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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
4

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31 Abstract

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.

59 Funding

60 Ministry of Education, Youth and Sports of the Czech Republic; EEA and Norway Grants

61

62

63 Keywords

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

66

67

68 Background

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) worldwide¹. 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 Mosweu² 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^{3,4}.
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 aspirations⁵.

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 criminality⁶⁻⁸. 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^{9,10}. 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 impact¹⁰⁻¹³.

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 region⁵. 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

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 units¹⁴. 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 test¹⁵
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^{16,17,18}. 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^{16,19}. Although the EQ-5D
150 descriptive system should be used with caution when measuring the impact of psychosis^{20,21},
151 its value for cost-effectiveness studies in mental health has been well demonstrated²². 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 death²³. 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 areas²⁴. 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 influential²⁴. We used the
160 standard area under the curve method to calculate QALYs²⁵.

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 use²⁶. 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 research²⁷. 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 cost²⁸. 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 €22,000²⁸⁻³⁰. 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 dimensions³¹. 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 uncertainty³².

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 model³³. 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 15³⁴. 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^{35,36}. 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.³⁷ 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. ± 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

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 2nd
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

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^{4,38},
335 and clinical arguments based on long-term favourable outcomes of deinstitutionalized
336 patients in other countries of the world^{6,7}.

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^{10,40}
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 lacking⁵ and where there is a lack of evaluative culture⁴¹. 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^{10,42}, 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 suicides⁴³ and mortality⁴⁴ among patients, increase in revolving door⁴⁵,
399 transinstitutionalization⁴⁶, and satisfaction and quality of life of patients⁶. 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

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)
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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 (%*)†	%*,†
Gender	Male	21	60	47	59
	Female	14	40	33	41
	Missing	0	0	0	0
Nationality	Czech	34	97	74	95
	Other	1	3	4	5
	Missing	0	0	2	3
Marital status	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
Highest educational attainment	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
	Age (in years)	Mean (SD)	41	11	42
Missing		0	0	1	1
Years of contact with mental health services	Mean (SD)	2.5	2.7	2.1	2.2
	Missing	0	0	14	18
Days since discharge	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**

Hospital	Care location at baseline	Community
18	Total number of providers in the Czech Republic	c.20
↓		↓
18	Providers invited for participation in the study	8
↓		↓
11 (13 wards)	Providers who agreed to participate in the study	8
↓		↓
Unknown	Patients considered as potentially eligible for the study	277
↓		↓
86	Patients who consented to participate in the study	138*
↓		↓
80†	Patients included in the base case analysis	35**

543

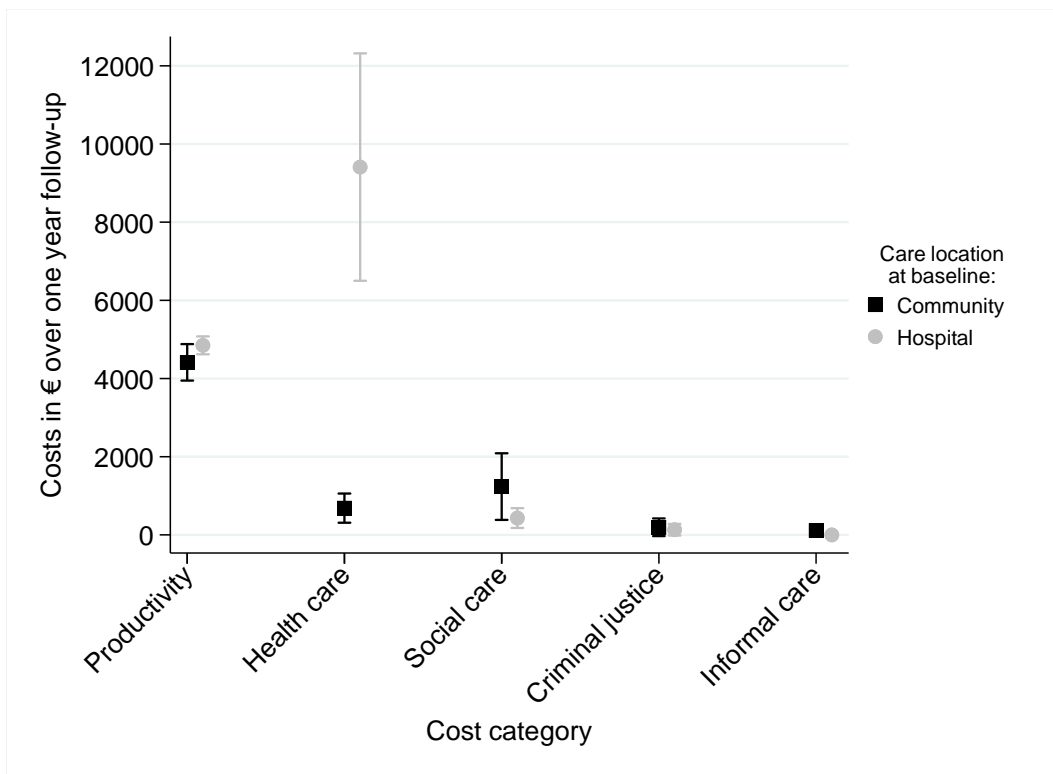
544 * Reasons for non-participation: not in a good health (N=29), no interest in research (N=29), hospitalised
 545 (N=26), concerns about confidentiality of the study (N=22), no longer seen by service (N=13), unable to be
 546 reached (N=9), length/frequency of interviews (N=7), lack of cooperation (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)**

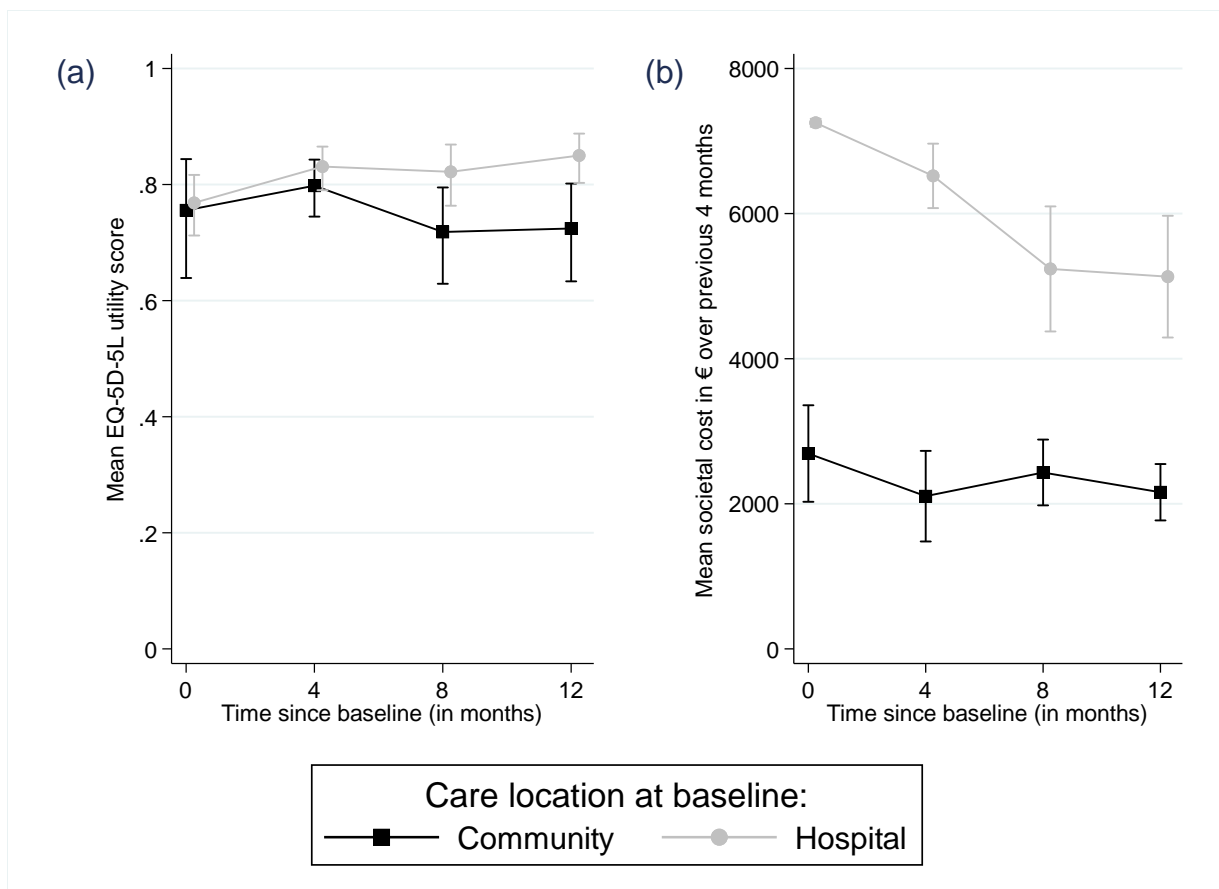


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557 **Figure 3: Development of unadjusted (a) EQ-5D-5L utility scores and (b) societal costs over the**
558 **study follow-up (base case analysis)**



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561

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

562

563 Research in context

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