ISSN 1353-2650

PSSRU
at the University of Kent at Canterbury,
the London School of Economics
and the University of Manchester

CEMH
Centre for the Economics of Mental Health
INSTITUTE OF PSYCHIATRY

Mental Health Research Review 7, May 2000

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Published by: PSSRU, University of Kent at Canterbury, Canterbury, Kent CT2 7NF
ISSN 1353-2650

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If you have access to the Internet, general information about PSSRU and CEMH research, and electronic versions of this and other publications, can be obtained from the PSSRU and CEMH websites at www.ukc.ac.uk/PSSRU/ and www.iop.kcl.ac.uk/IoP/Departments/HSR/CEMH/index.stm

Director's introduction

Martin Knapp

Across the world there are growing demands for cost information, cost-effectiveness evidence, economic analyses of health care systems and a better understanding of the incentives within them. It is useful to distinguish between *latent* and *manifest* demands for economics. The former are the underlying needs for a costs perspective, linked to scarcity of resources, whilst the latter are the *expressed* wants for actual cost or cost-effectiveness evaluations or insights.

Expressed demands are made known in various ways and by different stakeholders. For example, governments want economic data to help them calculate any cost savings from slimming down a care programme, closing a hospital, or introducing a new efficiency drive. They want to know the costs and (particularly) the outcome pay-offs of a new drug, care service or support arrangement. Treatment funders also want to know how to save money or raise cost-effectiveness. Service providers want to be able to justify their unit costs in comparison to those of 'competitor' agencies, and they are often looking to improve patient-level and other outcomes achieved from a given budget.

Scarcity prompts choice. There are usually insufficient treatment or care resources available to meet all assessed or expressed needs. Consequently — whatever the health care system, and whatever the decision-making procedures within it — difficult choices must be made. Economics studies try to inform and assist those decision-making tasks.

Information and assistance are the watch words of the annual *Mental Health Research Review.* The two research groups producing the Review are engaged in a quite large number of economic studies, some of which are described in this seventh volume of the Review. At both the Centre for the Economics of Mental Health and the Personal Social Services Research Unit, we undertake studies for governments, health care system stakeholders, industry, research charities and others. Both of the research groups are completely dependent on research contracts for their continued survival. It is therefore testament to the quality of the work that the number of projects undertaken has grown year on year for the past decade. Many of these projects are described in this Review.

Andrew Healey and Krister Järbrink have worked hard to pull together a very interesting collection of papers in this Review. We hope you enjoy reading them. We would be delighted to receive comments on the work summarised here.

Editors' introduction

Andrew Healey and Krister Järbrink

In keeping with previous issues, this year's *Mental Health Research Review* introduces some of the mental health related research work, either completed or in progress, undertaken by research staff at the Centre for the Economics of Mental Health (CEMH) and Personal Social Services Research Unit (PSSRU). Following the usual format, the review is broadly split into a series of short articles that highlight the salient policy issues and background to a specific research project along with the key results and conclusions to be drawn. Details of work in progress, or mental health research programmes that are about to be undertaken, are condensed into a series of summary boxes. For readers who are interested to find out more about work that has been completed over the past few years we also give details of recent CEMH and PSSRU publications appearing as reports and publicly available papers, as well as in peer-reviewed academic journals and books.

A large body of the research work conducted at CEMH/PSSRU is concerned with broad mental health-related policy issues, methodological developments and the evaluation of specific treatment or service initiatives. In general, the research tends to be multidisciplinary (typically involving collaboration with psychiatric research staff), although most projects have an economic theme running through them. We hope that we have managed to pull together a selection of work that will appeal to a broad spectrum of academics, practitioners and policy makers with an interest in mental health policy issues.

A CEMH study into the costs of childhood conduct disorder, carried out in collaboration with research staff from the Maudsley hospital in London, is discussed by Martin Knapp. There are few economic analyses in this area and so this study represents an important starting point in the assessment of the economic and social consequences of behavioural problems at an early age. Stephen Almond and Bill Byrom report findings from a survey of psychiatrists that seeks to gain insight into the appropriateness of the existing matching of residential care facilities to the clinical needs of people with schizophrenia. Stephen Almond and Andrew Healey provide details of a programme of research looking at the effects of depression and anxiety on labour force absenteeism. Their preliminary findings, based on a large sample UK household survey, suggest that depression, even after allowing for the effects of other co-morbid health problems, has a significant impact on the likelihood of workers going absent.

This year we have two papers addressing methodological issues. Daniel Chisholm provides a useful overview of the statistical problems involved when analysing cost data within economic evaluations of mental health care, whilst also highlighting some possible solutions to these problems as currently put forward in the literature. Roshni Mangalore discusses the current state of play concerning the use of utility-based outcome measures in the evaluation of treatments for schizophrenia — an important issue given the growing emphasis placed on the development of generic outcomes measures for use in an NHS priority-setting context.

Finally, we have invited two external research teams to contribute to this year's review. Francesco Amaddeo and colleagues from the University of Verona in Italy are long-standing collaborators with CEMH. They present some findings from their programme of work looking at factors predicting community mental health service costs in Verona. Closer to home, William Finn and Jon Hyslop from the Revolving Doors Agency in London present findings from a collaborative research exercise between Revolving Doors and PSSRU at the LSE. Attention here is focused on the resource burden placed on the criminal justice and health services by people with severe and enduring mental health problems (typically people with a dual diagnosis and/or personality disorder) who are generally seen as inappropriate for receipt of treatment and care from health and social care agencies.

We would like to thank the contributors for their hard work in helping us to put together this year's issue. We hope that you find its content both useful and of interest — and as always the editors and contributors would welcome any comments and questions regarding work presented in the review.

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Employee absenteeism and mental health: descriptive evidence from the Quarterly Labour Force Survey

Stephen Almond and Andrew Healey

Background

Employee absenteeism is a familiar characteristic of modern-day labour markets. In the UK, estimates from the Quarterly Labour Force Survey (QLFS) suggest that 4.7% of all workers interviewed in a reference week will report being absent from their place of employment for at least one day (Labour Market Trends, February 1999).

Acute and chronic sickness and disability — including mental health related problems — experienced by the working population are potentially an important contributory factor to observed absenteeism rates. This certainly appears to be the view held by British employers. A recent survey of 537 private and public sector organisations by the Confederation of British Industry (CBI) showed that employers ranked manual and non-manual worker sickness at the top of the list of potential reasons for employee absence from work.

This paper seeks to use data from the QLFS to derive empirical descriptive estimates of the impact of depression and other self-reported illnesses on labour force absenteeism in the UK.

QLFS data The QLFS is the single most important source of labour market data in the UK. It is a large random survey of around 60,000 households sampling over 155,000 individuals.

Each quarter is made up of five waves of around 12,000 households who are interviewed over five successive quarters. Within any one quarter the survey captures between 67,000 and 70,000 of the working population. Many of the UK's routine macroeconomic statistics (e.g. employment, average earnings) and microeconomic statistics (e.g. characteristics of the workforce) are based on the QLFS.

Although the QLFS is employment-focused, the survey also collects valuable information on chronic health problems and disabilities: whether an individual currently has *any* health problems which they expect to last for a year or more (13 categories are used — see the tables for full details); what the individual regards as their current *main* chronic health problem; and whether health problems affect paid work. Combined with data on absenteeism (in the interview week and over longer periods), the QLFS is a valuable source of information to explore the impact of (self-reported) depression and other illnesses on labour market activity.

The preliminary findings reported here are based on pooled data for five cohorts of sampled individuals, each followed over five quarters, based on interviews conducted across nine quarters (from Spring 1995 to Spring 1997). The total number of individuals in the pooled sample is 188,000, giving a working population of around 70,000 people. We have also focused on individuals who self-reported *any* health problems.

Results

Health problems Table 1 shows that by far the largest category of any chronic health problem was 'problems and disabilities (including arthritis and or rheumatism) connected with arms, legs, hands, feet, back and neck' — 112,049

Table 1 Self-reported health problems and absenteeism

Health problem/disability	Any health problem (n=188,000)[a]	Any / duration of absenteeism (n=11,800)[b]	Co-morbidity with depression (n=4,317)[c]
Problems or disabilities (including arthritis or rheumatism) with arms, legs, hands, feet, back, neck	12,049 (6.4)	0.30 / 7.52	2,940 (68.1)
Difficulty in hearing	7,165 (3.8)	0.27 / 6.84	2,067 (47.9)
Chest, breathing problems, asthma, bronchitis	6,293 (3.3)	0.25 / 5.69	1,929 (44.7)
Stomach, liver, kidney, digestive problems	6,206 (3.3)	0.27 / 6.62	2,619 (60.7)
Heart, blood pressure, circulation problems	6,164 (3.3)	0.30 / 7.84	1,974 (45.7)
Difficulty in seeing	5,951 (3.2)	0.27 / 6.67	1,966 (45.5)
Severe disfigurement, skin conditions, allergies	4,652 (2.5)	0.23 / 6.67	1,464 (33.9)
Depression, bad nerves, anxiety	4,317 (2.3)	0.37 / 9.65	4,317 (100.0)
Diabetes	4,087 (2.2)	0.27 / 7.62	1,529 (35.4)
Severe or specific learning difficulties	3,220 (1.7)	0.31 / 8.95	2,031 (47.0)
Other problems, disabilities	2,824 (1.5)	0.32 / 8.58	1,034 (24.0)
Epilepsy	2,226 (1.2)	0.25 / 6.86	979 (22.7)
Mental illness, phobia, panic	2,147 (1.1)	0.31 / 8.84	1,365 (31.6)

a. The full sample from the QLFS

b. Any absenteeism is coded 0 or 1 and then averaged over the working population who self-reported each health problem; average duration is in days over 5 reference weeks for respondents who reported any sickness only (excludes Sundays)

c The 'depression' only sub-sample of the QLFS

individuals or just over 6% of the full sample (column 1). Out of 13 chronic health categories in total, 'depression, bad nerves or anxiety' is ranked the eighth largest category; 'Mental illness or phobias, panics and other nervous disorders' was the least frequently reported category of problem.

Absenteeism Despite the relatively low frequency of self-reported 'Depression, bad nerves and anxiety', and 'Mental illness or phobias, panics and other nervous disorder', table 1 (column 2) reveals — at the descriptive level at least — that absenteeism is relatively more frequently reported by people with these health problems compared with most of the other categories of sickness and disability. Individuals falling in either of these categories of mental health appear to be more likely to report taking sick leave within the five reference weeks over which they were surveyed, and to report more days off sick within these weeks (column 3).

Co-morbidities and absenteeism Perhaps the most informative data presented in table 1 shows the importance of considering the impact of co-morbidity when attempting to isolate the effect of specific categories of sickness and disability on labour market performance (column 4). The data presented in the table specifically focuses on 'depression, bad nerves and anxiety' as a co-morbid health problem for other sickness categories. It can be seen, for example, that 68% of people who report depression, bad nerves or anxiety also report problems with their hands, legs, feet, back and neck. A similarly high proportion of respondents also report stomach, liver kidney and digestive problems.

The importance of controlling for co-morbidities can also be seen when engaging in a crude modelling exercise of the absenteeism data. Table 2 shows that in a univariate logistic model (i.e. examining the impact of each reported health problem and disability on the likelihood of going absent *without* controlling for any other variables including other health problems and disabilities), depression has the highest odds ratio (4.07) compared with any other chronic illness categories. In other words, people who report having depression, bad nerves and anxiety at any time point in the survey are just over four times more likely to report going absent from work. Severe or specific learning difficulties and the mental illness category occupy second and third place in this crude ranking of health and disability.

The second column of table 2 reports odds ratios derived from a multivariate logistic model of absenteeism which includes all health problems and a selection of individual and occupational characteristics. The most striking result from the multivariate modelling is the fall in the odds ratios for all categories of health problem and disability when compared with the univariate modelling exercise. Thus, after controlling for other concomitant sickness and disability reported by respondents, the odds ratio for depression, anxiety and bad nerves falls from 4.07 to 1.08. The odds ratio on the mental illness, phobia and panic category of health problem fails to obtain statistical significance in the multivariate model. Whilst providing an alternative illustration of the extent of co-morbidity as presented in table 1, this basic modelling of the data emphasises the importance of controlling for co-morbid effects in a more complete empirical model of the impact of sickness and disability on labour market performance.

Table 2 Odds ratios from logistic regressions when dependent variable is *any* absenteeism (yes or no)

Health problem	Single variable or univariate logistic[a]	Multivariate logistic[b]
Depression, anxiety, bad nerves	4.07	1.37
Mental illness, phobia, panic	3.74	1.20*
Epilepsy	2.85	1.21*
Severe or specific learning difficulties	3.78	1.43
Arms, legs, hands, feet, back, neck	3.03	2.06
Difficulty in seeing	3.14	1.15
Difficulty in hearing	2.87	1.07*
Skin conditions, allergies	2.69	1.04*
Chest, breathing problems	2.60	1.26
Heart, blood, pressure, circulation	3.06	1.38
Stomach, liver, kidney, digestion	2.84	1.18
Diabetes	2.99	1.20
Other problems, disabilities	3.24	1.63
Age (16-65)	1.45	1.16*
Sex (male)	1.34	1.40
Qualifications (degree or higher)	0.81	0.82
Qualifications (none)	1.14	0.98*
Industry (agr & fisheries)	0.73	0.83
Industry (manufacturing)	1.01	1.07
Industry (construction)	0.90	1.01*
Occupation (managerial)	0.82	0.79
Occupation (professional)	1.03	1.00*
Occupation (unskilled)	1.23	1.08

a. The simple logistic relationship between each variable on its own and absenteeism or not

b. Health problem reported at least once during the five reference points — all variables included in model

* *Not* significant at 5% level

Conclusions

The QLFS is far from an ideal source of data for use in determining the effect of sickness and disability in the work force on absenteeism. Its main drawback in this respect is its reliance on self-reported measures of sickness and disability using questions that are not based on clinically defined classifications of disease and disability, and the use of questions that do not allow the identification of self reported problems that clinicians would regard as pathological. This is particularly the case with the categories of mental health problems covered by the survey. Nevertheless, whereas it loses on the issue of the measurement of health and disability, particularly when compared with large scale epidemiological or specific worksite studies of health and absence, it gains in its delivery of detailed data on the labour market behaviour and characteristics of a large random household sample of workers.

Key points

- ☐ Employee absenteeism is a familiar characteristic of modern-day labour markets.
- ☐ Self-reported 'depression' is ranked eighth largest out of 13 chronic health categories, with 'mental illness' the least frequently reported.
- ☐ Despite its low ranking, absenteeism is relatively more frequently reported by people with self-reported 'depression'.
- ☐ Descriptive results show that the impact of co-morbidities is important when examining the relationship between specific health problems and absenteeism.

The results we have presented in this short paper are very much descriptive and preliminary. We intend to explore the QLFS data in more depth and to utilise its cross-sectional and longitudinal elements to test a more complete economic model of health related absence behaviour in the UK labour market. A more complete set of results will be available in June 2000.

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The economic burden of personality disorder

The term personality disorder carries many negative connotations and is very poorly understood outside of the psychiatric setting. Many people equate the term with other mental disorders such as schizophrenia and fail to see its independent nature. Both the ICD and the DSM classification systems place personality disorder on a separate axis of diagnosis and stress the enduring and inflexible nature of the disorder.

Many studies have highlighted the potential financial burden personality disordered patients could impose on the National Health Service and more widely. Research shows high service utilisation among such patients, with an increased use of all emergency surgeries and services. Personality disordered individuals have also been shown to have greater psychiatric morbidity, leading to an increased use of primary and secondary care services. And recent studies showing the co-morbidity of personality disorders with axis I disorders have found that personality affects the symptoms, outcomes and responses to treatment of a patient.

Evidence would therefore seem to suggest that personality disordered patients could have a tremendous impact on the financial budgets of primary care groups. Such patients seem to make more use of health services, due in part to an increased susceptibility to accidents and to a high co-occurrence of axis I disorders. They also seem more likely to resist treatment, producing a sustained long-term use of services.

However, whilst many studies speculate that personality disordered patients will have a higher use of services than their non-personality disordered counterparts, leading to an increased financial burden, there have in fact been no formal economic evaluations of this group of patients.

CEMH is currently collaborating with the Section of Epidemiology and General Practice at the Institute of Psychiatry on a study that seeks to test the hypothesis that personality disordered individuals impose an excess resource burden on health and social care services. The study has followed up a sample of 303 consecutive attenders from four general practices in south London. These patients were screened one year previously for personality disorders using a brief, validated, informant-based instrument (Standardised Assessment of Personality (Mann et al., 1981)). An overall prevalence rate of 23.8% for personality disorders was found amongst this sample.

Preliminary results were presented at the 10th European Symposium of the Psychiatric, Epidemiology and Social Psychiatry Section of the Association of European Psychiatrists, April 2000. The full findings will be available early in 2001.

For further information about this study, contact Alison Rendu at CEMH.

The cost consequences of conduct disorder

Martin Knapp

Conduct disorder can have very damaging consequences in early childhood. It can also be responsible for scholastic failure, poor peer relations and delinquency in adolescence. It can severely impair individual development and social functioning, and a substantial proportion of children with conduct disorder go on to have psychiatric and other medical problems in adult life, including 'phobia, major depressive disorders, obsessive-compulsive disorder, schizophrenia, panic disorder, manic episodes and somatisation' (Maughan and Rutter, 1998). They also have a higher risk of poor social functioning, and higher rates of alcohol and substance use, unemployment, broken marriages, criminality and imprisonment.

Each of these common childhood and adulthood consequences of conduct disorder has a personal and a social cost: there are potential losses (costs) to the person with conduct disorder, to their family and to the wider society. Some of these losses are direct economic costs and some are more indirect. Treatments or other interventions intended to tackle the conditions or disorders underlying these personal and social problems are themselves costly because of the need to devote skilled staff time, office space and other resources to support and care.

Of course, the treatments and other interventions which professionals provide to children and families would be expected to generate beneficial effects — to reduce the amount of anti-social behaviour, to improve peer relations and personal development, to reduce the likelihood of social and personal problems in adulthood, and so on. Different interventions by health care and other bodies could produce different effects.

A number of PSSRU and CEMH studies are examining the costs of conduct disorder — in both childhood and adulthood — and the cost-effectiveness of various interventions to treat it. One evaluation is examining a video-based family training programme, and will be completed later in 2000. Three others are adulthood follow-ups of people who had conduct disorder as children. Two of those studies will also be reporting this year.

In this short note I want to summarise some findings from a pilot study of ten children referred to the Maudsley Hospital with behavioural problems, diagnosed as conduct disorder (Knapp et al., 1999). This small study found that the total annual costs attributable to these children's conduct problems amounted to an average of over £15,000 during 1996/97, including allowances and benefits (transfer payments).

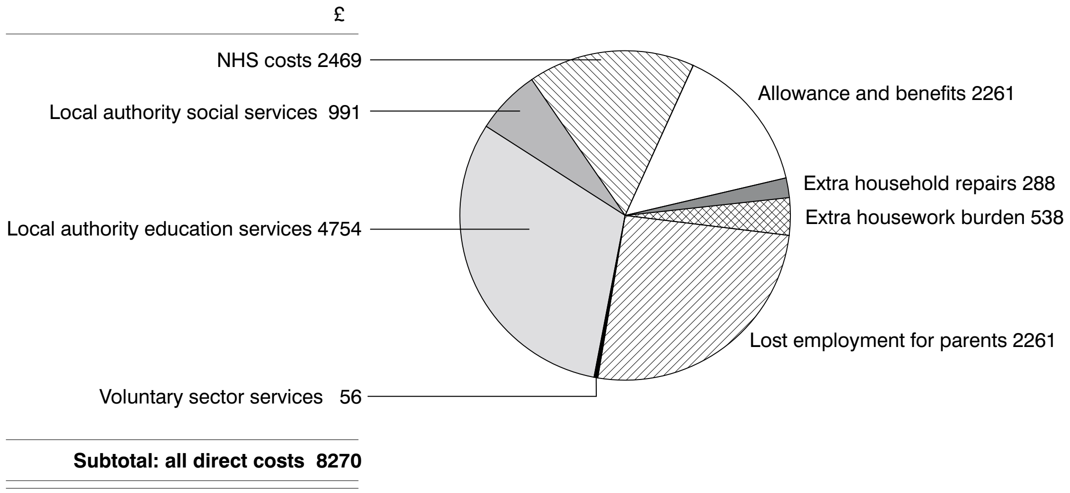
The breakdown of costs is shown in the figure, and illustrates the range of agencies and 'stakeholders' involved and the consequent need for comprehensive costing if we are to understand the full effects of a mental health problem. Although not obvious from the figure, the costs in this pilot study also showed the potential for wide inter-personal variations in cost. Among the ten children and families, annual costs ranged from £5,411 in one case to £40,896 in another.

Three years ago the House of Commons Health Committee took the view that:

> The cost of conduct disorders, both in terms of the quality of life of those who have conduct disorder and the people around them, and in terms of the resources necessary to counteract them, is high. It is therefore important that treatment for conduct disorder is both effective and cost-effective (House of Commons Health Committee, 1997, page xxiii).

The results of the small pilot study summarised here do not, of course, take us very

Figure 1 Ten children with conduct disorder: annual costs



Total cost (including allowances and benefits) per child: £15370

Source: Knapp, Scott and Davies (1999)

far towards answering questions about cost-effective interventions. But they are a start, in an area which has been largely neglected by economists (Knapp, 1997). Combined with findings later this year from our other studies, we hope soon to have a better understanding of the economic impacts of conduct disorder and the cost-effectiveness of different ways of tackling this difficult mental health problem.

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Key points

☐ Conduct disorder can have damaging consequences in childhood, commonly leads to problems in adolescence, and is associated with poor personal and social outcomes in adulthood.

☐ A pilot sample of ten children with conduct disorder was using a wide range of services and was also imposing both direct and indirect costs on families.

☐ Average costs amounted to over £15,000 per child, over and above the costs expected for a child without conduct disorder.

Other ongoing child research

Individual and group psychotherapy interventions for girls who have been sexually abused are being compared in collaboration with the Camberwell Child and Adolescent Service and the Tavistock Clinic. Cost-minimisation and cost-consequences comparisons will be conducted. (Contact: Paul McCrone and Martin Knapp).

Service use and costs of former child psychiatry patients with depression and depression with conduct disorder are being compared in a study carried out with the Child Psychiatry Department at the Institute of Psychiatry. (Contact: Martin Knapp and Paul McCrone).

An exploration of the costs and cost variations in 70 child and adolescent mental health inpatient units is underway, undertaken with members of the RCP Research Unit, London. (Contact: Jennifer Beecham).

Another study is examining the costs and costs-effectiveness of support for 160 young people during and after admission to psychiatric inpatient units. Research is being undertaken in conjunction with personnel from the Institute of Psychiatry and a number of consultant child psychiatrists. (Contact: Jennifer Beecham).

An investigation has started of the services and supports provided for the mental health of children who come to the notice of social services departments. This work is undertaken in collaboration with the Policy Research Bureau, London and the University of Manchester. (Contact: Jennifer Beecham).

Post-traumatic stress disorder in the military

The Defence Evaluation Research Agency of the Ministry of Defence recently commissioned CEMH to undertake a scoping exercise to examine the economic implications of post-traumatic stress disorder (PTSD), arising from military activity, and to identify key issues that need to be considered when undertaking health economic evaluations of different treatments. PTSD occurs as a result of a traumatic event, such as combat, and is characterised by intrusive symptoms, avoidance symptoms and arousal. Depression and anxiety are frequent co-morbidities. The prevalence of combat-related PTSD is unclear and varies according to the type of conflict. The overall cost of PTSD is also, therefore, uncertain, and is additionally influenced by services used, physical and psychiatric co-morbidities and cases of litigation.

The main treatment options for PTSD are psychological (mainly forms of exposure therapy), pharmacological (in particular anti-depressants but also anti-convulsants and benzodiazepines) and eye movement desensitisation and reprocessing (EMDR). The latter is a form of exposure therapy but there is much controversy as to whether or not the induced eye movements provide additional therapeutic benefits.

The scoping study involved a review of the literature on military and non-military related PTSD. Clearly any studies which reported cost or cost-effectiveness findings were of particular interest. However, other studies which provided information on the number of therapeutic sessions or amounts of medication taken were also useful as these could be combined with existing unit cost information in order to estimate — in a very preliminary way — the direct treatment costs. A report has been submitted to the Defence Evaluation Research Agency and we expect to publish some findings later in 2000. For further information contact Paul McCrone at CEMH.

The utility approach to valuing health states in schizophrenia

Roshni Mangalore

Introduction

The plethora of outcome measures available for use in the evaluation of treatments and services for people with schizophrenia poses difficulties in reviewing the evidence from different studies on the effectiveness of specific interventions. Comparing the clinical and economic desirability of treatments can also be hampered in instances where interventions perform differently depending on which measure of outcome is used. Moreover, the highly condition-specific nature of existing clinical effectiveness measures in schizophrenia makes direct comparisons of the costs and outcomes of treatments and service arrangements with other programmes both within and outside the mental health field difficult if not impossible.

Given that rationing is now largely recognised as an inescapable fact of life in health service planning, the need for broad inter-programme comparability in costs and outcomes is of paramount importance if limited NHS resources are to be allocated to their most beneficial use. In principle, the use of utility-based outcome measures can help address the growing need for explicit comparability. The utility approach rates patient wellbeing on a continuum ranging from 0 (for death or the worst possible health state) to 1.0 (for optimum health). The utility scores can be combined with survival data to calculate quality-adjusted life years (QALYs), which are useful indicators of outcome in cost-utility analysis. Utility values can, in principle, be derived from a variety of potentially relevant stakeholders in health care planning, including patients, relatives, clinicians and the general public.

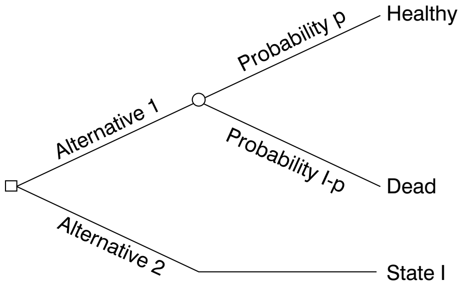
Generating utilities

There are currently three methods employed for deriving health state utility scores:

The rating scale method Respondents are asked to indicate where on a vertical scale with endpoints of 1(best imaginable health state) and 0 (worst imaginable health state) they would place each of the states, such that the intervals between the placements correspond to the differences in preference as perceived by the respondent.

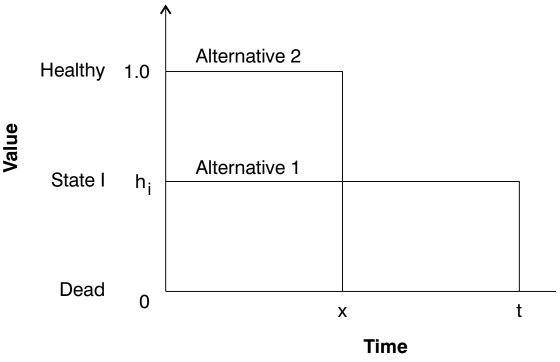
The standard gamble Respondents are asked to make a choice between a certain health state, such as severe psychopathology requiring hospitalisation (say health state *i*), or an uncertain gamble. The gamble is usually expressed as some probability of being healthy or dead. The standard gamble for a chronic health state preferred to death is illustrated diagrammatically in figure 1. To arrive at the utility value for state *i,* the subject is offered two alternatives. Alternative 1 is a treatment with two possible outcomes: either the patient is returned to normal health and lives for an additional *t* years (with probability *p*), or the patient dies immediately (with probability *1-p*). Alternative 2 has the certain outcome (100% chance of occurring) of chronic state *i* for life (*t* years). Probability *p* is varied systematically until the respondent is indifferent between the two alternatives, at which point the respondent's preference value (utility score) for state *i* is equal to *p.*

Figure 1 The standard gamble



The time trade-off Respondents are offered two alternatives. Alternative 1 is being in health state i for time t (life expectancy of an individual with the chronic condition) followed by death, whilst alternative 2 is being healthy for time $x < t$ followed by death. Time x is varied until the respondent is indifferent between the two alternatives, at which point the required preference value for state i is given by $h_i = x/t$. The time trade-off is illustrated in figure 2.

Figure 2 The time trade-off



The application of these methods to the evaluation of health states pertaining to schizophrenia raises a number of issues (Chisholm et al., 1996). For example, when relying on patient-generated values, there may be problems in asking respondents to engage in cognitively demanding exercises (particularly with respect to the standard gamble and time trade-off methods) if psychiatric illness and/or any medication taken impairs respondent cognition. Even when relying on the other sources, the complex and detailed nature of schizophrenia-relevant health states can expose utility elicitation exercises to the danger of informational overload. It is therefore important that health state scenarios convey with clarity the salient features of the effects of schizophrenia without engaging in too extensive a description of the health and quality of life that effects this type of illness can involve. This is not an easy task, but is crucial as the framing of health state descriptions can affect the utility values they elicit.

Utility of health states in schizophrenia

A few recent studies have estimated utilities for some schizophrenia-related health states, despite the difficulties outlined above. Table 1 summarises the utility values for different health states estimated using the standard gamble technique in these studies.

Revicki et al. (1996) examined the preferences of patients, caregivers and psychiatrists for five schizophrenia-related health states. The hypothetical health states (see table 1) described varied levels of psychopathologic symptoms and the impact of schizophrenia on patient functioning and wellbeing for in-patient and out-patient settings. Areas of functioning included activities of daily living (e.g. dressing, bathing), cognitive, social and role functioning and psychological wellbeing (e.g. anxiety, depression). Patients and their caregivers rated the states using categorical rating scales only. Physicians rated the health states using the standard gamble and the categorical rating scale. It was found that patient preferences were comparable with clinician and caregiver preferences on the basis of the rating scale exercise. The rating scale appeared to be workable in the patient sample though not the standard gamble.

Glennie (1997) obtained health state utilities values, using the standard gamble and the rating scale, from seven schizophrenic patients who were felt by nursing staff to be capable of understanding the three scenarios presented: (1) moderate delusional symptoms, hospitalised; (2) mild delusional symptoms, community-dwelling and (3) mild delusional symptoms, hospitalised. An additional scenario relating to extrapyramidal symptoms (EPS) was also incorporated. Reliance on valuations from only seven out of the 50 study patients is an indication of how difficult it may be to ensure one is obtaining valid and reliable data from the patients.

Chouinard and Albright (1997) in their cost-utility analysis of risperidone compared to the standard neuroleptic, haloperidol, derived utilities for three

Table 1 Utility values for schizophrenia-related health states

Study	Health states	Utility value	Valuations by whom	Method
Revicki, Shakespeare and Kind, 1996	Inpatient, acute positive symptoms	0.56	Psychiatrists (n=12)	Standard gamble
	Outpatient, negative symptoms	0.60		
	Outpatient, moderate function	0.70		
	Outpatient, good function	0.73		
	Outpatient, excellent function	0.83		
Glennie, 1997	Moderate delusional symptoms	0.82	Patients (n=7)	Standard gamble
	Mild delusional symptoms[a]	0.86-0.89		
	Disutility for hospitalisation	0.07		
	Disutility for EPS	0.07		
Chouinard and Albright, 1997	Mild symptoms (PANSS)[b]	0.61	Psychiatric Nurses (n=64)	Standard gamble
	Moderate symptoms (PANSS)	0.36		
	Severe symptoms (PANSS)	0.29		
Lenert et al., 1997	Tardive dyskinesia	0.87	Patients (n=22)	Standard gamble
	Akathisia	0.88		
	Psuedo-parkinsonism	0.79		
	Tardive dyskinesia	0.89	Healthy Volunteers (n=41)	Standard gamble
	Akathisia	0.88		
	Psuedo-parkinsonism	0.83		
Risebrogh and Lanctot, 1998	Mild	0.91	Patients (n=28) and psychiatrists (n=4)	Standard gamble
	Mild with EPS	0.86		
	Mild in hospital	0.75		
	Moderate	0.83		
Cummins, Stevens and Kisely, 1998 (DEC report)	Need for acute treatment	0.76	General public	Standard gamble for IHQL states
	Response	0.96		
	Relapse	0.76		
	EPS in acute episode/relapse	0.63		
	EPS after response	0.81		

Notes

a. Average utility rating for 'mild delusional symptoms' varied from 0.86 for patients on haloperidol, fluphenazine decanoate and haloperidol decanoate to 0.89 for those on risperdone.

b. PANSS = Positive and Negative Syndrome Scale

health state profiles — mild, moderate and severe schizophrenic symptoms. The health state profiles were derived from the PANSS (Positive and Negative Syndrome Scale) items contributing to quality of life assessments as follows:

1. Thought quality: consisting of items of conceptual disorganisation, hallucinatory behaviour, poor attention, lack of judgement and insight and stereotyped thinking;
2. Emotional quality: comprising hostility, anxiety and poor impulse control;
3. Social functioning: comprising emotional withdrawal, passive/apathetic social withdrawal, preoccupation and active social avoidance; and
4. Physical functioning: comprising excitement, somatic concerns, mannerisms and posturing and motor retardation.

Descriptions of the extrapyramidal symptoms — parkinsonism, dyskinesia and dystonia — were added to the three health state profiles, according to the mean treatment group ESRS (extrapyramidal symptom rating scale) scores. The utility values for the three health state profiles were derived using the standard gamble technique from 64 psychiatric nurses.

Lenert et al. (1997) elicited utility values, using an interactive computer survey, for three common side-effects of anti-psychotic drugs — tardive dyskinesia, akathesia and psuedo-parkinsonism — from 41 healthy volunteers as well as from 22 schizophrenic patients. Standard gamble and categorical rating scale values were derived from both groups. Utility values for groups were more or less similar. However, the study also showed that only 60% of the patients had the same rank order of the desirability of states across the two methods of preference assessment, suggesting the difficulty of using complex methods such as the standard gamble to elicit utility values.

Risebrough and Lanctot (1998) measured patient utilities for hypothetical schizophrenia-related health states and determined whether these were in agreement with physician-based utility ratings (28 stable out-patients with schizophrenia or schizoaffective disorder and 4 psychiatrists) using standard gamble. Standard scenarios, based on PANSS profiles, included moderate symptoms treated in in-patient and out-patient settings, improved symptoms with drug therapy (clozapine, haloperidol or risperidone) with associated side-effects, specifically EPS. It was found that patient utilities were similar, yet higher on all health states compared to physician ratings. Therefore the authors' conclusion was that patients with stable schizophrenia are capable of providing sound quality of life and preference judgements.

There have also been some attempts to use valuations derived from generic instruments of health-related quality of life like the EuroQol and the IHQL (Index of Health-Related Quality of Life). The Development and Evaluation Committee Report (Cummins, Stevens and Kisely, 1998) for example, used a cost-utility model to show potential improvements in quality of life from interventions in schizophrenia in comparison with other interventions impacting on other diseases, using the Index of Health Related Quality of Life (IHQL). Valuations for the composite health states that were created by combining three dimensions — disability, physical distress and emotional distress — were obtained using the standard gamble, which were then applied to different outcome states in the treatment of schizophrenia. Similar attempts at developing the EuroQol-5D instrument are currently ongoing. The usefulness of such generic instruments in schizophrenia is yet to be seen, as quality of life is not taken from instruments designed and tested specifically for use on patients with severe and chronic mental health problems.

Conclusion

The examples in table 1 show how utility scores vary by the structure and content of health state descriptions and by the type of respondents.The need to develop valid and reliable utility-based mental health-related quality of life indices is pressing. Much of the existing work in schizophrenia has yielded utility values from small groups of individuals using condition-specific health state descriptions. Some of these studies raise important issues regarding the feasibility of applying the utility approach to outcome measurement in schizophrenia. For example, there appears to be some doubt over the extent to which the standard gamble method can work in attempts to derive mental health state preferences from patient groups. Whilst continued research into generation of utility-based outcomes within a condition-specific context is of importance, the needs of health service planners will place increasing demands on researchers to come up with generic forms of instrumentation that enable the impact of treatments for severe mental illness to be placed within a general priority setting framework. There are questions over the extent to which existing generic instruments are sensitive enough for use in mental heath care evaluation. Further work is required on this issue, and the feasibility of developing new mental health outcome instruments that have a more generic content needs to be looked at.

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Key points

- ☐ Although utility based outcome measures enable comparison of treatment effectiveness across different areas of health care provision, generating such measures of outcome for the treatment of schizophrenia poses many problems to researchers.
- ☐ Three techniques commonly used for deriving utilities are the rating scale, the standard gamble and time trade-off. While the rating scale is a fairly simple technique, the other two are cognitively demanding, which make them less suitable for deriving utilities from mental health patients in general and schizophrenics in particular.
- ☐ Attempts to generate utility values for schizophrenia-related health states by various researchers have shown that while patients suffering from stable schizophrenia can rate their health states using the categorical rating scale fairly reliably, attempts to derive utilities using the standard gamble exercises from them have resulted in inconsistent and unreliable results.

Trends in accommodation for patients with schizophrenia: some evidence from psychiatrists

Stephen Almond and Bill Byrom

Introduction

As part of the government's programme to create 'modern and dependable' health and social services, radical changes are being proposed to improve the treatment of mental illness. These changes include extra provision of 24 hour crisis teams to respond to emergencies, more acute mental health beds, more hostels and supported accommodation, more home treatment teams, more staff training and access to National Health Service (NHS) Direct for 24 hour help and advice. A National Service Framework (NSF) for mental health will 'translate this vision into practice' by setting new national standards and service models. To fund these improvements, the government has committed an extra £700 million over the next three years (*Modernising Mental Health Services* (MMHS),1998; *National Service Framework for Mental Health*, 1999).

In 1997, the NHS Executive in collaboration with NHS regional offices and the Social Services Inspectorate carried out a review of mental health and social care services. Only 16 health authorities claimed to have a comprehensive range of provision in 1996/7, with the majority suggesting that it would take several years for a full range to be developed. Health authorities report shortages of ordinary housing and 24 hour staffed residential accommodation as major causes of patients staying longer than necessary in hospital beds, particularly acute beds. At the same time, there are patients in secure hospitals who are ready to move on but cannot do so because of difficulties in finding suitable placements at appropriate levels of security. In response, the government suggests a need for 'enough beds of the right kind in the right places' and that the current review of beds in the NHS will provide guidance to help local services assess how many beds, and which types of bed, are needed (*MMHS,* 1998).

In this paper we report findings from a small survey of psychiatrists who provided information on the likely distribution of residential care for patients with positive, negative or no symptoms of schizophrenia. Patients with schizophrenia put heavy demands on all types of supported accommodation, in particular high-staffed facilities. The findings of the survey offer information on current resource utilisation as reported by psychiatrists alongside information already gained from health authorities.

The survey

Data were collected in a postal survey of psychiatrists using a simple one-page questionnaire. Psychiatrists were asked to identify the percentage of patients within each of four symptom severity groups likely to be discharged from in-patient hospital care to five residential care settings: family home or independent living, group home, low- to mid-staffed hostel, high-staffed hostel or staffed care home, and long-stay psychiatric ward. The definitions of these different care settings were taken from research described previously (Lelliott et al., 1996). Ratings were recorded assuming the current local resource availability.

A total of 152 questionnaires were sent out to psychiatrists in five UK NHS Regions. Psychiatrists were randomly identified from those assigned to NHS Trusts detailed in the Medical Register 1998 as having a psychiatry speciality with at least one psychiatrist listed. In addition, data collected from an earlier pilot survey of UK psychiatrists were also included. Despite a low response rate we can report the findings based on the responses of 22 psychiatrists.

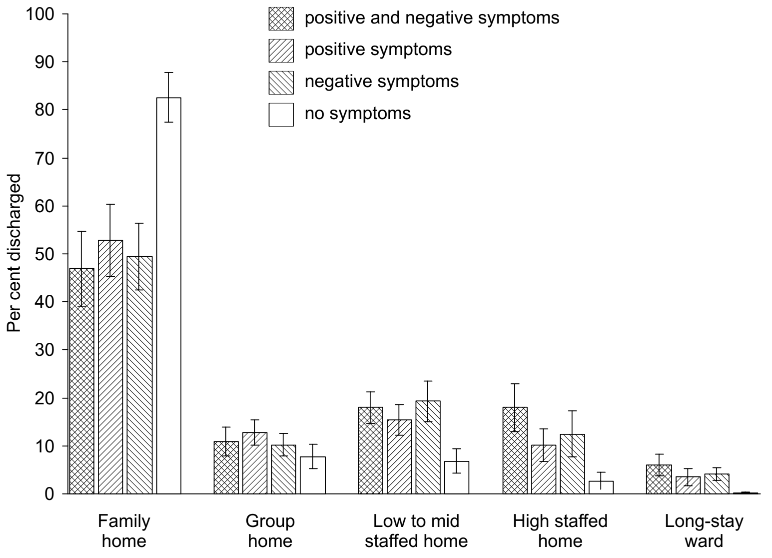
The majority of patients suffering from schizophrenia require long-term treatment and care. For such patients, the disease is often characterised by acute episodes following relapse, and stable maintenance phases. In general, the overriding symptomotology expressed in acute and maintenance phases switches from positive to negative symptoms. Positive symptoms are both distressing for the patient and carer, and potentially very disabling. When the symptoms are severe, such patients may require a period of hospitalisation in addition to intensive treatment to stabilise symptoms. During the maintenance phase, patients may exhibit negative symptoms, which reduce the ability to perform the tasks required for daily living and full participation in society. This may lead to a higher requirement for staffed accommodation, day care, home help and other community services.

Because of the perceived different care requirements of patients exhibiting positive and negative symptoms, and because these are easily measurable in clinical trials by using investigator-scored rating instruments such as the Positive and Negative Syndrome Scale (PANSS) (Kay et al., 1986), the percentage of patients discharged to each residential setting was estimated for four symptom groups: patients exhibiting both significant positive and negative symptoms; significant positive symptoms only; significant negative symptoms only; or no significant positive or negative symptoms. The PANSS scale scores items are from 1 (absent) to 7 (severe). We defined significant positive symptoms as a PANSS positive items (delusions, conceptual disorganisation and hallucinatory behaviour) total score greater than 8 with at least one item greater than 3. Similarly, significant negative symptoms was defined as PANSS negative items (blunted affect, emotional withdrawal, poor rapport, passive/apathetic social withdrawal, difficulty in abstract thinking, lack of spontaneity and flow of conversation, stereotyped thinking) total score greater than 20 and at least one item greater than 3 (as used in Palmer et al., 1998).

Results

The small number of respondents prohibited formal statistical analysis and investigation of regional differences between NHS Executive regions. Figure 1 presents the mean proportion of patients discharged to the various residential settings by symptom group assuming current local resource availability. The standard error bars on this graph indicate that for most categories there is some general agreement in discharge patterns by psychiatrists.

Figure 1 Mean (± standard error) discharge distributions reported by survey respondents



In general, the data indicate that the vast majority of patients without significant positive and negative symptoms are currently cared for at home. This is higher than the proportion of patients exhibiting positive and/or negative symptoms, where around half of these patients require care outside the family home. Trends indicate that patients suffering from both significant positive and negative symptoms appear to be cared for in high-staffed accommodation and long-stay wards more often than those with just positive or negative symptoms. In addition, patients with negative symptoms (either alone or in combination with positive symptoms) appear to have a greater requirement for low- to mid-staffed, high-staffed and long-stay ward accommodation compared to those with positive symptoms only.

Table 1 Mean percentage of schizophrenia patients by residential status and positive/negative symptoms (N=22)

Symptoms	Family home	Group home	Low to mid staff	High staff	Long stay	Total
Positive & negative	47.1	10.9	18.0	18.0	6.0	100
Positive only	55.9	13.4	16.3	10.7	3.7	100
Negative only	51.8	10.7	20.2	13.1	4.2	100
No symptoms	82.4	7.8	6.9	2.7	0.2	100

A more interesting finding is the change in distribution of care setting following changes in symptom categories. This allows some comment to be made on the extent to which patients, as a group, can be placed in various types of accommodation (see table 1). Moving from patients with both positive and negative symptoms to those with positive only, we found an increase of 8.8% for family home and an increase of 2.5% for group homes. At the same time there is a reduction in the percentages resident in the remaining categories of care, with the largest difference for patients in high-staffed accommodation (7.3%). A similar comparison but with patients who experience only negative symptoms shows a smaller increase in the percentage of patients living at home (4.7%) and a slightly smaller decrease in the percentage of patients in high-staffed accommodation (4.9%). As expected, the largest distributional change occurs between patients with both positive and negative symptoms and those with no significant symptoms, with most now resident at home (an increase of 35.3%), with the remainder in group homes (a decrease of 3.1%), low to mid-staffed accommodation (a decrease of 11.1%); and with some patients remaining in high-staffed accommodation (a decrease of 15.3% to 2.7%) and in long-stay (a decrease of almost 6% to 0.2%).

From these simple descriptive figures it would appear that changing mental health symptoms (or ‘need’) results in some changes in accommodation type. The small percentage of patients with no symptoms in high-staffed accommodation and long-stay wards may be consistent with findings from health authorities reporting patients staying too long in secure hospitals. Also, the generally high percentage of patients in some form of supported accommodation for any symptom category may be consistent with reports of a shortage of ordinary housing.

However, caution must be placed on the accuracy of our findings because of the small sample size. It should also be noted that in a survey of this type — as in Delphi panels generally — psychiatrists might be reporting ideal rather than actual distributions. A further limitation is that psychiatrists were asked, as decision-makers, whether they could allocate patients to a residential care setting conditional only on the presence of positive and negative symptoms. The use of one particular scale to measure clinical outcomes offers only a starting point in gaining better information on the residential needs for patients with schizophrenia. A better option might have been to use vignettes describing patient symptoms in more detail. A larger survey of this type could be combined with information on the current distribution of mental illness symptoms, using the appropriate measures. This would enable a more informed discussion of the future needs for mental health accommodation.

It should be emphasised that in this paper we are only trying to build up an improved picture of the relationship between changes in mental health outcomes and residential status. Understanding the needs of patients is vital to policy makers and the decision process in allocating more expenditure to accommodation. This is a complicated issue as the service needs of an individual patient will depend not only on clinical status but also on, for example, personal and family circumstances, preferences, education and financial status. In addition, effective implementation of new policy initiatives or the introduction of new therapies must also overcome budgetary constraints.

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Key points

- ☐ The MMHS has identified a need for vastly improved service provision, especially accommodation, for people with mental illness.
- ☐ In a small postal survey, psychiatrists were asked to identify the likely distribution of residential care for patients with positive and negative symptoms using the PANSS.
- ☐ Results indicate that for most categories there is some general agreement in discharge patterns by psychiatrists, and severity of symptoms is generally associated with higher cost residential accommodation.
- ☐ Caution must be placed on the accuracy of the findings because of the low response rate and the limiting association between PANSS items and residential placement.
- ☐ A larger survey which measures a more direct relationship between mental health outcomes and the provision of accommodation would greatly inform the NSF for mental health.

International research on schizophrenia

Quite a sizeable proportion of completed and ongoing CEMH research is in the psychosis field. Several studies focus on schizophrenia. Two international studies are the recently finished EPSILON study, details of which are presented on page 22 of this issue, and an ongoing multi-centre economic evaluation of Quetiapine. The latter is a double-blind RCT, funded by AstraZeneca Pharmaceuticals, which involves concurrent data collection for a range of clinical, economic and quality of life outcomes for 381 patients with schizophrenia or schizoaffective disorder. The study results will include a cost-consequences evaluation of the treatment of Quetiapine compared to Haloperidol and multivariate analyses of costs and outcome variations across samples.

For further information about this study, please contact Anita Patel at CEMH.

Publications by CEMH and PSSRU authors

These two pages give brief details of selected recent and forthcoming publications.

Further details of CEMH Working Papers and PSSRU Discussion Papers, including those cited in this *Review*, are available from the PSSRU librarian (telephone 01227 827773; email pssru_library@ukc.ac.uk) or Janice Dickson at the CEMH (0171 919 3198; cemh@iop.kcl.ac.uk). Recent papers, research summaries, and previous issues of the *Mental Health Research Review*, can be accessed and downloaded free of charge from the PSSRU website: `www.ukc.ac.uk/PSSRU/`.

We aim to disseminate findings as widely as possible, but both PSSRU and CEMH have to charge for printed copies of papers. If a paper is published as a journal article or book chapter we advise interested readers to obtain that publication from a bookshop, library (through the inter-library loan system if necessary) or website.

Issue 11 of the *PSSRU Bulletin*, which covers the Unit's work as a whole, is available free of charge. The PSSRU also publishes a book series under the Ashgate imprint, monographs, and newsletters.

Access to and uptake of community mental health care in low-income countries: lessons from a demonstration project in India and Pakistan
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Daniel Chisholm (1999), *Epidemiologia e Psichiatria Sociale*, **8**, 11-15, editorial.

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Daniel Chisholm, Emma Godfrey, Leone Ridsdale, Trudie Chalder, Michael King, Paul Seed, Paul Wallace, Simon Wessely and the Fatigue Trialists' Group (2000), submitted for publication.

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Costs of care for people with schizophrenia in five European countries: the EPSILON study

Daniel Chisholm and Martin Knapp, on behalf of the EPSILON study group

Policy and research context

The multiplicity of care arrangements for people with schizophrenia that have emerged in different countries, together with the responsibility of governments and health care agencies to ensure that resources are targeted appropriately, has led to a growing interest in comparative studies of disease burden, both within and between individual countries. To date, multi-national studies of schizophrenia have focused on establishing the prevalence of the disease and assessing outcomes cross-culturally. There is little comparative research examining the relationship between inputs, processes and outcomes for people with schizophrenia living in different countries and settings.

Overview of the EPSILON study

The EPSILON study (European Psychiatric Services: Inputs Linked to Outcome Domains and Needs) is a cross-sectional, multinational investigation of the characteristics, needs and life qualities of people with schizophrenia, the services they receive, and the associated costs and satisfaction levels, based on an administrative prevalence sample of people with schizophrenia in contact with mental health services (Becker et al., 1999). The study was funded under the EU BIOMED programme and the five research sites were Amsterdam (Netherlands), Copenhagen (Denmark), London (England), Santander (Spain) and Verona (Italy). The main aims and stages of the project were:

1. To produce standardised versions of five instruments in key areas of mental health service research in five European languages (Danish, Dutch, English, Italian and Spanish) each of which was converted from the original into the other four languages. The five instruments were the Camberwell Assessment of Need (CAN), the Client Service Receipt Inventory (CSRI; Chisholm et al., 2000a), the Involvement Evaluation Questionnaire (IEQ;), the Lancashire Quality of Life Profile (LQoLP) and the Verona Service Satisfaction Scale (VSSS). Reliability and validity studies were carried out in each of the sites for these five instruments, and are to be published together in a special supplement of the *British Journal of Psychiatry* later this year (2000).
2. To obtain and compare, in five European centres, data about social and clinical variables in patients with schizophrenia, the mental health care they receive and its costs. A total of 404 subjects across the five participating sites were recruited into the study, and a series of papers are in preparation that document different aspects or dimensions of the data, including comparative studies of need, quality of life, service satisfaction and family involvement (details are available on request from the authors).

There is also a set of three further papers that cover the economic component of the study:

i) **A description of patterns of service utilisation and costs of care**, which set out to test the null hypothesis that patterns, rates or levels in sociodemography, service use and costs would be the same across the sites (Chisholm et al., 2000b). Service costs were estimated by attaching site-specific unit costs to each individual's use of resources, subsequently transformed into a single currency (UK £) using purchasing power parities (PPPs). The total annual cost per patient for the combined sample of 404 subjects is an estimated £5,038 (95% CI £3,888-6,237). Cost comparisons of adjusted means between sites reveals economically and statistically significant differences, ranging between £1,444 and £7,460 (p=0.005). There were widespread and considerable differences between the participating sites both in the proportions of patients in contact with services and in the absolute level of service utilisation.

ii) **A multivariate analysis that explored the inter-relationship between costs and needs-related variables** (Knapp et al., 2000a), testing the following hypotheses: met and unmet needs, symptom severity and psychiatric history are positively associated with costs; after standardising for symptom severity/need, higher rates of service use will be associated with better quality of life and greater service satisfaction; and associations between symptomatology, quality of life and service costs are the same across the sites. A series of site-specific and pooled multivariate models were constructed, and these have illustrated the complex and heterogeneous set of relationships that exist between costs and needs-related vartiables in the different sites.

iii) **A description and comparison of patterns of utilisation of antipsychotic drugs**, including identification of factors (via logistic regression) that are associated with their use (Knapp et al., 2000b). The null hypothesis was that patterns of utilisation of atypical antipsychotics would be the same across the five sites, after adjustment for inherent or hypothesised site-level differences in sociodemographic and clinical characteristics of the sampled populations. Results again indicate the wide divergence between sites, both in terms of the proportions using different psychopharmacological regimens and in terms of key determinants of their use.

EPSILON study forthcoming publications (details of other papers in preparation available on request)

Becker, T., Knapp, M.R.J., Knudsen, H. et al. (1999) The EPSILON study of schizophrenia in five European countries: Design and methodology for standardising outcome measures and comparing patterns of care and service costs, *British Journal of Psychiatry*, 175, 514-521.

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Costs and outcomes management in supported housing

In 1998 a housing association in London commissioned a study of the services they were providing, in order to understand how they might improve service delivery and quality of care. The study aimed to examine the relationship between the levels of care and support provided and tenants' characteristics, needs and living environment. The costs of providing housing and the costs of services used by tenants independently of their accommodation arrangements were also to be explored in the context of assessed needs and characteristics. The study group comprised 238 individuals selected, randomly, from a pool of 1,600 people.

Tenants in the most costly arrangements were assessed as having a greater number of needs than those in other accommodation categories. However, several tenants in the most independent arrangements were reported as having many and/or particularly severe needs. These tenants received higher levels of informal care than those in more highly supported housing. People who expressed a lack of basic skills received less support within their accommodation arrangements than others. Tenants' needs were of importance in explaining cost variations, and there was also a relationship between cost and the physical condition of the building and its furniture and fittings.

The study results suggest that an outcomes management system, built on stated goals and the monitoring of the extent to which these goals are being met, has the opportunity to improve tenants satisfaction with housing arrangements and to engage the more effective targeting of available resources at those people with greater needs. The paper, which is currently in press, provides descriptive information as a benchmark for further investigation towards the more effective and cost-effective management of housing and support.

For further details contact Krister Järbrink, Angela Hallam, or Martin Knapp at CEMH.

Tackling the revolving doors problem: the evaluation of a voluntary sector service initiative

William Finn and Jon Hyslop

In 1990 money raised by the ITV Telethon was used to commission an investigation into the relationship between mental health, homelessness and the criminal justice system. One recommendation was that an organisation be set up to '... identify how existing services might best integrate their funds and skills, and what new mechanisms and/or services are needed...' to better meet the needs of a group which is the responsibility of no single community agency, but which impacts significantly on the work of many (Jones, 1992). Front-line community agencies such as the police, health, housing and homelessness services have long been aware of the existence of this group, which has become known as the 'revolving door' group and after which the Revolving Doors Agency was named.

The Link Worker Scheme

A major study carried out by the Revolving Doors Agency looked at service use by people with mental health problems in contact with the police (Keyes et al., 1998). Over 30,000 custody records from police stations in the London Boroughs of Camden and Islington were searched, identifying 499 people with a mental illness.

- 50% had local addresses, with a further 16% of no fixed abode.
- 82% of those with local addresses were known to local services.
- 34% had criminal records.
- 79% had never committed a serious offence.
- 40% misused drugs or alcohol — with only 15% of these accessing related services.
- 61 people with a high level of unmet need were identified as falling through the net of local services.

In response to these findings and in the absence of other appropriate lead agencies, Revolving Doors decided to set up, operate and evaluate an experimental service targeted at this latter group. Taking referrals exclusively from the police in the area in which it operates, the Revolving Doors Link Worker scheme aims to:

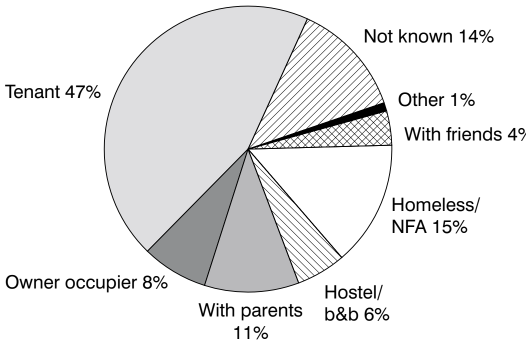
- Provide support and practical help at the time of arrest to people suspected of having a mental health problem.
- Support and advocate on behalf of people to help them re-engage with local services.
- Play a continuing support and advisory role for up to two years.

The evaluation

The evaluation of the link worker scheme is being carried out in cooperation with the Home Office Research and Statistics Directorate, the Institute of Psychiatry and the PSSRU at the LSE. One of the key objectives is to provide more information about the client group. A database jointly designed and maintained by the Home Office and Revolving Doors has enable a fairly detailed picture of the client group to be built up.

Of the people referred to the scheme, 29% are female — a higher percentage than many other studies of 'mentally disordered offenders' (Guite and Field, 1997). This is partially explained by the fact that the scheme accepts referrals of people who have not been arrested (e.g. victims of crime, witnesses, and people

Figure 1 Accommodation types



repeatedly making complaints), whom the police perceive as vulnerable. This group is predominantly female. Approximately 23% are from visible ethnic minority populations, with three significant groups (Black Caribbean, White and Bangladeshi). Of the full group, 61% are aged 25-45, a similar figure to the 65% reported in a 1991 study of mentally disordered offenders on remand (Dell et al., 1991). Figure 1 shows that about half of the group are tenants, fewer than one in ten owner-occupiers.

As with the original Camden and Islington study (Keyes et al., 1998), most of the alleged offences are relatively minor (see table 1).

Table 1 Alleged offences

Offence	Per cent of referrals
Warrant only	4
Not arrested	13
Drug related offences	5
Other offences	4
Other public order	3
Prostitution/sex work	4
Violent crime	13
Minor disorder	24
Property offences	35

Of the 13% arrested for violent crime, only 4% resulted in serious charges. This seems to be reflected in the criminal justice outcomes. For the first 100 referrals, 54% were charged, 36% convicted and 12% received a custodial sentence (Home Office, 1999).

Reasons for an economic evaluation

We know from the Camden and Islington study (Keyes et al., 1998) that the revolving door client group tend to make heavy demands on the services with which they come into contact. These agencies have long suspected that the ways in which they can intervene do not meet the needs of this group. Typically, interventions are short-term and crisis-oriented, and may not be sufficient to have a lasting effect. At the same time, people with chaotic lifestyles can find it difficult to engage with services that work from 9 to 5 and revolve around pre-arranged appointments. In the climate of constrained resources, health and social care providers have been becoming increasingly concerned with this inefficient targeting and use of public resources.

There are important differences between the revolving door clients and psychiatric patients in community care. The majority of the revolving door group are not considered eligible for statutory case management as a result of the ways in which mental health and social services are targeted and delivered, being mainly diagnosis and treatment focused. Those clients with diagnoses of personality disorder or dual-diagnosis (mental health combined with alcohol or drug problems) for example, are not automatically eligible for statutory mental health services. However they may be known to services following an in-patient episode but either did not engage or were assessed as inappropriate. Consequently the cost of service utilisation by this client group is likely to be different and this study aims to explore the extent to which this is the case.

The area of criminal justice costs is particularly relevant to the revolving door group, who often come into contact with police, arguably as a result of a failure to engage with other health or social services. This study aims to produce a unit cost per hour of police custody to allow the costing of an arrest, to map progress through the criminal justice system, attach costs where these are available and to compare costs with a control group to assess the implications of the Link Worker intervention for criminal justice system, health and social care costs.

Methodology

The study employs a quasi-experimental design. Subjects are referrals to one of the Link Worker schemes over a 1-year period. A control group was identified from a custody record search at a comparable neighbouring police station where the scheme is not in operation. The cost implications of the Link Worker model are to be examined using 'before-and-after' comparisons, and with reference to the costs incurred by the control group.

Initial findings

A review of custody records revealed that the subjects of the study were involved in a substantial amount of offending, as their arrest histories demonstrate. Within the first 100 referrals analysed, 476 separate arrests were identified. These were recorded at a single police station over a two-year period. A high arrest group (more than five arrests) of just over 20% of referrals account for the vast majority of arrests. Using a cost for arrest of £200, based on an average of 6.5 hours in custody (Home Office, 1998), these arrests total over £95,000. Custody staff conduct more frequent cell visits for this group, in some cases mounting a continuous watch over a detained person who may come to harm through as a result of intoxication, suicide or self-harm. Additional resource costs also arise due to forensic medical examiner visits to police stations. The review showed that this group uses forensic medical examiner services three out of every four times they are arrested. The Audit Commission has calculated an average cost for an FME consultation of £45 (Audit Commission, 1998).

Some care is needed in interpreting these cost estimates. They reflect an assessment of that proportion of the opportunity cost (the value of other socially valuable activities sacrificed) from diverting resources (human or otherwise) into the police force that we might reasonably attribute to the offending committed by this group of people. Within existing staffing and capital resource constraints they will not necessarily reflect the immediate resource implications of additional arrests.

Initial findings from reviews of records at hospital Accident and Emergency (A&E) departments also show extremely high service use. Twenty-four referrals to the link worker schemes used A&E 90 times in the 2-year period, and used an ambulance to get there 51 times. The police were involved in one in seven of these attendances, either initiating the referral to A&E or accompanying the client. In almost half of all attendances the client was not treated, A&E records recording the attendance as 'left before treatment'. A review of community mental health services and acute care records will shed further light on use of health services.

Final report

In addition to police and health services, this study will also examine the clients' use of local authority housing and social services. The evaluation report is due to be published in summer 2000.

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Key points

- ☐ Previous research has shown that the 'revolving door' client group has significant mental health and social care needs that are not adequately met by services as they are currently configured. However, this client group makes heavy demands on the resources of a wide range of health, social and criminal justice agencies.
- ☐ Most revolving door clients do not receive case management or similar statutory services as a result of the ways in which these services are targeted and delivered.
- ☐ The Revolving Doors Agency Link Worker Schemes are community-based assertive outreach teams working specifically with people with mental health problems and complex needs who are also in contact with the police. The schemes have had almost 600 referrals at three sites in two years.
- ☐ The evaluation of the Link Worker Schemes aims to map service use over a 2-year period, calculate comprehensive costs for service use, and identify the impact of the schemes on clients' lives and use of services.

The economic burden of autistic spectrum disorder in Britain

Autistic spectrum disorder (ASD) is a potentially costly form of mental health problem, not just in terms of resources allocated to the care of people with ASD, but also with respect to the direct burden placed on ASD sufferers and their relatives. Because ASD is a multi-agency responsibility, with education, health, social services and other agencies playing key roles, the full extent of its potential cost burden is not widely appreciated. Moreover, because new interventions continue to enter the arena, questions are being asked about the affordability and cost-effectiveness of services delivered to people with ASD. For example, behavioural interventions have recently been developed which, according to some researchers, have the potential to improve quality of life. So far, there has also been no evaluation of the costs or cost-effectiveness of these interventions except for one tentative estimate of the cost and benefits of an early intensive behavioural intervention in the US.

The almost complete lack of knowledge about the economic consequences of ASD and the cost-effectiveness of the education, treatment or support of people with the disorder complicates the planning of services and appropriate allocation of resources to these areas. In order to review what is known about the economic impact of autistic spectrum disorder CEMH carried out an exploratory study during 1999 funded by the Shirley Trust Foundation, via the Mental Health Foundation. The estimates were built on existing evidence and on the re-analysis of earlier studies carried out at the CEMH and including people with ASD. The study ensured that databases and selected journals were thoroughly searched. Searches were also made of library catalogues for relevant books and reports, including electronic databases and, where appropriate, researchers in the field of ASD were also asked to contribute relevant information.

The key findings of the research were as follows:

- ☐ The annual total cost of autism in the UK is at least £1 billion;
- ☐ The average additional lifetime cost resulting from autism and associated learning disabilities is estimated to be £2,940,538 per person;
- ☐ The greatest costs are for living support (70%) and day activities (14%); much less is spent on education (7%). Evidence suggests that even moderate increases in educational provision could potentially result in major savings in later living costs;
- ☐ The economic consequences to parents of having a child with autism living at home include an annual loss of earnings estimated as at least one sixth of the average disposable income;
- ☐ Further information is needed on the costs to families of having a child with autism, and on the economic costs of high-functioning autism and Asperger's syndrome.

The full empirical findings for people with core autism have been submitted to a scientific journal. For further details contact Krister Järbrink or Martin Knapp at CEMH.

Exploring the relationships between patients' characteristics and costs of community-based mental health care

Francesco Amaddeo, Giulia Bisoffi, Paola Bonizzato and Michele Tansella

In the last few years a number of research studies have attempted to identify factors related to psychiatric costs, not only in order to achieve a more cost-effective deployment of resources but also to develop — at least in some European areas, such as in Italy — a funding system better tailored to community-based psychiatric services (Amaddeo and Bonizzato, 1999).

In 1994, with the collaboration of the CEMH, the Cost Evaluation Unit of the Section of Psychiatry of the Department of Medicine and Public Health, University of Verona, started to explore the relationships between individual patients characteristics and costs of community-based mental health care.

In Verona, a Psychiatric Case Register (PCR) has been operating since 1979; using this routine data collection system, a costing methodology was developed. A unit cost list and a bespoke software package were linked to the South Verona PCR to obtain individual costs grouped into five components: *in-patient costs* (all days spent in a public or private sector hospital for psychiatric care), *sheltered accommodation costs* (all days spent in public sector hostels and apartments for long-stay psychiatric patients), *day-patient costs* (all contacts at psychiatric day-hospitals or at rehabilitation groups), *out-patient costs* (all psychiatric contacts at the out-patient department, at the liaison psychiatric service and at the emergency department of the general hospital), and *community costs* (psychiatric visits made to patients' or relatives' homes, visits to patients temporarily registered with other agencies, or visits to the premises of voluntary organisations, as well as the provision of social services by psychiatrists, nurses, psychologists, social workers and other psychiatric staff). These five components represent the functional components of the South Verona Community Mental Health Service (CMHS).

Three studies have been completed so far to explore which sets of variables have the best predictive power to estimate mental health care costs (Amaddeo et al., 1997, 1998; Bonizzato et al., in press).

1. Direct costs of all South Verona patients who contacted psychiatric services in one year

The first study analysed all patients (N=706) who in 1992 had at least one contact with services reporting to the South-Verona PCR and received an ICD-10 diagnosis.

Multivariate analyses were conducted to test for associations between yearly costs and patients' characteristics (socio-demographic variables and psychiatric history) collected by the PCR. Separate equations were estimated using ordinary least squares regression for each of four diagnostic groups (schizophrenia and related disorders, affective disorders, neurotic and somatoform disorders, other diagnoses). The logarithm of total costs was taken as the dependent variable, because of the skewness of the cost distribution. The final version of each equation was selected on the conventional criteria of parsimony, statistical significance and interpretability. The results can be summarised as follows (see table 1).

- All costs, grouped by service type, were found to be significantly different ($p<0.01$) between diagnostic groups (costs were significantly higher for people with a diagnosis of schizophrenia than for people belonging to the other groups).

Table 1 Regression of direct costs on patients characteristics by diagnostic groups (1992 cohort; 1992-93 cohorts)

	Schizophrenia and related disorders	Affective disorders	Neurotic disorders	Other diagnosis
All patients (1992 cohort)				
R^2	0.395	0.397	0.372	0.530
Sample size (N)	122	169	148	198
Significant variables	Age Gender Education Length of contact Long-term case	Age Gender Education Length of contact Long-term case	Age Gender Education Length of contact Long-term case	Age Gender Length of contact Long-term case
Not significant variables	Employment status	Employment status	Gender Employment status	Education Employment status
First-ever patients (1992-93 cohorts)				
R^2	0.686	0.387	0.430	0.204
Sample size (N)	14	76	63	125
Significant variables	Marital status Education Accommodation	Age Gender Education Accommodation Job status Referral source	Age Gender Marital status Accommodation Job status Referral source	Gender Marital status Referral source Type of first contact
Not significant variables	Age Gender Employment status Job status Type of first contact Referral source	Type of first contact Marital status Employment status	Education Employment status Type of first contact	Age Education Accommodation Employment status Job status

- However, only 6% of the variation could be explained by diagnosis alone. On the other hand, between 37% and 53% of the cost variation of mental health care was predicted by patients' personal characteristics and the other measures recorded on the PCR. Variables that showed a significant positive effect in each separate equation were whether a long-term patient and the length of contact with psychiatric services.

2. Direct costs of all South Verona patients having their first lifetime psychiatric contact

In a separate study we planned to analyse the costs of patients with no previous history of psychiatric service receipt. This would enable a comparison to be made with the cost-function relationships estimated for patients with prior experience of psychiatric service use. Direct costs of care provided in the 365 days following the index contact were assessed for all first-ever patients (N=299) and (for comparison) for all other patients (N=768) who had at least one contact with psychiatric services over a two-year period (1992-93). The results can be summarised as follows (see table 1).

- First-ever patients, in the first year after the index contact, were significantly less costly as compared with all other patients in contact with the same services during an equivalent period of time. This was probably due to different patterns of care in the two groups.
- For first-ever patients, between 20 and 43 per cent of the observed cost variation was explained by individual patient characteristics. Statistically the significant variables included: age (older patients with neurotic or affective disorders were less costly); gender (males with affective disorders cost more); marital status (all single people with schizophrenia cost more, as did single

males with neurosis); unemployment (males with neurotic and somatoform disorders were more costly); and referral (patients with affective disorders referred by non-psychiatrists specialists were less costly and neurotic patients referred by relatives were more costly). A high R^2 value was observed for patients with diagnosis of schizophrenia and related disorders, but the small sample size (N=14) suggested the need for further investigations.

This study showed that it is possible to find a statistical model to explain some of the cost variations between first-ever patients. Again, it was confirmed that diagnosis alone is a poor predictor of costs.

3. The association between clinical, social and service history variables and direct costs of South Verona patients

Finally, we added clinical as well as previous psychiatric services utilisation to the set of explanatory variables used in the previous studies, and calculated both psychiatric and non-psychiatric costs. All patients who had at least one contact with a psychiatrist or a psychologist between 1 October 1996 and 31 December 1996 received an ICD diagnosis and completed both the clinical assessment, the Global Assessment of Functioning (GAF) Scale (Endicott et al., 1976) and, three months later, the ICAP, the Italian version of the Client Service Receipt Inventory (Beecham, 1995; Chisholm et al., 1999) were included in the analysis. Data on previous service utilisation, derived from the PCR, were: *length of psychiatric history* (years between the first ever contact with psychiatric services and inclusion into the study), *length of contact* (time interval between the first contact with the South Verona CMHS and the index date), *intensity of contact* (number of lifetime contacts divided by length of period over which contacts were made) and *admitted to hospital in the previous year*. Since only subjects completing both clinical and service use measures were included in the study (N=339), weighting procedures were used to make the sample representative of all eligible subjects. A single equation was estimated including diagnosis in the set of explanatory variables. The results can be summarised as follows (see table 2).

- It was possible to explain a substantial amount (66%) of the variation in psychiatric costs: a considerably higher value than that found in our previous studies conducted in the same area, as well as in other published studies. The most significant variable was admittance to hospital in the previous year, which was predicted to increase costs. Positive associations were also found for intensity and duration of contacts, being unemployed and being diagnosed with an affective disorder. In contrast, age, being unmarried and living with family were negatively associated with cost. The GAF score was also strongly associated with costs: patients with a lower level of of psychiatric functioning measured on this scale were predicted to cost more.
- For medical non-psychiatric costs, the overall explanatory power of the model was lower (R^2 value = 0.13). Age and intensity of contacts were positively associated with cost, while living with family, having a higher GAF score and a diagnosis of schizophrenia were negatively associated with non-psychiatric costs.

Table 2 Regression of costs on patients' characteristics (1996 cohort, N=339)

	Direct psychiatric costs	Medical non-psychiatric costs
R^2	0.659	0.125
Significant variables	Length of contact Intensity of contact Admission in the previous year GAF score Living with family Not married Age Unemployed Affective disorder	Age Schizophrenia and related disorders Intensity of contact Living with family GAF score
Not significant variables	Gender Education	Gender Education Marital status Occupational status Admission in the previous year Length of contact

Although a diagnosis of schizophrenia was not directly related to higher costs, the results of this study confirmed that more resources were targeted on patients with characteristics typically related to patients with a diagnosis of schizophrenia (e.g. living alone, admitted in the previous year, higher intensity and length of contact, and a lower global functioning).

Conclusions

Although a relatively high proportion of the variation in costs remains unexplained, the three studies summarised in this paper produced an improvement in the understanding of variables that influence service utilisation and costs. However, some methodological issues are still not resolved. For example, one of the most important statistical problems in this kind of analysis is the skewed nature of the costs distribution: as far as we know, all the studies published so far in the field of mental health services research (including our own) have used a logarithmic transformation of costs as a dependent variable in the regression analysis. The use of logarithmic transformation to normalise costs distributions, as required for regression models, enables the exploration of associations, but does not allow costs to be predicted for specific patients without a transformation of logarithmic values back onto an actual costs scale. When a regression model applied on the log-transformed costs is re-transformed in this manner, the fitted values would be related to the median response of actual costs to identified explanatory variables (Miller, 1984). A more detailed discussion of the many complex statistical issues involved in this area of work is provided by Daniel Chisholm in this edition of the *Review* (see page 33).

In our opinion, there is an urgent need to develop more sophisticated methods of statistical analysis in this field of research in order to make reliable predictions regarding future patient service utilisation and costs. This exercise must be seen as a challenge for researchers with the task of informing policy makers and professionals on the resource and cost consequences of delivering effective community-based health services for people with mental health problems.

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Key points

- ☐ A psychiatric service costing methodology was developed using a routine data collection system (psychiatric case register). This methodology can be used so that decisions on community mental health care provision and placement are informed by knowledge of their direct cost implications.
- ☐ Only 6% of variation in direct psychiatric costs across patients could be explained by diagnosis alone.
- ☐ It was possible to explain a substantial amount (66%) of the variation in psychiatric costs using both sociodemographic and clinical variables.
- ☐ One of the most challenging problems in this kind of analysis is the skewness of the cost distribution over patient samples. All the studies published in this field to date have used logarithmic transformation of costs as dependent variable in the regression analysis as a means of normalising cost distributions.
- ☐ There is an urgent need to develop more sophisticated methods of statistical analysis in this field to predict future service utilisation and associated resource costs.

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The last to leave...

The closure of long-stay hospitals has been a policy objective in the UK for more than 30 years and most institutions in England have now either closed or are scaling down towards closure. One 13 year longitudinal study of psychiatric reprovision in North London allowed researchers to monitor a complete hospital closure programme and to assess the outcomes experienced by the former long-stay patients in their community placements. The research was carried out by the Team for the Assessment of Psychiatric Services (TAPS) under the direction of Julian Leff and a parallel economic evaluation was undertaken, originally by researchers based at the Personal Social Services Research Unit and, in later years, at the Centre for the Economics of Mental Health.

Little systematic research relates specifically to the last patients to leave a psychiatric hospital at the end of a closure programme: people who often show high levels of challenging behaviour. This long-running evaluation allowed a special study to be made of such a group (67 people in all) whose range of problem behaviours made them difficult to place in community settings. The patients were relatively young, with a shorter length of stay than the remainder of the former long-stay population. They were assessed before leaving Friern hospital, and one and five years after relocation. The social and clinical characteristics of each person were measured, and the full costs of their care calculated.

The 67 patients moved to four highly staffed rehabilitation facilities, where the total cost of their care was, on average, more than £1,150 per week. There was no overall change in their mental health state over the five years after they left Friern, although they gained skills in several areas of daily functioning. Most importantly, there was a fall of almost 50 per cent in the number of challenging behaviours exhibited by the study group. At the five year follow-up point, the costs of their care had fallen, on average, by £160 per week, and 24 people had been able to move to more independent accommodation arrangements. Study members gained a new network of community service contacts, and used services provided by a greater variety of agencies. The indicators suggest that high expenditure on care for this group in the first years after they left hospital was justified retrospectively by overall improvements in the longer term.

An important policy lesson from the Friern reprovision study is that adequate funds should be reserved until the end of the closure programme to allow the investment of resources in provision for patients with the most severe problem behaviours.

A paper by Angela Hallam and Noam Trieman is in preparation, relating specifically to the cost-effectiveness of arrangements for people who were considered difficult to place. The paper will be available in the autumn of 2000. For more information, contact Angela Hallam at CEMH.

‘Mind how you go’: issues in the analysis of cost-effectiveness in mental health care

Daniel Chisholm

Introduction

The number of economic studies relating to mental health care has grown considerably over the past decade (Knapp, 1995; Hargreaves et al., 1998), reflecting an underlying demand for improved understanding of and increased evidence for the cost-effectiveness of alternative interventions, strategies or policies. As the volume of completed studies has risen, so in general has the standard of data analysis and presentation, in no small part due to the higher standards and expectations of peer-review journals and commissioning agencies (Drummond et al., 1996; Gold et al., 1996). In particular, increasingly sophisticated statistical and econometric methods are now being employed by researchers in a bid to overcome some of the difficulties associated with the analysis of cost and cost-effectiveness data. The aim of this article is to highlight some recurring features and problems of these types of data, and to offer discussion on alternative ways in which these problems may be managed.

Common features of cost data in mental health care

Economic analysis of mental health services to date has most commonly been conducted alongside clinical trials, allowing as they do the (prospective or retrospective) collection of individual service utilisation data at key assessment points of the clinical evaluation. (These data can be and have been subsequently incorporated into a range of non-experimental study designs, such as simulation studies and decision-tree analyses.) Resource utilisation data across a range of service components represent the ‘building blocks’ of economic analysis, since their collection, typically via the administration of a study-specific service receipt schedule, provides a comprehensive service profile to which unit costs can be attached. Unit cost estimates themselves may be imprecise or uncertain, since their estimation is commonly based on a very small sample of provider units and reflects the average (unweighted) cost per service user. In reality, the unit cost of daily care in, say, a psychiatric in-patient ward, varies markedly by setting, locality and the symptom severity of individual in-patients.

A fundamental feature of costs data in mental health care evaluation is that uptake of the range of specified service components, each with their differing cost implications, is highly variable. The result of this variability is that pooled individual service use and cost data tend to be highly positively skewed, reflecting the relatively heavy use of services by a small number of sampled individuals, and compounded if those services, such as in-patient care, carry high unit costs. The skewed distribution of costs has important consequences both for the design of the economic study and subsequent analyses of data.

In terms of design, the most notable problem concerns the statistical power of a study (the probability of avoiding a type II error, that is the decision not to reject the null hypothesis, when in fact it is false). The sensitivity of power calculations to the variance of the parameter(s) under investigation (as well as the effect size) means that the numbers needed to show a statistically significant cost difference between groups or over time may be very large, and may exceed the number necessary to show a clinical difference. Gray et al. (1997), for example, showed (retrospectively) that at 80% power, their case management study (N=30) was sufficient to detect between-group differences of approximately 30% for total costs, but to detect a 20% difference in health care costs alone over 700 subjects per arm would have been required! Such estimates of sample size requirements are not that uncommon (Sturm et al., 1999).

In terms of data analysis, the key implication of skewed cost data is that core assumptions underlying parametric statistical approaches (including normality of distribution, homoskedasticity and independence in the residual error) may not be satisfied, suggesting therefore that either non-parametric approaches or a process of data transformation may be required.

A number of questions are therefore provoked by consideration of these recurring features of cost data collection and analysis:

- for power calculations, what is a worthwhile difference in cost, and what is the appropriate unit of analysis?
- how can skewness of cost data be appropriately managed when comparing differences between intervention groups and when modelling relationships between cost and other variables?
- how should descriptive and multivariate cost data be reported?

Power calculation considerations

There is an increasing requirement to demonstrate that sufficient numbers of subjects are being recruited to and retained in a study, in order to show that a real difference in the parameter(s) under study has occurred, rather than a difference that could be attributable to chance. In the context of most economic studies of mental health services, the correct parameter upon which to base power calculations is *not* expected differences in cost alone; to show that an intervention is cost-effective, it would be sufficient to have equivalent cost and superior outcome. Rather, the parameter of concern in cost-effectiveness or cost-utility studies is the ratio of costs to outcomes, such as the cost per quality adjusted life year (QALY). Derivation of the variance for such a ratio, however, is complicated both by the absence of reliable and available data upon which to base estimates (it may be necessary to make assumptions about the expected change in mean cost, noting that the standard deviation is typically proportional to the mean), and also by the estimation process itself (two approaches suggested by O'Brien et al. (1994) for estimating two non-independent variance values are the Taylor Series Method and non-parametric bootstrapping; see below).

A further decision concerns what constitutes a worthwhile difference in cost-effectiveness (effect size). The answer to this will depend on the perspective of the study (for example, is the viewpoint that of the health service alone, or a wider perspective taking in other agencies including users and informal carers) and to an extent the societal burden of the disorder under investigation (a small cost-effectiveness advantage of 10% for one intervention over another in the treatment of a highly prevalent or costly mental disorder may be considered more politically attractive than an equivalent relative advantage for treating a rare or lower impact disorder). An indicative range to consider when determining the effect size (differences in cost-effectiveness) might be 10-50%.

In conclusion, and despite the tedium of doing so, undertaking a power calculation for the economic component of a trial represents an important study design task. Too many economic studies of the past have been seriously under-powered, which has inevitably reduced the conclusiveness of key findings. It is important to note that the final sample size required to show a significant economic difference may greatly exceed that required to show a significant difference in clinical effectiveness, which introduces loaded issues about the extent to which it is reasonable or affordable to extend the size of a trial on the basis of an economic question alone. At the very least, therefore, it is important to establish at the outset (to clinical collaborators and research funding agencies alike) what effect size is indicated by the clinically-determined sample size.

Management and reporting of cost data

Comparison of costs and cost-effectiveness ratios In a recent review of 45 randomised cost-effectiveness trials published in 1995, Barber and Thompson (1998) revealed the marked variability of reporting formats for costs data. 44% of the articles failed to use any statistical analysis to compare costs between groups, and of those who did only a half used appropriate tests of difference. Two common methodologies that have been used by researchers when faced with the prevailing problem of skewed costs data have been the use of median rather than mean values as the key measure of central tendency (with consequent reliance on non-parametric tests such as a Mann-Whitney U test), and transformation of the data onto a log or other scale. While use of the median may be useful for showing the 'typical' cost of a study subject, it does not capture the total or (arithmetic) mean cost of treatment and care, which is the measure of direct policy interest (Barber and Thompson, 1998). Confidence intervals around mean costs and differences in mean costs should be presented (not just standard deviations), since these provide a more informative measure of the magnitude of variability and effect size.

Standard non-parametric tests of differences in medians are not normally suitable, since these produce ranked data (rather than actual values) and ignore the influence of outliers. Likewise, while log-transformation of costs data may resolve the problem of skewness, the resulting test of difference between groups is on the geometric rather than the arithmetic mean. The estimated difference in log-costs (or any other non-linear transformation) of two treatments is not the same as the log of the estimated cost difference. Since logarithmic (or other) transformation of costs data and the use of standard non-parametric tests are usually inappropriate methods for dealing with skewed data when the focus of the study is on the comparison of group means, what can be done? One increasingly used approach to statistical inference in this situation is the non-parametric 'bootstrap', which makes no distributional assumptions, yet is able to generate standard errors and confidence intervals for the parameter of interest. Bootstrapping uses sampled data to estimate the distribution of the parameter of interest on the basis of re-sampling with replacement many times from the observed data (Efron and Tibshuani, 1993; Mooney and Duval, 1993). Statistical inference using this non-parametric bootstrapping method, which can be accomplished using such statistics packages as STATA, commonly reveals that parametric tests such as the t-test are in fact robust to non-normality (particularly if the study sample size is relatively large, the distribution of costs is not too severely skewed and if the extent of skewness is similar across groups; Barber and Thompson, 1998).

Table 1 provides an example of how differences in mean costs, outcome and cost-effectiveness — in this case for alternative interventions in the treatment of chronic fatigue (Chisholm et al., 2000)can be reported using bootstrapping techniques, and illustrates how bootstrapped confidence intervals are not substantially different to those obtained using normal parametric methods. It is important to note that although counselling appears to *dominate*, in the sense that this group shows superior clinical improvement and cost reduction, none of the between-group differences reach statistical significance (at the 5% level). A *post hoc* sample size calculation (with 80% power) indicated that at least double the number of participants would have been required in the trial to show such a difference in, for example, the observed costs of health care.

Multivariate cost analyses Skewness of cost data also presents problems for the modelling of costs and other variables through multivariate analysis, since again the key assumptions behind ordinary least squares (OLS) regression — normality of distribution, homoskedasticity and independence in the residual

Table 1 Costs and effects of two alternative interventions for chronic fatigue

	Counselling (N=65)		CBT (N=64)		Difference (Counselling minus CBT)	
Measure of change (0-6 months)	Mean change	(95% CI)	Mean change	(95% CI)	Mean	(95% CI)
Effectiveness measure (Chalder fatigue score)	-8.25	(6.7; 10.3)[a] (6.5; 10.0)[c]	-7.34	(5.3; 9.4)[a] (5.5; 9.1)[c]	0.90	(-1.60; 3.77)[b] (-1.80; 3.60)[c]
Cost measure (£, 1999) (Treatment and health care only)	+65	(-16; 146)[a] (-6.0; 146)[c]	+129	(11; 247)[a] (23; 242)[c]	-63	(-205; 78)[b] (-258; 42)[c]
Cost-effectiveness ratios (£ per unit change in fatigue score)	7.9	(-2.5; 18.2)[c]	17.5	(4.2; 41)[c]	-9.6	(-33; 8.5)[c]

Notes

a Confidence limits obtained via a two-sided paired t-test statistic
b Confidence limits obtained via a two-sided independent samples t-test statistic
c Confidence limits obtained via non-parametric bootstrapping (bias corrected; 1000 repetitions)

errors — may be broken. Where this is shown to be the case, for example by performing a Kolmogorov-Smirnov test of normality on the residual term, there are a number of alternative analytical strategies that can be considered.

Firstly, and in the same vein as two-group comparisons of mean costs, OLS regression coefficients can be re-estimated using non-parametric bootstrapping, thereby avoiding the strong distributional assumptions of parametric estimation. Independent variables that are significantly associated with cost can be identified in this way, and findings can be compared with those reached via conventional OLS estimation. In common with OLS estimation, however, the use of bootstrapping does not rule out the possibility that the underlying model may be misspecified (for example, the relationship between costs and age may not be linear).

An alternative method for addressing the related problems of skewness, outliers and heteroscedasticity is transformation of the cost dependent variable onto a logarithmic scale (Diehr et al., 1999). After log transformation, it is often found that residual errors are normally distributed. As mentioned above, however, transformation of costs onto a log-scale produces geometric mean values. Where the focus of interest is on reporting arithmetic mean cost results in the original units of currency, therefore, it is necessary to apply a factor that overcomes this 'retransformation problem', such as Duan's 'smearing factor' (Manning, 1998).

A final method that can be considered in order to explore the possibility that alternative models with differing distributional assumptions might fit the study data better is generalised linear modelling (GLM), using for example a gamma distribution with a log-link function (Diehr et al., 1999). The usefulness of GLM models as an alternative to log-normal models can be assessed by comparing such diagnostics as the deviance and kurtosis (lower deviance suggests a better model, while kurtosis greater than 3 suggests that the log-normal OLS model is preferable to the GLM; Manning, 1998).

Table 2 provides an example of how these separate strategies were applied to a pooled data set of people with schizophrenia living in five European countries, involving successive OLS estimation on the untransformed and log-transformed cost data, followed by the generalised linear model (Knapp et al., 2000). The robustness of the OLS models was investigated using Kolmogorov-Smirnov tests for the normality of the residuals, and visual examination of plots of the residuals against the independent variables. These diagnostics were generally satisfactory for the log-normal model except that the kurtosis of the residuals for certain models was high (>3); furthermore, there was slight evidence for

Table 2 Schizophrenia in Europe: pooled multivariate cost analyses
Dependent variable = Total annual service cost (£UK PPP[a], 1998)

	Pooled site equations (N=385)				
	OLS model (£, PPP)	OLS log-normal model (£ log, PPP)		GLM (log-gamma) model (£, PPP)	
Variable	β	β	Exp (β)	β	Exp (β)
Constant term	*11873*	*8.407*		12.827	
Site 2 (Copenhagen)	*4647*	-0.022	0.978	0.734	2.083
Site 3 (London)	1279	0.108	1.114	-0.171	0.842
Site 4 (Santander)	-1611	***-1.871***	***0.154***	*-1.240*	*0.289*
Site 5 (Verona)	1945	-0.096	0.909	0.535	1.708
Gender (0 = female; 1 = male)	1122	***0.383***	***1.466***	0.341	1.407
Psychiatric admissions (total)	***284***	***0.053***	***1.055***	*0.052*	*1.053*
GAF score	**-66**	***0.022***	***0.978***	*-0.020*	*0.980*
CAN met needs score	*595*	***0.119***	***1.126***	0.090	1.094
VSSS mean score	**-2234**	-0.251	0.778	*-1.151*	*0.316*
R^2, Adjusted R^2	0.125, 0.104	0.295, 0.278			
K-Smirnov test (p value) (standardised residuals)	4.85 (<0.001)	0.888 (0.409)			
Sum sq. residuals / deviance		1190		994	

Notes

a PPP refers to purchasing power parities, an alternative mechanism to exchange rates for the conversion of different currencies.

Coefficients in *italics* are significant at p<0.05 (estimated parametrically); for OLS models only, coefficients in **bold** are significant at p<0.05 (estimated by a non-parametric bootstrap, 1000 repetitions) and coefficients in ***bold italics*** are significant at p<0.05 under both estimation approaches.

heteroscedasticity by site. The non-parametric correction factor (Duan's smearing factor) was applied to the site coefficients from the log-normal model, retransformed on to the original scale so that comparisons with the GLM model could be made. Whereas the meaning of the coefficients on the original scale is straightforward (for example, being male carries an additional cost of £1,122, other things being equal), the interpretation of the (exponentiated) log-normal and log-gamma coefficients is closer to a logistic regression (men have an additional cost of more than 40%).

The above tabulated analysis is an example of a one-stage model, referring to the fact that all cases were included irrespective of whether services were actually used or not. One final analytical strategy is to split cases into those who use a service and those who do not (via logistic regression), and then estimate costs for service users only (via OLS linear or log-linear regression models). Employment of two-stage models, such as Heckman's two-part selectivity model (Heckman, 1979), is appropriate where the focus of interest is on exploring the utilisation of a particular resource such as in-patient care, but is less suitable when considering the effect of covariates on total costs due to added difficulties of interpretation (it is necessary to multiply the likelihood of using a service, obtained in the first-stage equation, by the expected amount estimated by the second-stage equation). A more detailed set of recommendations around the respective use of one- or two-stage models is provided by Diehr et al., 1999.

Conclusion

As the number of and demand for economic studies in mental health care rises, there is a growing need for standardisation in the analysis and reporting of costs data, so that research findings can be compared and/or aggregated. The application of appropriate statistical and econometric methods of analysis, together with the sufficient powering of studies, represent two important facets of this process of standardisation which need to be actively pursued if cost-effectiveness studies are to contribute usefully to mental health policy and decision-making.

Acknowledgements

Participants of CEMH/PSSRU mental health economics workshop (February 1997).
Presentation by Professor Simon Thomson at CEMH, Institute of Psychiatry (July 1998).
Informal discussion and/or collaborative work with Pak Sham, Andrew Pickles, Morven Leese and Paul McCrone (all current or recent employees of the Institute of Psychiatry).

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Key points

- ☐ For economic analysis alongside clinical trials, it is important (if challenging) to perform a power calculation in order to establish the likely number of subjects needed to demonstrate a significant economic difference between groups.
- ☐ When comparing costs across groups, use should be made of the arithmetic mean cost rather than the median cost or log-transformed/geometric mean cost.
- ☐ Non-parametric bootstrapping is a viable technique for overcoming the common problem of skewed data, and often confirms the results of standard parametric tests.
- ☐ Multivariate analysis of costs data requires careful consideration and the potential specification of a series of alternative models in order to ascertain the model that best fits the data.

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