

The Maudsley long-term follow-up of child and adolescent depression

3. Impact of comorbid conduct disorder on service use and costs in adulthood

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Background Depression in childhood or adolescence often has morbidity implications continuing into adulthood, generating needs for specialist services and support.

Aims To estimate the patterns of service use and costs in adulthood of former patients.

Method Service use and other cost-related data were collected from former patients. Comparisons were made between those people with and without comorbid conduct disorder in childhood and with data for the general population.

Results Data on 91 people with depression (only) and 49 with comorbid conduct disorder revealed high adulthood service utilisation rates and costs. In-patient care and criminal justice services were used more frequently by the comorbid group and total costs were significantly higher. There were also indications of higher service use by the comorbid group than the general adult population.

Conclusions The high and enduring long-term costs associated with childhood depression and conduct disorder give further reason for early and effective intervention.

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The Maudsley long-term follow-up of childhood and adolescent depression has found strong threads of continuity in psychiatric morbidity running through to adulthood (Fombonne *et al*, 2001a,b). The aims of this study were to examine patterns of service use and costs for adults who as children were treated for depression; to compare those who had major depressive disorder (MDD) with those who had depression and comorbid conduct disorder (CD–MDD); and to explore whether personal, family and situational characteristics in childhood are related to service use patterns and cost levels in adulthood. In this paper we focus on the first and second of these aims. While it is increasingly being recognised that economic studies are needed in the mental health field, there are precious few in relation to the problems of childhood and adolescence, and fewer still that follow up patients into adulthood (Knapp, 1997; Knapp & Henderson, 1999).

METHOD

Sample

The sample was drawn from those adults who as children attended the Child and Adolescent Psychiatric Department of the Maudsley Hospital (south London) between 1970 and 1983. The Maudsley Item Sheet database was searched, as described in full by Fombonne *et al* (2001a), to identify 245 children who met DSM–IV criteria for major depressive disorder with or without conduct disorder (American Psychiatric Association, 1994). The interviews covered lifetime rates of affective disorders and other psychiatric disorders; social dysfunction in key domains of adult life; family psychiatric history; childhood experiences of care and abuse; adverse life events; social support networks; and patterns of service use. Interviewees completed self-report assessments of self-esteem, self-efficacy, personality, beliefs and assumptions about

oneself, emotional disturbance and associated somatic symptoms, depressive symptomatology and attributional style. Criminal Records Office (CRO) files were examined for criminal history data. Interviews were conducted with 149 participants, and the representativeness of the sample for whom cost data were obtained ($n=140$) was examined by comparison with those for whom service use data were unavailable.

Service use measurement

Recognising that there are potentially many health and other consequences of childhood mental illness, we adopted a wide-ranging approach to measuring service use. For this purpose we employed a customised adaptation of the Client Service Receipt Inventory (CSRI) (Beecham & Knapp, 1992, 2001).

In the interviews we asked about the use of psychiatric in-patient stays, psychiatric out-patient attendances, general hospital in-patient stays, general hospital out-patient attendances, contacts with the police, prison terms served, court attendances and contacts with probation officers from the age of 17 years until the interview date. Other services, expected to be used more frequently, were measured for a 6-month period: these were general practitioners, psychiatrists, psychologists, community psychiatric nurses, other nurses, social workers, counsellors and day care. Subjects were asked to provide details of the number of contacts with each service and their duration. The uptake of some services was relatively low. Consequently, the psychiatrist and psychologist categories were combined, as were the various criminal justice services and general health care services (general practitioners and nurses).

Cost calculation

Service use data were combined with appropriate unit costs to generate service costs per subject. Unit costs for 1996–1997 were obtained from a recognised national source (Netten & Dennett, 1997) and supplemented from a previous study (McCrone *et al*, 1998) with adjustments to 1996–1997 values.

Costs were presented (and analysed) as annual figures. Therefore, costs of services used since age 17 years were divided by the number of years elapsed between then and the interview date, and costs for services measured over a 6-month period were multiplied by two.

Using unpublished unit cost figures from the Home Office we calculated total and annual crime costs for each participant from their CRO records. These Home Office costs primarily include expenditure by the criminal justice system. We reported these costs separately to ensure that we did not double-count, as criminal justice service contacts were also recorded from the interviews.

Statistical analyses

The representativeness of the costed sample was tested by comparing it to the subjects for whom cost data were not available. Chi-squared tests were conducted for categorical variables. The proportions of subjects in the two groups (depression without or with conduct disorder) using each service (or group of services) were compared using logistic regression, controlling for gender and age. Controlling for age was particularly important because sample members had different exposure times for services since age 17 years. The dependent variable used in the logistic models took the value 1 if the service was used and 0 if it was not. Independent variables were group (1 indicating depression with conduct disorder, and 0 without), gender (1 for men, 0 for women) and age in years.

Regression analyses were used to compare service costs between the groups with and without conduct disorder. The dependent variable was the annual cost of each service in turn; independent variables were again group, gender and age. Cost data are often highly skewed, because a substantial number of subjects may have no contact with a specific service whereas a small number may have a very high level of utilisation. Non-normality of cost variables is only a problem in regression analysis if the regression residuals are themselves not normally distributed, in which case a method such as bootstrapping can be employed (Thompson & Barber, 2000). Bootstrap regression was used here. We generated 1000 random samples with replacement from the original data-set, each the same size as the original. Regression coefficients were calculated on each of the 1000 re-samples, the distribution of the coefficients for the group variable was observed, and the probability calculated that in the population this coefficient would equal zero (Mooney & Duval, 1993).

Finally, the figures for service use were compared with data from the general

population. Comparisons could not be made for all services because national data are not as comprehensive as data collected for this sample, nor were they straightforward because the period over which service use was measured differed.

Analyses were carried out using SPSS version 7 (SPSS, 1997) and STATA release 6 (Stata Corporation, 1999).

RESULTS

Sample size and characteristics

For the period 1970 to 1983, a total of 5380 children were recorded in the database maintained by the Child and Adolescent Psychiatry Department, 935 of whom had depressive syndromes. Ratings were made from case notes for 645 of them. Of the 245 people who met criteria for DSM-IV major depressive disorder, 8 had died (6 CD-MDD, 2 MDD), 48 could not be traced, and 40 either refused to be interviewed or repeatedly failed to keep appointments with interviewers. Of the remaining 149 who were successfully interviewed in adulthood, 53 had had CD-MDD in childhood. Service use data were missing for 9 of these 149 people, leaving 91 with MDD (when a child) and 49 with CD-MDD.

A majority (61%) of the 140 participants were female and the average age when first attending the Maudsley was 13.8 years (depression group) and 14.1 years (comorbid group). A significantly

greater proportion of the MDD group lived with two parents and this group also had a significantly higher average IQ score (although this was measured only for 84 subjects). Fombonne *et al* (2001a,b) have described the sample along these and various other dimensions, and we do not repeat the details here. There were few statistically significant differences (at the 5% level of significance) between the costed sample ($n=140$) and those for whom cost data were not obtained ($n=9$). As children, members of the costed sample group were significantly more likely to have received individual therapy (66% *v.* 25%, $P=0.019$) and their parents were more likely to have received counselling (49% *v.* 0%, $P=0.007$). Of the costed sample 49 (35%) had had CD-MDD as children, and in the non-costed sample the figure was 4 (44%) ($P=0.721$).

Service use patterns

Utilisation rates were quite high, both for services used since age 17 years and for those used in the 6 months immediately prior to interview (Table 1). For example, 12 (13%) people with MDD in childhood and 13 (27%) people with CD-MDD had at least one psychiatric in-patient admission since age 17. For psychiatric out-patient services the respective proportions were 22% (20) and 31% (15) and for criminal justice services 36% (33) and 65% (32); the

Table 1 Number and percentage of adults using services during follow-up period

Service	MDD ($n=91$) No. (%)	CD-MDD ($n=49$) No. (%)	OR ¹ (95% CI)	P
<i>Since age 17 years</i>				
General hospital in-patient	55 (60)	35 (71)	2.25 (0.98–5.19)	0.056
General hospital out-patient	64 (70)	39 (80)	1.57 (0.68–3.64)	0.288
Psychiatric hospital in-patient	12 (13)	13 (27)	2.81 (1.12–7.01)	0.027
Psychiatric hospital out-patient	20 (22)	15 (31)	1.71 (0.76–3.87)	0.194
Criminal justice services ²	33 (36)	32 (65)	3.52 (1.62–7.65)	<0.001
<i>During preceding 6 months</i>				
General health ³	69 (76)	37 (76)	1.03 (0.46–2.34)	0.934
Psychiatrist/psychologist	6 (7)	3 (6)	1.01 (0.24–4.31)	0.989
Social worker	5 (5)	5 (10)	2.06 (0.55–7.65)	0.282
Community psychiatric nurse	5 (5)	2 (4)	0.84 (0.15–4.63)	0.843
Counsellor	8 (9)	4 (8)	0.92 (0.26–3.27)	0.894
Day care	4 (4)	1 (2)	0.46 (0.05–4.27)	0.492

CD, conduct disorder; CD-MDD, major depressive disorder with comorbid conduct disorder.

1. Odds ratio (odds of comorbid group using service compared with depression group).

2. Police, probation, court attendances, prison.

3. General practitioners, general nurses.

proportions for use of prison were 2% (2) and 14% (7).

The proportions of children treated for CD-MDD who had used psychiatric in-patient and criminal justice services since age 17 years were significantly ($P < 0.05$) higher than for those treated for MDD as children (Table 1). There was also a trend for this group to make more use of psychiatric out-patient and general hospital in-patient and out-patient services. Looking at the 6-month period before the follow-up interview, 76% (both groups) had seen their general practitioner at least once (the average number of contacts was 2.15 for the MDD group and 2.55 for the CD-MDD group), and 4–10% had consulted a psychiatrist, social worker, community psychiatric nurse or counsellor.

Service costs

Annualised costs indicate intensity of use, weighted by their resource implications. The largest cost elements, not surprisingly, were associated with psychiatric and general in-patient service use (Table 2). Criminal justice service use since age 17 years was high for the CD-MDD group but not for the MDD group. In the 6 months before the follow-up interview, highest costs were

associated with general health care, social worker contacts (particularly for the CD-MDD group) and day care.

The annualised costs of some individual services were significantly higher for the CD-MDD than the MDD group, notably general hospital out-patient visits and criminal justice services, after adjusting for gender and age. Even when differences were not statistically significant, the trend was for costs to be higher for CD-MDD than for MDD, with the exception of day care. Overall, the annualised total cost for the CD-MDD group (£1372) was more than twice that of the MDD group (£631, $P = 0.015$).

The distribution of service costs was substantially skewed. The median annual cost for the MDD group was £147 with a range of £0 to £7327. For the CD-MDD group the median was £326 and the range was £5 to £7532. The difference in costs was again found to be statistically significant ($P = 0.031$) when the Kruskal-Wallis non-parametric test was used.

Crime costs

The annualised costs of crimes committed since age 17 (based on CRO data) were

significantly higher for the comorbid group (mean of £179) than for the MDD group (£32) (bootstrapped t -test, $P < 0.001$). Again, there was a wide variation in the crime costs (85% of the MDD group and 61% of the CD-MDD group had no crime costs). The maximum annualised crime costs were £522 and £2208 for the MDD and CD-MDD groups respectively.

Cost contributions

In-patient care accounted for 57% of the service costs for the MDD group and 51% of the costs for the CD-MDD group (Table 3). Legal services accounted proportionately for eight times as much cost in the CD-MDD group compared with the MDD group.

Comparison with population data

Use of prison

In the general population it has been estimated that approximately 4% of people who were born in 1953 had received a custodial sentence by the time they were aged 40 (Home Office, 1999a). In this study (where all subjects were aged 25–43 years) we found that 2% (95% CI 0–8%) of subjects who had had MDD as children and 14% (95% CI 6–27%) of those who had had CD-MDD had spent some time in custody since the age of 17. Comparing the population figure to the 95% confidence intervals reveals that the CD-MDD group are significantly more likely to be imprisoned. Some of these people would have been remanded to custody rather than given a custodial sentence, although we do not know the proportions. Official figures reveal that approximately 29% of those in custody are on remand (Home Office, 1995, 1999b). Even allowing for the likelihood that some of the CD-MDD group with custodial stays were only ever remanded and not sentenced, it is still probable – particularly given that the average age of this sample was less than 40 years – that subjects who had had CD-MDD were much more likely to be imprisoned than the general population average, whereas the MDD group were similar to the general population.

Use of out-patient care

Based on the rate of out-patient appointments per year (psychiatric and general health), which we assumed to be constant, we estimated (using a cumulative Poisson distribution) that 15% (95% CI 9–24%)

Table 2 Annualised service costs per patient (1996/7 £s)

Service	MDD (n=91)		CD-MDD (n=49)		P
	Mean	s.d.	Mean	s.d.	
<i>Since age 17 years</i>					
General hospital in-patient	161	585	270	653	0.235
General hospital out-patient	32	57	81	130	0.003
Psychiatric hospital in-patient	193	893	422	1148	0.101
Psychiatric hospital out-patient	64	432	79	242	0.723
Criminal justice services ¹	11	65	232	805	0.011
Total lifetime costs per year	462	1133	1085	1790	0.015
<i>During preceding 6 months</i>					
General health ²	51	65	65	120	0.375
Psychiatrist/psychologist	13	58	15	66	0.995
Social worker	22	92	150	619	0.067
Community psychiatric nurse	5	32	9	45	0.627
Counsellor	19	80	12	65	0.549
Day care	58	425	36	254	0.631
Total 6-month costs per year	169	513	287	798	0.293
Total service costs	631	1324	1372	2209	0.015
Costs of crime since age 17 years	32	91	179	425	<0.001

CD, conduct disorder; CD-MDD, major depressive disorder with comorbid conduct disorder.

1. Police, probation, court attendances, prison.

2. General practitioners, general nurses.

Table 3 Contribution of services to annualised total cost

Service	MDD	CD-MDD
	(n=91) %	(n=49) %
<i>Since age 17 years</i>		
General hospital		
In-patient	26	20
Out-patient	5	6
Psychiatric hospital		
In-patient	31	31
Out-patient	10	6
Criminal justice services	2	17
Subtotal	73	79
<i>During preceding 6 months</i>		
General health	8	5
Psychiatrist/psychologist	2	1
Social worker	3	11
Community psychiatric nurse	1	1
Counsellor	3	1
Day care	9	3
Subtotal	27	21
Total	100	100

CD, conduct disorder; CD-MDD, major depressive disorder with comorbid conduct disorder.

of the MDD group and 39% (95% CI 25–54%) of the CD-MDD group would have had an appointment during the previous 3 months. In 1993 it was estimated that 16% of the general population aged 16–44 years would have had out-patient or accident and emergency clinic contacts during such a period (Foster *et al*, 1995). Therefore, the CD-MDD group were 2.4 times more likely than the general population to have used this type of service and this was statistically significant, whereas the MDD group were fairly similar to the population norm.

Use of in-patient care

In a similar manner we estimated that 12% (95% CI 6–21%) of the MDD group and 22% (95% CI 12–37%) of the CD-MDD group would have been in-patients during the previous year (psychiatric and general hospital stays combined). This compares with 9% of the general population between the ages of 16 and 44 years (Foster *et al*, 1995). Therefore, we see a higher rate of use of services for the CD-MDD group (by a factor of 2.6) compared with the

general population and also an increased likelihood for the MDD group, although the latter is not significant at the 95% level of confidence.

Use of GP care

We found that the mean number of general practitioner (GP) contacts during the previous 6 months was 2.2 for the MDD group and 2.6 for the CD-MDD group. If we assume a constant rate of GP contacts over the year then we have annual averages of 4.4 (95% CI 3.4–5.4) and 5.2 (95% CI 3.1–7.3) respectively. In the general population, the mean number of GP contacts in 1993 for those aged 16–64 years was 5 (Foster *et al*, 1995).

DISCUSSION

Importance of findings

Children with conduct disorder and/or depression can generate quite high costs in childhood (Knapp *et al*, 1999), but there are few published studies of the economic consequences of mental health problems in childhood or adolescence, or of their treatment. Among the exceptions are Siegert & Yates (1980), Bickman *et al* (1996), Greenwood *et al* (1996), Byford *et al* (1999), Knapp *et al* (1999) and Leibson *et al* (2001). There have been few published UK studies to date that have followed children with disorders through into adulthood and examined the economic consequences, although other work is emerging (Scott *et al*, 2001). The study reported here is therefore unusual in its focus.

Limitations

Although the service and crime costs for the CD-MDD group are high, they are likely to be an underestimate of the true costs. For instance, the costs of lost employment as a result of ill health have not been included, nor have the costs associated with the high levels of suicide and suicide attempts (Fombonne *et al*, 2001b).

The comparisons between the service use data reported here and population figures also need to be treated with caution because the periods over which measures were taken were not the same. In particular, the *General Household Survey* (Foster *et al*, 1995) measures service use for the previous year or the previous 3 months. In order to make comparisons we have assumed a constant rate of service use which may not necessarily hold true. Nevertheless,

the comparisons do indicate that members of the MDD group have a similar level of use of criminal justice and out-patient services and a trend towards greater use of in-patient care than the general population, while the CD-MDD group use all these services substantially more than the general population. However, no clear differences can be detected between these groups and the general population with regard to general practitioner care. The finding that the MDD group did not appear to be high service users compared with the general population is of prime importance. However, caution is necessary as the range of services for which we could make such comparisons was limited. It is unlikely that the average annual care cost of £631 would be matched in the general population. Although we were able to compare proportions of people using in-patient care and being imprisoned, we were not able to compare lengths of stay, which are clearly important 'drivers' of cost.

Previous findings

Although no previously published study has made comparisons of costs for children with MDD and CD-MDD, the large body of international evidence (as reviewed by Maughan & Rutter, 1998) of impaired personal development and social functioning for adults who had CD-MDD as children would suggest that service use and costs are high. In an American study comparing adult mental health service users who had also received child psychiatric services with those who had not received child services, Woodward (1995) found that the former group had higher levels of service use and also were more likely to have been involved in criminal activity as adults. The adulthood follow-up of a conduct disorder sample by Scott *et al* (2001) found substantial costs through to age 28 years, particularly linked to criminality. In another American study, Weissman *et al* (1999) found that 55% of adults who had had MDD were admitted to hospital for psychiatric reasons during a follow-up period of some 10 years, and 45% were admitted for medical reasons. The respective figures for a 'healthy' comparison group were 5% and 19%. The figures for the MDD subjects in that study were, therefore, much higher than those reported here. Some of the difference in admissions between American and UK MDD subjects may be due to idiosyncrasies in the respective health care systems, but other factors may also be influential.

Implications

The House of Commons Health Committee looked at child and adolescent mental health services a few years ago. They commented that:

The cost of conduct disorder, 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: p. xxiii).

If the sentiment in this quotation is extended to include childhood depression, it is clear from the findings of the present study that the interpretation of 'cost-effective' needs to be broadened to range beyond the childhood years. There are high, and certainly enduring, costs associated with childhood depression and especially with comorbid conduct disorder. Early, effective interventions could do much to reduce these cost consequences while also improving the quality of life of the individuals concerned.

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CLINICAL IMPLICATIONS

■ Children with comorbid depression and conduct disorders have higher adulthood service use and costs than those without conduct disorder, and also than those of the general population.

■ The cost of criminal justice services associated with comorbid depression and conduct disorder is substantially greater than with depression alone.

■ Treatment strategies need to take into account the long-term resource implications of childhood mental health problems.

LIMITATIONS

■ Many subjects were lost to follow-up. It is possible that these had different service use and cost profiles to those who were followed up.

■ The estimated costs were underestimates of the true costs.

■ Service use and costs were not directly measured for a general population sample, although secondary comparisons could be made.

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