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Cost of treatment of schizophrenia in six European countries

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Abstract

Background and aims: As part of an RCT in six European sites, the direct mental health care cost for 422 patients with schizophrenia was analysed according to how total and medication costs differed across sites and which variables were likely to predict total or service-specific costs.

Method: Service use was recorded continuously during a 12-month follow-up. Prescribed psychotropic medication was recorded at baseline and 12 months later. Service use data were transformed into EURO, log-transformed and analysed using linear regression models.

Results: Although samples were homogeneous, large inter-site cost differences were found (annual means ranging from 2958 € in Spain up to 36978 € in Switzerland). Psychopharmacologic costs were much more constant across sites than costs for other services. Total costs were associated more with region or socio-demographic characteristics than with disorder related parameters.

Conclusions: The findings confirm remarkable differences in direct costs of patients with schizophrenia across Europe. However, the relative stability of medication costs suggests a need to analyse mechanisms that influence service-specific costs for schizophrenia.

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1. Introduction

Research on the costs of care for patients suffering from schizophrenia has increased during recent years. However, evidence is still scarce, as most studies target only selected aspects of the wide range of treatments or services provided for patients with schizophrenia. A considerable proportion of research focuses on psychopharmacological treatment regimes and their economic consequences. This was stimulated by the need to evaluate whether or not the prescription of costly second-generation neuroleptic drugs, which were increasingly launched throughout the 1990s, is cost-effective in routine care. However, many of these cost-effectiveness studies preferred a decision model approach, feeding selected administrative, epidemiological, or clinical data into decision trees. The appropriateness of this approach is an issue of recent controversial debate (Hansen et al., 2006; Beard et al., 2006; Barbui and Lintas, 2006). Follow-up studies assessing and analysing psychopharmacologic drug consumption and the associated costs from a naturalistic perspective on a patient level are still scarce. Rarer still are cross-country comparisons that address total cost of care for patients suffering from schizophrenia with a particular focus on medication costs, as in this case, the diversity of international community mental health care models has to be controlled for. Such an approach multiplies the methodological problems. Among the factors to be considered are varying price levels and funding mechanisms for mental health care, which are even more complex than the various community care concepts (Knapp et al., 2003; Windmeijer et al., 2006).
Thus, very few macro-level comparisons of the cost of care for patients with schizophrenia across European countries are available to date, e.g., the EPSILON study (Knapp et al., 2002), that compared service utilization and cost profiles of people with schizophrenia living in five European locations. The study found higher needs, greater symptom severity and longer psychiatric history being associated with higher costs. However, most of cost studies in this field often fail to link costs to outcomes of care, and they do not necessarily specify the cost of psychopharmacological drug use. In the face of recent doubts about the cost-effectiveness of second-generation antipsychotics informed by controversial findings from various trials and meta-analyses (Rosenheck, 2006; Rosenheck et al., 2006; Jones et al., 2006; Davies et al., 2008; Zhu et al., 2008; Carpenter and Buchanan, 2008), quantitative data in this field are fundamental to the ongoing transformation of community care systems. To bridge this gap, we analysed the total cost of care for patients with a diagnosis of schizophrenia in six countries as a part of a randomised controlled European trial, in which particular emphasis was put on the prospective recording of the cost of psychopharmacologic drug use on the patient level. The following research questions were addressed:

- What are the overall costs and service-specific costs of care for patients with schizophrenia in the six sites and how do these differ across sites?
- What variables predict total and service-specific costs of care across the sites?

2. Material and methods

2.1. Study

This randomised controlled trial was conducted in community psychiatric services in Granada (Spain), Groningen (the Netherlands), London (UK), Lund (Sweden), Mannheim (Germany) and Zurich (Switzerland), covering urban and mixed urban–rural areas.

The original trial hypothesised that regular use of a novel computer-mediated procedure (called DIALOG) in routine meetings between clinicians and community patients with schizophrenia would be associated with a more favourable quality of life, fewer unmet needs for care, and higher treatment satisfaction after a one-year period as opposed to treatment as usual. By applying DIALOG, clinicians discussed regularly eleven life and treatment domains with the patients in the experimental group and asked them to rate their satisfaction with each domain. The rating was followed by a question as to whether the patients wanted any additional or different help in the given domain. The control group patients continued with standard treatment. The study design, study sample, settings, aims, and primary outcomes are described in detail elsewhere (Priebe et al., 2002, 2007).

In order to analyse the costs of mental health care for participating patients, the assessments included a detailed prospective recording of mental health service use covering a 12-month follow-up period. Additionally, for each patient the prescription of psychotropic medication (including type of drug, brand name, daily dosage and dosage form) was recorded at baseline and again 12 months later.

The prime objective of the cost analyses (based on the service use and medication data) was to determine and analyse the total mental health care costs and service-specific costs, including psychopharmacologic drug cost for patients across all sites. In a second step, predictors of the cost of care were analyzed.

2.2. Inclusion criteria

Clients who met the following inclusion criteria were identified: living in the community (not 24-hour assisted accommodation) and treated as outpatients by community mental health teams; at least 3 months of continuous care in the current service; capable of giving informed consent; sufficient knowledge of the language of the host country; a primary diagnosis of schizophrenia or related psychotic disorder (ICD-10 = F20–F29); aged between 18 and 65 years of age (to constrain the sample to the core group of community psychiatry and exclude patients suffering from comorbidity such as somatic diseases or dementia); meeting with their key worker at least once every two months, with the expectation that they would continue with the service for the next 12 months; and absence of severe organic psychiatric illness or primary substance abuse. Written informed consent was obtained from all patients participating in the study.

Pre-intervention data collection was from December 2002 to September 2004, and post-intervention data was collected from December 2003 to May 2005. Patients were interviewed at both time points by trained researchers (psychologists who did not belong to the clinical teams that were responsible for the treatment of patients), either at the relevant community mental health service or at home. The interviews included the whole set of scales and instruments as described below (see assessments). The psychologists were not blinded whether patients were in the experimental or control group.

2.2.1. Organisational characteristics of services involved

The population size of the involved catchment areas varied (Granada: 188,000 inhabitants; Groningen: 400,000; London: 710,000; Lund: 100,000; Mannheim: 320,000; Zurich: 382,000). Although all included countries adopted community mental health care as a basic concept for treating patients with schizophrenia, the actual provision of inpatient, outpatient or rehabilitative services differed considerably from region to region, according to national characteristics of mental health care delivery or other factors.

Granada, where 3 community mental health teams (CMHT) with a total of 19 staff members were provided to serve the patients with schizophrenia of the catchment area, was the least well equipped region in terms of CMHTs, psychiatric hospital beds (0.10–0.11 per 1000 population) or places in sheltered accommodation (0.08 per 1000 population). Groningen had 4 CMHTs with 55 staff members, a psychiatric bed rate of ca. 0.4 per 1000 population and ca. 0.10 sheltered accommodation places per 1000 population. The East London site, which collaborated in the study offered 267 psychiatric hospital beds (0.37 per 1000 population). Outpatient care in London was provided by 10 CMHTs with a total of 400 staff members. In Lund, there were 4 CMHTs with 15–18 staff members each. The psychiatric bed rate of the Lund catchment area was 0.85 per 1000 population and places in
The randomization procedure was completed separately by
with the use of a computer generated random block number
between intervention groups. Key workers were randomized
control condition in order to avoid potential contamination
were randomly assigned to either the intervention or
community care concepts.

those to services described above to characterize the different
mental health care services in the respective region, not only
fi

Nevertheless, such core services as CMHTs is hard to assess from the size,
tative services not mentioned here may contribute to the
estimates, as inpatient or outpatient capacities of catchment
services.

Outpatient mental health care in Mannheim and Zurich
differed from the other centres, as in Germany and Switzerland,
numerous private psychiatrists in office practice (whose
treatments are covered by the Swiss or German health
insurance schemes and were not disproportionally more
expensive against those provided by outpatient departments) are
strongly involved in outpatient mental health care. In the
Zurich region alone, approx. 200 psychiatrists are based in
office practice (ca. 0.5 per 1000 population). Compared to
other countries, this dense network of outpatient psychiatrists
diminishes the role of German or Swiss CMHTs to a
certain degree. On the other hand, rehabilitative and
residential care is a major sector of mental health care both
in Switzerland and Germany, where places in sheltered
accommodation mounted to 0.52 (Mannheim) and 1.05
(Zurich) per 1000 population. Mannheim had 0.52 psychiatric
hospital beds per 1000 population, whereas the rate in Zurich
was 0.78.

The average case-load of a CMHT-key worker varied also. It
ranged from 8 (Zurich) 10–12 (Mannheim, London), to 18.5
(Groningen) and 25 (Lund). Case-loads in Granada were
probably much higher, but unfortunately case-load figures from
Granada were not available. Usually, CMHTs include part-
or full time psychiatric nurses or social workers. Psychiatrists or psychologists are part of the teams in most,
but not in all countries (e.g. for reasons mentioned above, not
in Switzerland or Germany). Some teams add additional
professions e.g. occupational or other therapists, while others
do not provide such services. CMHTs usually are responsible
for health care planning and coordination, case management,
supportive counselling, the prescription or application of
psychotropic medication, psychotherapy, home visits or other
services. Again, this differs with the national mental health
care principles or concepts and the capacities of regional
services.

These capacities and rates must be seen as rough es-
timates, as inpatient or outpatient capacities of catchment
areas are rarely selective and tend to overlap with neigh-
bouring regions. Additionally a variety of additional rehabili-
tative services not mentioned here may contribute to the
various community care systems, so that the effectiveness of
such core services as CMHTs is hard to assess from the size,
composition or case-loads of the teams alone. Nevertheless,
these figures suggest that community mental health care in the
6 countries provide somewhat different care on the
ground.

This cost study recorded all contacts of patients with
mental health care services in the respective region, not only
those to services described above to characterize the different
community care concepts.

2.3. Study sample

The original RCT included a total of 507 patients. Their key
workers were randomly assigned to either the intervention or
control condition in order to avoid potential contamination
between intervention groups. Key workers were randomized
with the use of a computer generated random block number
allocation sequence (to ensure an equal balance across sites).
The randomization procedure was completed separately by
each country, per CMHT and was stratified by professional
background (Community psychiatric nurse, social worker,
support worker etc.) and by the number of patients within
each key worker’s case-load that consented to participate.

Overall, the intervention group included 271, the control
group 236 patients. Of these patients, 451 completed the
follow-up. Detailed socio-demographic and morbidity data
are reported elsewhere (Priebe et al., 2007). Due to the
randomised controlled trial design, there were no significant
differences in the characteristics of participants in the control
and intervention groups across all sites at baseline. Only
patients with full 12-month coverage of utilisation data were
included into the cost analyses. Additionally to 57 drop-outs
during the follow-up, another 29 patients had to be dropped
from the final data set due to incomplete service use
information (Granada 11, Groningen 0, London 7, Lund 3,
Mannheim 6, Zurich 1). The final sample for cost analyses
encompassed 422 patients.

2.4. Assessments

Clinical assessments as used in the original RCT to
compare clinical outcomes in the control and intervention
groups (Priebe et al., 2007) were seen as potential cost
predictors and included into the cost analyses. These scales
were used:

- the Manchester Short Assessment of Quality of Life
  (Mansa) (Priebe et al., 1999), on which patients rate
  their satisfaction with 12 life domains on a 7-point scale
  from 1 (‘couldn’t be worse’) to 7 (‘couldn’t be better’). The
  mean score of all 12-satisfaction questions was used as a
  cost predictor.
- the 8-item Client Satisfaction Questionnaire (CSQ-8)
  (Nguyen et al., 1983) assessing clients’ general satisfaction
  with services.
- the Camberwell Assessment of Need Short Appraisal
  Schedule, patient-rated version (CANSAS) (Slade et al.,
  1996) which assesses health and social needs across 22
domains, the CANSAS produces two subtotal scores: ‘total
  unmet needs’ and ‘total met needs’.
- the Positive and Negative Syndrome Scale (PANSS)
  (Kay et al., 1987), a 30-item, 7-point scale from 1
  (‘extreme’). The PANSS comprises a global score, and three
  subscales (positive, negative, and general psychopathology).
- Socio-demographic information and data on mastery,
  empowerment, self esteem, drug compliance, and other
domains were also collected at baseline or during follow-up
and used as potential cost predictors.
- Study clients’ use of mental health care services was
  recorded continuously for twelve months with the Service
  Utilization Sheet (SUS), which adapted the service items
  and definitions of the Client Socio-demographic and Service
  Receipt Inventory (CSSRI) (Chisholm et al., 2000) and of the
  European Service Mapping Schedule (ESMS) (Johnson et al.,
  2000).
- Intake of psychotropic medication was assessed cross-
  sectionally at baseline and follow-up by recording the brand
  name and dosage of each psychotropic drug prescribed for
each patient.
The 12-month psychotropic drug cost was estimated on the basis of the medication intake at baseline, assuming that possible changes in psychotropic drug prescription were levelled out across the sample and intake patterns at the group level remained more or less stable over time. Prior to assigning cost estimates, depot medication was converted into average doses of mg/day. To avoid double costing, intake and costs of psychotropic drugs were adjusted for inpatient stays, during which medication is covered by hospital fees or rates.

Patient-level cost profiles were calculated by weighting all service contacts during the follow-up with country- or centre-specific unit-cost estimates, which were derived from national data sources. To assign cost estimates for psychotropic drugs, the lowest national market price for the respective drug was used. All cost data was transformed into € as a single currency using conversion rates from January 1, 2004. To eliminate price-level differences between countries, PPP-conversion rates (power purchase parities) were used, which are routinely calculated by the OECD and provided by the Statistical Office of the European Communities.

2.5. Statistical cost analyses

The total cost of care was adjusted for socio-demographic and clinical variables to control for inter-site differences of samples. Due to non-normal errors of the cost variables to be analysed, standard linear regression for analysing the association of costs and socio-demographic or clinical characteristics were avoided. Instead, cost data were first log-transformed and then analysed by means of linear regression (log-normal model). For a better clearness of the model-parameters, logarithmic link function. Other than log-normal models, gamma models allow to process cost data in its original scale. To analyse data with both of the models can be viewed as an ad hoc robustness analysis (Wiens, 1999). Coefficients derived from these models may be compared directly and are to be interpreted as the logarithm of the relative change in cost associated with a one-unit change in the predictor variable (or: exponential coefficients provide estimated percentage increases in costs). Goodness-of-fit was assessed by the deviance indicating a good fit in case of low values.

Variables for inclusion into the GLM were selected according to their potential influence on costs of care during the follow-up. For detailed results of the variables used as cost predictors see Table 1 or Priebe et al. (2007). The (regression) model selection was done in a stepwise procedure. Thus, p-values of the predictors in the final models should be interpreted in an exploratory manner.

3. Results

Major socio-demographic and disorder related characteristics of the patients are shown in Table 1. Utilisation of mental health care services—which provided the basic data for all cost calculations—varied considerably across sites (Table 2). After transforming service utilisation data into cost-of-care data and adjusting for power purchase parities (PPP), there were sizeable inter-site differences in the total cost of mental health care and in most of the service types analysed. Average annual

### Table 1
Baseline socio-demographic characteristics of patients, means (standard deviation SD) or proportions (%) (Mansa: Manchester Short Assessment of Quality of Life, CSQ: Client Satisfaction Questionnaire, Kansas: Camberwell Assessment of Need Short Appraisal Schedule, PANSS: Positive and Negative Syndrome Scale).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean (SD) or proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients (n)</td>
<td>422</td>
</tr>
<tr>
<td>Mean age (years)</td>
<td>42.3 (11.3)</td>
</tr>
<tr>
<td>Gender (% female)</td>
<td>31.8%</td>
</tr>
<tr>
<td>Marital status (% single)</td>
<td>70.8%</td>
</tr>
<tr>
<td>Unemployed (%)</td>
<td>36.7%</td>
</tr>
<tr>
<td>Employed (incl. sheltered work)</td>
<td>29.4%</td>
</tr>
<tr>
<td>Diagnosis</td>
<td></td>
</tr>
<tr>
<td>Undifferentiated schizophrenia</td>
<td>35.1%</td>
</tr>
<tr>
<td>Paranoid schizophrenia</td>
<td>30.1%</td>
</tr>
<tr>
<td>Other schizophrenia (schizoaffective, delusional etc.)</td>
<td>18.4%</td>
</tr>
<tr>
<td>Other non-organic psychotic disorder</td>
<td>16.4%</td>
</tr>
<tr>
<td>Length of illness (years)</td>
<td>16.0 (10.1)</td>
</tr>
<tr>
<td>Number of hospital admissions</td>
<td>5.2 (7.1)</td>
</tr>
<tr>
<td>Quality of life (Mansa)</td>
<td>4.7 (0.8)</td>
</tr>
<tr>
<td>Satisfaction with treatment (CSQ)</td>
<td>25.7 (4.2)</td>
</tr>
<tr>
<td>Unmet needs (CANSAS)</td>
<td>2.7 (2.8)</td>
</tr>
<tr>
<td>PANSS subscales</td>
<td></td>
</tr>
<tr>
<td>Positive</td>
<td>14.8 (5.7)</td>
</tr>
<tr>
<td>Negative</td>
<td>16.6 (6.7)</td>
</tr>
<tr>
<td>General</td>
<td>32.4 (9.6)</td>
</tr>
</tbody>
</table>

### Table 2
Mental health care service utilization across sites (average frequency of contacts with or days spent in service per patient during the 12-month follow-up) (CMHC: Community Mental Health Centre).

<table>
<thead>
<tr>
<th>Site</th>
<th>Sample size</th>
<th>Granada</th>
<th>Groningen</th>
<th>London</th>
<th>Lund</th>
<th>Mannheim</th>
<th>Zurich</th>
</tr>
</thead>
<tbody>
<tr>
<td>Psychiatrists</td>
<td></td>
<td>3.7</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Psychologists</td>
<td></td>
<td>3.7</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Primary care physicians</td>
<td></td>
<td>3.7</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Psychiatric nurses</td>
<td></td>
<td>3.7</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Social worker</td>
<td></td>
<td>3.7</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Occupational therapists</td>
<td></td>
<td>3.7</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>District nurses</td>
<td></td>
<td>3.7</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Home help</td>
<td></td>
<td>3.7</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Other services</td>
<td></td>
<td>3.7</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Overnight 24 h staffed</td>
<td></td>
<td>3.7</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Overnight not 24 h staffed</td>
<td></td>
<td>3.7</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
</tr>
</tbody>
</table>
costs of mental health care were lowest in Granada (Spain) and highest in Zurich (Switzerland), where total costs were more than tenfold higher (Fig. 1).

Numerically, the average costs of psychotropic medication was much more constant across sites, whereas the average costs of other services, e.g., hospital or outpatient care, or sheltered accommodation, differed remarkably (see Fig. 1). Drug costs claimed a greater proportion of the mental health care costs, the smaller the total cost of care of the respective site was. In Granada, nearly 40% of all costs were accounted for by antipsychotics or other psychotropic drugs, whereas in Zurich this proportion was only 4.6% (see Fig. 2).
The cost proportions for first- and second-generation antipsychotics were clearly in favour of the latter and more or less constant across sites, with the exception of the Spanish centre, where the proportion spent on second-generation antipsychotics was far lower (see Table 3). The proportion of patients prescribed with second-generation antipsychotics was 61.1% across all sites. 44.1% of all patients were treated with first-generation antipsychotics and 14% took both drugs. These proportions differed between centres. Zurich showed the largest proportion of patients taking second-generation antipsychotics (84.3%) and the smallest first-generation group 27.1%. In Granada it was the opposite (42.8% of all patients taking second-generation and 62.5% first-generation antipsychotics). The highest share of patients taking both types of agents was identified in Lund (23.6%).

To explore this cost variation further, regression models were fitted separately for two dependent variables:

- total cost of care, and
- medication costs of psychotropic drug intake.

Tables 4 and 5 show the gamma and log-normal regression models for total cost of care and medication cost respectively that were calculated due to the skewed distribution of the cost data (see methods section). The tables show only predictors from the total set of variables that proved to be significant. Similarly, both models confirm the cost in Granada as being roughly one third of the cost in Zurich, in London as one quarter, in Lund as two thirds and in Mannheim as approximately half of the costs in Zurich (see Table 4).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Gamma model</th>
<th>Log-normal model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centre 1 (Granada)</td>
<td>B: -2.3228, Exp(β): 0.0980</td>
<td>B: 0.0934, Exp(β): 0.9112</td>
</tr>
<tr>
<td>Centre 2 (Groningen)</td>
<td>B: -0.9674, Exp(β): 0.3801</td>
<td>B: 0.7299, Exp(β): 0.4820</td>
</tr>
<tr>
<td>Centre 3 (London)</td>
<td>B: 1.4285, Exp(β): 0.2397</td>
<td>B: 1.5398, Exp(β): 0.2144</td>
</tr>
<tr>
<td>Centre 4 (Lund)</td>
<td>B: -0.3952, Exp(β): 0.6735</td>
<td>B: -0.0112, Exp(β): 0.9902</td>
</tr>
<tr>
<td>Centre 5 (Mannheim)</td>
<td>B: -0.6985, Exp(β): 0.4973</td>
<td>B: 0.6287, Exp(β): 0.5333</td>
</tr>
<tr>
<td>Age</td>
<td>B: 0.0001, Exp(β): 1.0001</td>
<td>B: 0.6287, Exp(β): 0.5333</td>
</tr>
<tr>
<td>Living situation</td>
<td>B: 0.5376, Exp(β): 1.7110</td>
<td>B: 0.5376, Exp(β): 1.7110</td>
</tr>
<tr>
<td>Main income source</td>
<td>B: 0.0014, Exp(β): 1.0014</td>
<td>B: 0.0014, Exp(β): 1.0014</td>
</tr>
<tr>
<td>PANS negative score follow-up</td>
<td>B: 0.1955, Exp(β): 1.2150</td>
<td>B: 0.1955, Exp(β): 1.2150</td>
</tr>
<tr>
<td>Treatment adherence baseline</td>
<td>B: 0.1545, Exp(β): 1.1671</td>
<td>B: 0.1545, Exp(β): 1.1671</td>
</tr>
<tr>
<td>Deviance</td>
<td>B: 282.62</td>
<td>B: 282.62</td>
</tr>
</tbody>
</table>

\(^1\)Compared against Centre 6 (Zurich, Switzerland).

The intervention from the original RCT (Priebe et al., 2007) proved to have no significant influence on the total care cost: the allocation variable (indicating the experimental or the control group) showed only a trend towards significance in the gamma model \((p \leq 0.10)\) and was above the 0.10 level in the log-normal model. Due to the constituent character of this variable for the original RCT, it was retained in the model and shown here, although from a health-economics perspective it is not statistically significant.

The two regression models predicting the medication cost (Table 5) showed that the influence of the site-variable is considerably less, since the costs of psychopharmacologic drug intake in Lund and Mannheim did not differ significantly from those in Zurich in both statistical models. Only Granada and Groningen showed a drug cost pattern significantly less costly than that of Zurich (shown by both models), whereas the difference with London was confirmed only by the log-normal model.

The association between medication costs and drug compliance at baseline was significant. A change from poor to average, or from average to good compliance was associated be significant. Similarly, both models confirm the cost in Granada as being roughly one third of the cost in Zurich, in London as one quarter, in Lund as two thirds and in Mannheim as approximately half of the costs in Zurich (see Table 4). Additionally, according to these models, each additional year of age reduces the total mental health care cost of a patient by roughly 1%. But being in sheltered accommodation increases the costs by 71%, whereas a self-earned income or salary cuts the total cost of care by half.

The influence of disorder related estimates was much lower: each additional negative symptom (PANSS) increases the total care costs by a mere 1.5%, whereas treatment compliance had a higher influence on costs. However, only the gamma model confirmed this as a significant predictor, while the log-normal model did not.

Table 3
Cost proportions for first- and second-generation antipsychotics across sites (100% = average annual medication cost per patient).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Granada</th>
<th>Groningen</th>
<th>London</th>
<th>Lund</th>
<th>Mannheim</th>
<th>Zurich</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Second generation antipsychotics</td>
<td>49.4%</td>
<td>80.0%</td>
<td>80.5%</td>
<td>64.8%</td>
<td>81.3%</td>
<td>74.5%</td>
</tr>
<tr>
<td>% First generation antipsychotics</td>
<td>38.9%</td>
<td>9.7%</td>
<td>8.7%</td>
<td>6.6%</td>
<td>10.9%</td>
<td>5.5%</td>
</tr>
<tr>
<td>% Other psychotropic drugs</td>
<td>11.8%</td>
<td>10.3%</td>
<td>10.8%</td>
<td>26.6%</td>
<td>7.8%</td>
<td>20.0%</td>
</tr>
<tr>
<td>Total medication cost (100%)</td>
<td>1,181.27</td>
<td>767.98</td>
<td>1,463.70</td>
<td>1,947.08</td>
<td>2,019.46</td>
<td>1,695.40</td>
</tr>
</tbody>
</table>

\(^1\)Compared against Centre 6 (Zurich, Switzerland).
with an overall decrease of drug costs by 29% (confirmed by
the gamma model, but not by the log-normal model). Finally,
drug costs were associated with needs for care: each addi-
tional domain in which the patient thought professional
help was needed increased costs by 11% to 22%.

4. Discussion

The study confirms the remarkable differences in the total
costs of mental health care for patients with schizophrenia
across European countries. This is the case even though the
participating patients were homogeneous with respect to
diagnosis and other characteristics and all of the relevant
countries agree on community mental health care as a basic
concept for treating patients with schizophrenia. We found
considerably higher inter-site differences than in earlier pan-
European projects (Knapp et al., 2002). However, regional
cost of care did not exceed the ranges found in earlier national
studies (Haro et al., 1998; Salize and Rössler, 1996; Salvador-
Carulla et al., 1999; Stant et al., 2003; Vazquez-Polo et al.,
2005). Compared to earlier multi-center studies, this study
has some methodological advantages which include a long
follow-up and recording period of service utilisation (a full
12 months) and the inclusion of detailed medication costs.
Different price levels across countries were balanced out by
power purchase parities. A weak influence of different salary
scales for health workers or other factors could not com-
pletely be ruled out, but they are unlikely to account for the
huge variation in total costs.

Service provision and consequently service use differed
remarkably between the included regions. Although all of
the countries practice community care, many reasons may
account for the differences across the psychiatric systems:
different starting points or specific aims of the national
psychiatric reforms, different organisational characteristics
of overall health care delivery, different financing structures,
different mental health care budgets or economic constraints
etc.

Although patients with schizophrenia have a wide range
of needs which may vary individually by amount and type,
our results suggest that the in principle elastic demand curve
of psychiatric care show a clear tendency to follow the
regional availability of services. Thus, the cost of care patterns
reflect more or less different national mental health care
concepts and the characteristic range of services to be found
in the participating regions and countries, rather than patient
psychopathology or the actual needs for care. Particularly,
unmet needs did not have a significant influence on total care
costs. If this had been the case, it might have suggested
deficient mental health care in regions with low costs, e.g. in
Granada. However, unmet needs were highest in London, and
not in the Spanish centre where costs were lowest.

Of course, where services are not available, expenses for
them cannot be incurred. However, an absence of specific
services does not necessarily mean that treatments such
services usually offer are not needed. But when specific
services for these needs are not available they tend to be
overlooked as a need that requires measures by the profes-
sional care system. For example, among other factors, the
considerable differences in the availability and use of
sheltered accommodation services may be explained by
cultural aspects. Families, particularly in southern European
countries such as Spain, are traditionally involved—usually at
their own expenses—in caring for the chronically mentally ill
to a much higher degree than in other European countries. In
Middle Europe or Scandinavia, a more pronounced societal
trend towards weaker family ties may support the imple-
mentation of professional residential services as an essential
part of community mental health care.

As a consequence, total costs of care cannot be seen as an
indicator for the quality or effectiveness of psychiatric care in
a particular region and even less so in cross-border compar-
isons — at least not on the level of analyses that was done
here. For identifying an association between costs and quality
of care much better indicators of the global effectiveness
of mental health care systems are required than are currently
available. Such indicators must cover informal care or any
relevant contribution of families and relatives.

Although the effectiveness of the mental health care
systems or the commensurability of total care costs cannot
finally be decided on this level, the second set of regression
analyses (on psychopharmacologic costs) in this study does
indicate an association between quality of care and costs. In
these regression models centre effects show far less influence
on medication costs than they did on the total care costs,
despite the considerable proportion that medication costs
cost claim of the total mental health care budgets. In the case
of Granada where rehabilitative services or sheltered accom-
odation are scarce, expenditures for medication rose to
nearly 40% of the total expenditure. Medication costs as high
as that may reduce the options for prescribing costly second-
generation antipsychotics, which accounted for the majority
of psychopharmacologic drug costs at all other sites. These
issues are worthy of further exploration.

This relative stability of medication costs compared to the
total cost of care may have several reasons. First of all,
psychopharmacologic drugs represent the backbone of
schizophrenia treatment that requires the lowest infrastruc-
ture of all psychiatric care modalities. So it would probably be
the last of all treatments to be curtailed when cost constraints
limit mental health care spending. Furthermore, a relatively
solid evidence base for the effectiveness of antipsychotic drug
treatment is recognised worldwide supporting the homo-
genisation of drug treatment and the associated costs
internationally. Another explanation may be that drug
prescription is one of the few sectors of mental health care
in which prices are predominantly market driven and far less
state regulated than in most other sectors or services where
costs may vary according to national health policies, health
insurance schemes or public health care spending. Addition-
ally, homogenized price policies of the internationally
operating pharmacological companies may contribute to the
stability of medication costs.

All in all, the huge overall cost differences as found in
this study should be reason enough to stimulate research on
the factors that influence service provision, costs and their
linkage with outcomes in greater depth and detail (Washburn,
2008; Möller, 2008; Carpenter and Buchanan, 2008). For this
purpose, it is essential to build an evidence base for the
effectiveness of the service types or treatments for schizo-
phrenic patients in the various care models, and to develop
good indicators for their effectiveness on a system level.
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The Research Directorate of the European Commission had no further role in study design; in the collection, analysis and interpretation of data; in the writing of the report; and in the decision to submit the paper for publication.

Contributors

Author S. Priebe designed the study (with contribution of all authors) and wrote the protocol. Author H.J. Salize drafted and managed the data analyses. Authors I. Reinhard and H.J. Salize undertook the statistical analysis, authors McCabe, Bollenkamp, Hansson, Lauber, Martinez-Leal, Rössler, Svensson, Torres Gonzalez, van den Brink and Wiersma managed the data assessment, contributed country specific cost information and were involved in the writing process of the article. All authors contributed to and have approved the final manuscript.

Conflict of interest

There were no fees, grants by or other relationships to organisations whose interests may be affected by the publication of this paper. All authors disclose any actual or potential conflict of interest including any financial, personal or other relationships with other people or organisations within three (3) years of beginning the work submitted that could inappropriately influence, or be perceived to influence, their work.

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