service use and a random effects logit model to estimate medication use. We  
248 performed all statistical analyses in Stata 15<sup>34</sup>. In line with expected mortality in this



249 population, one of the study participants died during the study follow-up, however, we  
250 considered our sample size too small to warrant the attempt to statistically model survival  
251 differences between groups using non-standard methods that adequately account for such  
252 rare events<sup>35,36</sup>. Instead, for simplicity, we treated the data following the death of this patient  
253 as missing.

## 254 Sensitivity analyses

255 To assess the sensitivity of the results, we first investigated whether the degree to which we  
256 restricted our community sample had any impact by increasing the maximum time between  
257 hospital discharge and baseline to two years and to five years. Second, based on evidence by  
258 Tulloch et al.<sup>37</sup> we used both a quadratic and a linear interaction factor between community  
259 care and time since discharge. Third, in addition to the aforementioned potential confounders,  
260 we included five CAN items in the analysis, namely whether the patient had any needs in terms  
261 of self-care (item 4), psychotic symptoms (item 7), safety to self (item 10) or any substance  
262 abuse problems (items 12 and 13 combined) (see appendix 2 for our rationale behind this  
263 choice). Fourth, data could be missing not at random (MNAR) rather than MAR, i.e.  
264 missingness could be associated with the unobserved value after conditioning on other  
265 variables. Hence, we investigated the impact of increasing and decreasing the utility score of  
266 time points in which there was missing data by approximately half a baseline standard  
267 deviation, i.e.  $\pm 0.1$ . Fifth, we excluded patients who did not fulfil the above-mentioned overlap  
268 requirement instead of extrapolating results based on the statistical model. Finally, we  
269 calculated the cost-effectiveness of the intervention from a government rather than a societal  
270 perspective, i.e. we excluded informal care costs and productivity losses, because this may be  
271 of relevance to some decision makers.

## 272 Results

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### 273 Participants and descriptive statistics

274 Overall, 115 patients were included in our base case analysis (see Figure 1). More participants  
275 were inpatients at baseline services (n=80, 70%) and more were male (n=68, 59%). For further  
276 sociodemographic characteristics see Table 1. Appendix Table A.3.1 shows that, on average,  
277 patients who agreed to participate in the community sample had longer length of contact with  
278 mental health services and were less likely to be single compared to those who declined to

279 participate. Appendix Figure A.3.1 shows that the rate of missingness for the potential  
280 confounders and outcome measures was markedly higher in patients who were inpatients at  
281 baseline and Appendix 2 discusses some of the reasons behind this. Figures A.3.2 and A.3.3 in  
282 the appendix show that the two groups were well balanced in terms of most potential  
283 confounders, however, self-care needs were somewhat more common among those who  
284 were inpatients at baseline and problems with psychotic symptoms were less common. There  
285 was some lack of overlap at the upper end of the distribution of GAF scores and at the lower  
286 end of the distribution of EQ-5D-5L utility scores. Use of antipsychotics at baseline and over  
287 the study follow-up were broadly comparable across the two groups but those who received  
288 hospital care at baseline were more likely to use multiple classes of antipsychotics and 2<sup>nd</sup>  
289 generation antipsychotics over the study follow-up (see appendix figure A.3.4).

### 290 [Costs, QALYs and cost-effectiveness](#)

291 As shown in Figure 3(b), societal costs over the study follow-up were consistently significantly  
292 higher in patients who were on a psychiatric ward at baseline, leading to an overall difference  
293 in costs of €7,922 (95% confidence interval (CI) 4497 to 11346). This difference was almost  
294 exclusively caused by the cost of inpatient care itself such that the decrease in costs among  
295 people who had not been discharged to the community at baseline mirrors the fact that by  
296 the end of follow-up approximately half of this group had been discharged (see Figure A.3.5).  
297 Costs of social care were somewhat higher in the community cohort and productivity losses  
298 slightly lower but, compared to differences in terms of health care costs between the groups  
299 driven by the high cost of inpatient care itself, these were insubstantial (see Figure 2). Patients  
300 who were in hospital at baseline had a 0.03 (95% CI -0.04 to 0.1) higher QALY over the follow-  
301 up but as shown in Figure 3 (a), EQ-5D-5L utility scores remained relatively stable in both arms.  
302 The cost-effectiveness plane in Appendix Figure A.3.6 illustrates the joint sampling uncertainty  
303 with respect to cost and QALY differences and Table A.3.2 shows the full regression results of  
304 the base case analysis. With an ICER of €256,855 per QALY, the QALY gain was not sufficiently  
305 high to offset the large difference in costs between the group such that, even at the highest  
306 of the thresholds mentioned above (€50,000 per QALY) continued inpatient care was not cost-  
307 effective. In fact, the cost-effectiveness acceptability curve in Appendix Figure A.3.7 indicates  
308 that even at a willingness to pay as high as €100,000 per QALY the probability that discharge  
309 to the community is cost-effective remains above 75%. Table 2 shows that, quantitatively, the

310 ICER was significantly affected by assumptions regarding the EQ-5D-5L missingness  
311 mechanism and how time since discharge was adjusted for in the model. However, even in  
312 the scenario most favourable not discharging patients at baseline we obtained an ICER of  
313 approximately €110,000 and the lowest probability that discharge to the community was cost-  
314 effective was estimated to be 97% such that, qualitatively, the results did not change in any  
315 of the sensitivity analyses.

316

## 317 Discussion

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318 This is the first study to provide economic evidence for the mental health care reform in the  
319 Czech Republic and could potentially act as a prototype for assessing similar reforms in other  
320 countries of CEE. Similar to previous studies, our results show that inpatient care for people  
321 with chronic psychosis is costly compared to the care in the community and these differences  
322 do not appear to be offset by savings elsewhere. Moreover, the difference in annual costs per  
323 patient of €7,922 dwarfed the 0.03 gain in QALYs. The high ICER did not appear to be a result  
324 of substandard antipsychotic treatments on psychiatric wards and were robust in our  
325 sensitivity analyses. In addition, patients who were discharged within less than one year and  
326 inpatients were much more similar in terms of their observed characteristics at baseline than  
327 we expected. This supported the comparability between the two groups and suggests that, if  
328 appropriately carried out, deinstitutionalisation may be feasible for a large proportion of the  
329 current inpatient population. Just like in other countries which have undergone the process  
330 of deinstitutionalisation, we do not believe that the results imply that there is no role for  
331 inpatient care but that shifting investments towards community care and providing time-  
332 restricted inpatient care is likely to give better value for money than long-term psychiatric  
333 hospitalisations. This argument adds to the human rights arguments based on the CRPD and  
334 especially on its article 19 emphasizing a right to live independently and in the community<sup>4,38</sup>,  
335 and clinical arguments based on long-term favourable outcomes of deinstitutionalized  
336 patients in other countries of the world<sup>6,7</sup>.

337 In terms of the scope of the study, the construction of the Czech version of the CSRI,  
338 calculation of unit costs, review of health service and epidemiological data and building  
339 partnership with providers of mental health care in the Czech Republic have been pioneering

340 and we were able to capture a broad range of cost-drivers and verify the accuracy of data in  
341 many cases. For example, although consumption of care was not independently assessed (e.g.  
342 by health insurance companies), where possible, we were able to cross-check CSRI data  
343 against the records of participating facilities to improve the accuracy of health and social care  
344 use data. At the same time, we did not account for the impact of discharge to the community  
345 on people other than the patient (e.g. family or partners providing care to the patient) or  
346 measure costs of physical health care, housing and pharmaceuticals. Participants were  
347 interviewed by a staff member of a mental health care facility upon completion of CSRI. This  
348 might have introduced some bias, as participants may have been hesitant to disclose sensitive  
349 information, such as contact with the system of criminal justice. In practice, we were also  
350 unable to compare the groups in terms of any measure of effectiveness other than QALYs  
351 derived from EQ-5D-5L. In addition, in this study we only followed up our participants for a  
352 year and we would think that the comparative advantage of discharge to the community care  
353 are likely to extend beyond this period thereby potentially improving cost-effectiveness  
354 further. Perhaps more importantly, one should keep in mind that we did not evaluate the  
355 impact of the reform directly, but we effectively estimated the cost-effectiveness of post-  
356 reform care practices compared with the current care practice once the necessary  
357 infrastructure and care professionals in the community are in place, i.e. leaving aside setup  
358 costs that are likely to be incurred. In addition, in practice, both systems, the old hospital-  
359 based and the new community-based one, will have to be run simultaneously for some time.

360 Several aspects relating to the study design are also relevant to the interpretation of the  
361 results and to informing the conduct of future studies of this kind. Although attempts were  
362 made to recruit patients from services that captured the regional variations in terms of the  
363 structure of mental health care and socio-cultural background of the Czech Republic, we only  
364 had limited evidence on whether institutions or participants who declined to participate  
365 systematically differed from the one's that would be impacted by the health care reforms and  
366 whether this may have led to recruitment bias. Rather than restricting our sample and relying  
367 on the correct specification of our statistical model, it would have been preferable to recruit  
368 people at the time of discharge to community services. Finally, as in every observational study,  
369 although we showed that there were no large differences between the two patient  
370 populations in terms of socio-demographic characteristics, health-related quality of life and

371 functioning, bias may have arisen due to the presence of unobserved confounders and the  
372 small sample size of the study limited our ability to adjust for confounding.

373

## 374 Conclusions

375 We demonstrated that in the Czech Republic, community-based care for people with chronic  
376 psychotic disorders is far less costly than care in psychiatric hospitals. We believe that this is  
377 yet another argument for pursuing deinstitutionalization in the Czech Republic. The results of  
378 this study add to the current modest evidence on the economics of deinstitutionalization<sup>10,40</sup>  
379 and, while one should be cautious in extrapolating the evidence to other CEE countries, the  
380 results suggest that deinstitutionalisation may not just be cost-effective in Western countries  
381 but also in a mental health care system that is much more similar to those in this region where  
382 other evidence is currently lacking<sup>5</sup> and where there is a lack of evaluative culture<sup>41</sup>. We  
383 believe that the economic evidence from the present study should be complemented with  
384 additional studies looking into economic consequences of the deinstitutionalization which has  
385 been proposed in the region. For example, similar to studies conducted in England, Italy, and  
386 Germany<sup>10,42</sup>, economic models of shifting the care from hospitals to communities as well as  
387 analyses of differences in costs across providers and regions would be useful. Before  
388 implementing this policy, decision makers also need to consider how to finance it. The Czech  
389 Republic utilized European Structural and Investment Funds to cover the costs of the first  
390 phase of the transition period and this funding opportunity may be open to other EU countries  
391 in the region, whereas non-EU countries in CEE may be able to benefit from other sources,  
392 such as the cooperation with Swiss Agency for Development and Cooperation. In addition, it  
393 would be undesirable if savings in one sector (e.g. health care) would be possible because of  
394 partially shifting the costs to another sector (e.g. social care) without appropriate rebalancing  
395 of budgets. Following deinstitutionalization, it would be valuable to follow up people in the  
396 community to monitor their services use and clinical outcomes in order to assess phenomena  
397 which have been associated with deinstitutionalization, such as decrease in (post-discharge)  
398 suicides<sup>43</sup> and mortality<sup>44</sup> among patients, increase in revolving door<sup>45</sup>,  
399 transinstitutionalization<sup>46</sup>, and satisfaction and quality of life of patients<sup>6</sup>. The studies of this  
400 kind should inform the decision making to ensure that the proposed reforms are economically  
401 sound, beneficial to patients and sustainable.

## 402 Authors' disclosure

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### 403 Authors' contribution

404 Petr Winkler initiated, planned and designed the study, coordinated the study, contributed to  
405 the analyses and led the writing of the manuscript. Leonardo Koeser conducted the statistical  
406 analyses, contributed to the study design and the writing of the manuscript. Lucie Kondrátová  
407 participated in designing the study, coordinated data collection and participated in writing of  
408 the manuscript. Hana Marie Broulíková calculated unit costs, participated in conducting  
409 economic analyses and writing of the manuscript. Marek Páv contributed to the design of the  
410 study, coordinated data collection in hospitals and writing of the manuscript. Lucie Kališová  
411 contributed to the design of the study and writing of the manuscript. Paul McCrone and  
412 Barbara Barrett supervised the whole project from the very beginning and helped to make  
413 important strategic decisions.

### 414 Ethical considerations

415 Ethical approval was obtained from the Prague Psychiatric Centre's (predecessor of NIMH CZ)  
416 ethical committee and from ethical committee of Psychiatric hospital Bohnice, coordinator of  
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### 427 Conflict of interest

428 Authors declare that they have no conflict of interest.

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432

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533



535 **Table 1: Baseline patient characteristics in the base case analysis (N=115)**

Care location at baseline		Community (N=35)		Hospital (N=80)	
Patient characteristic\Summary statistic		N†	%*,†	N (%*)†	%*,†
<b>Gender</b>	Male	21	60	47	59
	Female	14	40	33	41
	Missing	0	0	0	0
<b>Nationality</b>	Czech	34	97	74	95
	Other	1	3	4	5
	Missing	0	0	2	3
<b>Marital status</b>	Single	19	54	39	62
	Unmarried with a partner	5	14	6	10
	Married	1	3	3	5
	Divorced	10	29	14	22
	Widowed	0	0	1	2
	Missing	0	0	17	21
<b>Highest educational attainment</b>	Elementary	3	9	26	33
	Lower secondary	20	57	30	38
	Higher secondary	8	23	17	22
	College education	4	11	5	6
	Missing	0	0	2	3
	<b>Age (in years)</b>	Mean (SD)	41	11	42
Missing		0	0	1	1
<b>Years of contact with mental health services</b>	Mean (SD)	2.5	2.7	2.1	2.2
	Missing	0	0	14	18
<b>Days since discharge</b>	Mean (SD)	194	104	n/a	n/a

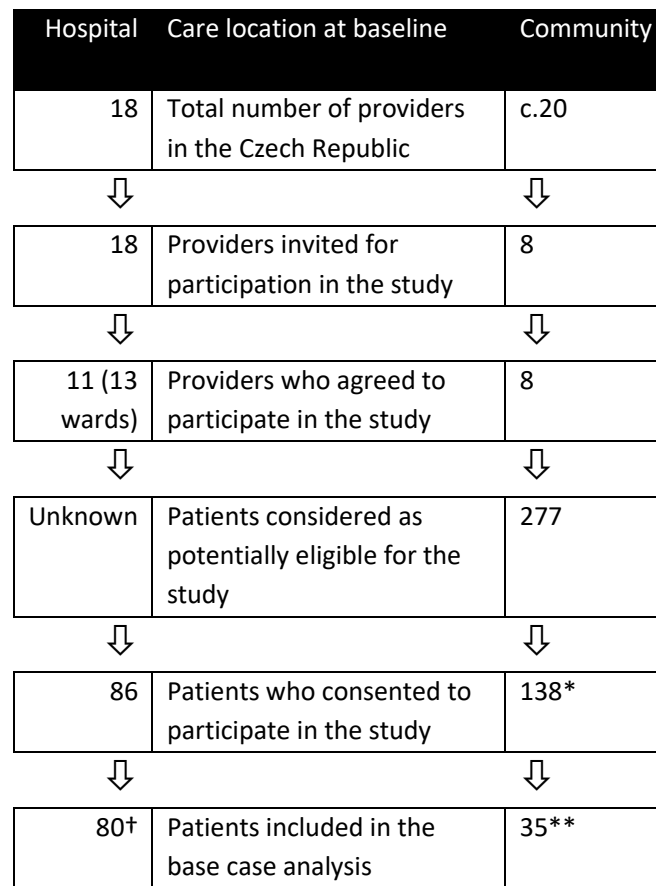
536 \*For categories other than 'Missing' the denominator for the percentages is the number of observations  
537 without missing data whereas for the 'Missing' category the percentage of missing data as a share of the  
538 whole sample is shown

539 † unless otherwise specified in the second column

540 SD: standard deviation

541

542 **Figure 1: Study flow-chart**



543

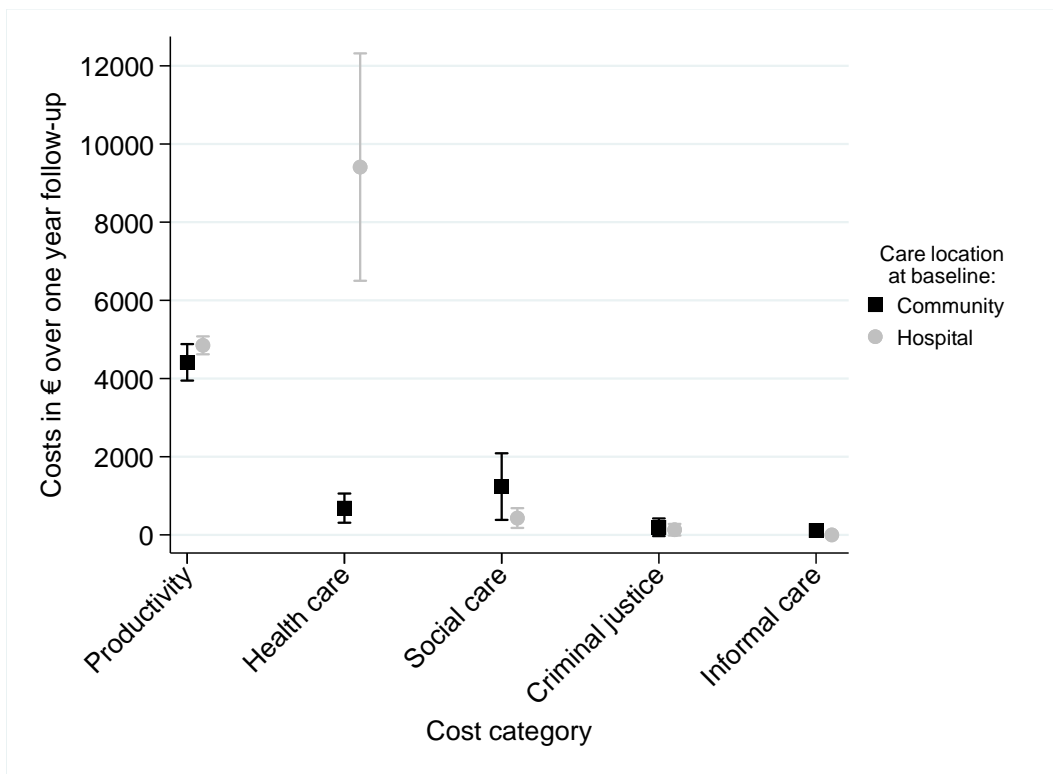
544 \* Reasons for non-participation: not in a good health (N=29), no interest in research (N=29), hospitalised  
 545 (N=26), concerns about confidentiality of the study (N=22), no longer seen by service (N=13), unable to be  
 546 reached (N=9), length/frequency of interviews (N=7), lack of cooperation (N=4) (see Appendix Table A.3.1  
 547 for comparison of characteristics between participants and non-participants)

548 \*\* Reason for exclusion: missing data on time from last hospitalisation (N=26), more than 1 year since  
 549 discharge from psychiatric hospital (N=75)

550 † Reason for exclusion: missing all follow-up cost and EQ-5D-5L date (N=6)

551

552 **Figure 2: Unadjusted costs by category over the 12-month follow-up by treatment group (base case**  
553 **analysis)**

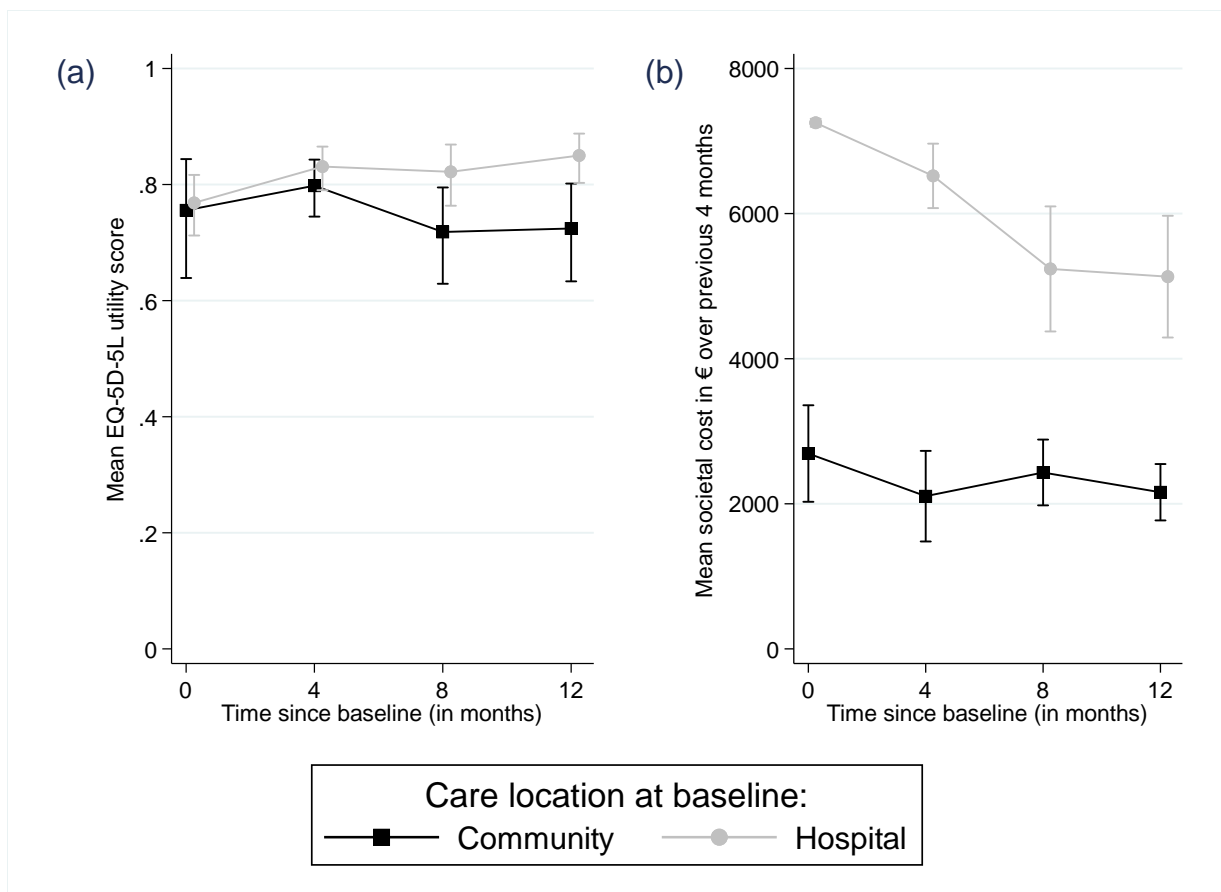


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557 **Figure 3: Development of unadjusted (a) EQ-5D-5L utility scores and (b) societal costs over the**  
558 **study follow-up (base case analysis)**



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**Table 2: Difference in costs, quality adjusted life years (QALYs) and cost-effectiveness by analysis scenario**

Scenario	Difference in costs (Not discharged at baseline-discharge to community at baseline)			Difference in QALYs (Not discharged at baseline- discharge to community at baseline)			Incremental cost- effectiveness ratio (ICER)	Probability of a discharge to the community at baseline being cost-effective at a threshold of €50,000/QALY
	Mean	95% Confidence Interval		Mean	95% Confidence Interval			
Base case	7922	4497	11346	0.03	-0.04	0.1	256855	100
Include patients up to 2 years after discharge	8684	6096	11272	0.04	-0.01	0.09	197573	100
Include patients up to 5 years after discharge	9580	7571	11588	0.06	0.02	0.1	157477	100
Adding quadratic interaction term	6017	698	11336	-0.02	-0.12	0.09	-398752	97
Adjusting for CAN items	7774	4234	11314	0.03	-0.04	0.1	263908	100
Increasing missing EQ-5D-5L by 0.1	7922	4497	11346	0.07	0	0.13	115764	97
Decreasing missing EQ-5D-5L by 0.1	7922	4497	11346	-0.01	-0.08	0.06	-1174035	100
Removing non-overlapping observations	7867	4237	11497	0.03	-0.04	0.1	268784	100
Government perspective	7685	4370	11000	0.03	-0.03	0.1	233172	100

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## 563 Research in context

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### 564 **Evidence before this study**

565 Economic evaluations have been widely used to support deinstitutionalization in a number of European  
566 countries. Studies that assessed both, costs and outcomes of mental health care for people with chronic severe  
567 mental illnesses, suggested that community care may be more cost-effective than long-stay hospital care.  
568 Mental health care reforms in the region of Central and Eastern Europe has remained largely unimplemented  
569 and the economic evidence to inform decision making there is almost completely missing.

### 570 **Added value of this study**

571 This study demonstrates that deinstitutionalization of psychiatric hospitals in the Czech Republic is a reform  
572 which is not only in line with EU and WHO policy recommendations, but which is also cost-effective. Although,  
573 in our sample, the QALY gain was slightly lower among patients who were discharged to community services  
574 when compared to those who stayed inpatient, the annual costs were much disproportionately higher in the  
575 inpatient group.

### 576 **Implications of all the available evidence**

577 The available evidence, which is now based not only on human rights and clinical but also on the economic  
578 argument, supports deinstitutionalization in the region of Central and Eastern Europe. Individual countries in  
579 the region should look for resources to fund transitional period which might temporarily incur higher costs  
580 associated with setting up new services, maintaining both, the old and the new mental health care system, and  
581 accommodating needs of deinstitutionalized patients. In order to achieve an optimal balance between costs  
582 and outcomes of mental health care in the region, future studies should model various scenarios of mental  
583 health care reforms in individual countries.

584

585