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# Cost-effectiveness of multisystemic therapy versus usual treatment for young people with antisocial problems

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ABSTRACT

**Background** *Behavioural problems are common among adolescents. The burden on society in social disturbance, health, failures to contribute and costs has triggered innovative community-based interventions such as multisystemic therapy (MST).*

**Aims** *Our aim was to compare the cost-effectiveness of MST and treatment as usual (TAU).*

**Methods** *Cost-effectiveness was assessed alongside a randomised clinical trial. One hundred and sixteen adolescents were allocated to MST or TAU. Follow-up lasted six months. Quality of life (EQ-5D) as perceived by the adolescents was the primary outcome. A societal perspective was used for cost assessment.*

**Results** *There was no significant difference between groups in the small improvement experienced in quality of life (EQ-5D average score improvement in both 0.02 points, standard deviation 0.13 MST; 0.23 TAU). Dropout before follow-up was 48% and 69% respectively. Overall costs attributed to these young people were, however, 50% lower in the MST group. The incremental cost-effectiveness ratio (ICER) was 384,633€ (95% CI: −2,001,433 to 2,024,681€), which indicates dominance of MST over TAU.*

**Conclusions/Implications for practice** *Our study shows that, at worst, MST offers no advantage to young offenders in terms of their experienced quality of life, but 'TAU' included family focused intervention as well as standard supervision.*

*There were some cost advantages for the individual and his/her family in the MST group, but substantial cost benefits for wider society. The case for a large, multi-centre, perhaps international trial is strong as widespread implementation of MST would benefit everyone if these findings are confirmed. Copyright © 2016 John Wiley & Sons, Ltd.*

## Background

Estimates of rates of behavioural problems among adolescents vary from 10 to 25% (Reijneveld et al., 2014), with serious consequences, including costs, both for the individual and society (Knuutila, 2010; Algemene Rekenkamer, 2012; Cary et al., 2013; Ter Bogt et al., 2003). Disruptive and aggressive behaviour during adolescence has been associated with dropping out of school, criminal involvement, incarceration, psychological disorders and low employment (Ogden and Hagen, 2008; Loeber et al., 2010; Smith & Smith, 2010). In addition to the detrimental effects on health and social functioning, the disruptive and aggressive behaviour of adolescents also has economic implications. The estimated direct costs of incarceration range from 114,000 to 250,000 euros per adolescent per year (Knuutila, 2010; Algemene Rekenkamer, 2012; Cary et al., 2013). As for a life in crime, Cohen (1998) estimated this cost to society, updated to 2010 figures by Foster (2010), to be more than 2,000,000 US dollars per criminal and family. In addition, Smith and Smith (2010) estimated that, in the long run, psychological conditions in childhood may lead to an average reduction in later annual family income of about 10,400 US dollars per family. This means that when these children are adults, they will earn about 20% less than their healthy peers. Should this effect persist during adulthood, it would translate into a lifetime loss in family income of about USD 300,000.

The burden on adolescents' health and social functioning, along with the high cost of incarceration, has led to a number of new community-based intensive interventions to reduce or resolve these behavioural problems. Some studies have reported on the effectiveness of these. Examples are multisystemic therapy (MST) (Henggeler et al., 2009) and functional family therapy (FFT) (Alexander & Robbins, 2010). MST has been the most studied. The first studies of its effectiveness compared with usual treatment were performed in the USA. In general, these studies reported significant reductions in the number of serious crimes committed and days in incarceration for the MST groups (Schaeffer & Borduin, 2005; Butler et al., 2011; Sawyer & Borduin, 2011). However, studies performed in other countries, such as Sweden and Canada, showed no significant differences between MST and usual treatment (Leschied & Cunningham, 2002; Sundell et al., 2008). One possible explanation might be a higher standard of 'usual treatment' in countries outside the USA.

Studies on the cost-effectiveness of such interventions, including MST, are scarce. This results in poorly informed policy decisions involving the reimbursement of innovations in care. The few studies which have reported on the cost-effectiveness or cost-benefit of MST compared to usual treatment (Aos et al., 2004; Klietz et al., 2010; Olsson, 2010; Cary et al., 2013) do present positive findings but, again, only for the USA.

Additional cost-effectiveness research is warranted for two reasons. First, standard care for adolescents with antisocial behaviour in European countries like the Netherlands differs considerably from the standard care described in previous studies. In the USA, for example, the amount of medication given to young people with disruptive behaviours is much higher than in the Netherlands (Garland et al., 2010). In addition, in European countries such as the Netherlands and Sweden, unlike the USA, community-based care and supervision are offered more often (Sundell et al., 2008). These differences may well mean that US findings cannot be generalised. The conclusions reached with regard to the benefits of a therapeutic approach like MST compared to standard treatment are, at best, a point of departure for planning future research in the Dutch setting.

Our aim, therefore, was to compare the balance between societal costs (comprising all relevant costs regardless of who pays for them) and the effect of MST on the adolescents with adolescent outcomes and costs of 'treatment as usual' (TAU) for adolescents with serious behavioural problems in the Netherlands.

## Methods

This cost-effectiveness study was conducted alongside the MST-effectiveness study (Asscher et al., 2007; Deković et al., 2012), so cost data were collected prospectively as part of the Randomized Controlled Trial (RCT).

### Design of the effectiveness study

The MST-effectiveness study was a randomised controlled trial in which 116 adolescents were randomly assigned to MST or TAU. Adolescents, aged between 12 and 18 years, who had been chronically antisocial and also seriously violent were considered eligible. Most of the adolescents were referred by family guardians from the Youth Care Office. A minority were referred by various other referral agencies, including the Child Protection Council, juvenile judges, youth care agencies and local referral agencies. Data were collected from March 1st, 2008 until July 31st, 2012. Details of the design, inclusion criteria and randomisation procedure have been published elsewhere (Jansen et al., 2013).

*Interventions*

MST is an intensive, short term, home- and community-based intervention for families of young people with severe psychosocial and behavioural problems. It may be considered as an alternative for out-of-home placement. In consultation with family members, therapists identify a set of treatment goals and then links the various systems in which an adolescent is involved, including family, peer group, neighbourhood and school into the treatment. Therapists are available seven days a week, 24 hours a day. Average duration of the therapy is four to six months.

The routinely offered forms of treatment for adolescents with severe psychosocial and behavioural problems which made up 'TAU' included juvenile justice and child welfare services. In our study, TAU mainly consisted of FFT, which is a family-focused, community-based programme intervening with the family of the adolescent with the aim of improving relationships within the family (Alexander & Robbins, 2010). The key issues are the responsibility of all family members, along with a positive attitude towards solving the problems. Planned weekly sessions with a therapist are offered in an outpatient setting and occasionally at the family home. The average duration of FFT is three to four months (Alexander & Robbins, 2010).

*Data collection procedure*

Data were collected by standardised self-report questionnaire, administered in person, prior to the intervention (T1), directly after the intervention (T2), about five months after inclusion and six months after treatment had stopped (T3). Adolescents and their parents both received 10 euros after filling out a questionnaire.

*Primary outcome measure*

The primary outcome measure was the between-group differences (MST versus TAU) in change in quality of life measured with the EuroQol five dimensions questionnaire (EQ-5D) from baseline through to six months after cessation of treatment, according to the adolescent and according to the parent/caregiver. The EQ-5D is a preference-based generic health-related quality of life instrument (Macran et al., 2003), well used internationally. It has five health dimensions: mobility, self-care, usual activities, pain/discomfort and anxiety/depression. Each dimension has three levels: no problems, some problems and extreme problems. The combination of the number of dimensions and of ratings within each means that it can yield scores for up to 243 health states. The algorithm developed by Dolan (1997) is widely used in economic evaluations and is sometime referred to as the 'UK tariff'. We chose this algorithm, instead of the Dutch tariff, to

facilitate comparisons. Health state values based on this algorithm vary between −0.59 and 1.00 (perfect health), while deceased is considered to equal 0.00. Values lower than zero mean that the person rating considers that his/her state of health is 'worse than being dead'.

Secondary outcomes were aggression and delinquency. Subscales of the Child Behavior Checklist (CBCL) (Verhulst et al., 1990), with 33 items, were used as a measure of parental perspective; the Youth Self Report (YSR) (Achenbach, 1991; Verhulst & Van der Ende, 1992), with 30 items, was the measure of the adolescents' perspective. For each item in both instruments, the behaviour of the child has to be rated on a 3 point scale ranging from 0 (never) to 2 (often).

*Resource use and costs*

Health and additional care consumption of adolescents with antisocial behaviour and the associated costs incurred by the parents were measured using a modified version of the Trimbos/iMTA questionnaire for costs associated with psychiatric illness (TiC-P) (Hakkaart-Van Roijen, 2002). This questionnaire was originally designed to measure the direct and indirect costs of mental health problems. For our study, we adapted the questionnaire to a version more suitable for assessments of costs related to young people with antisocial behaviour (Bouwmans et al., 2012). We did this by adding items about youth and social care that we expected to be important resource units. Direct costs of the adolescent included: visits to various types of care professionals such as psychologist, psychiatrist, social worker, general medical practitioner, medical specialist, remedial teacher; hospitalisations; residential treatments (including detention centres); contact with judicial authorities; contacts with centres for addiction care; contacts with youth care institutions; medication use; and out-of-pocket expenses. Direct costs of the parent consisted of the same items and were included only if the care consumption was related to their child's problems. Finally, productivity losses and travelling expenses were included.

Costs of the interventions under study (MST and TAU) were assessed through various informants: adolescents, their parents and professionals. Direct costs comprised all resources directly related to the intervention. Indirect costs entailed productivity loss of parents because of time lost from work because of the antisocial behaviour of their child (Drummond et al., 2005). Data on productivity loss were collected using the Short Form Health and Labor Questionnaire (SF-HLQ) that is part of the TiC-P (Hakkaart-Van Roijen, 2002). The SF-HLQ contains questions about absence from work, reduced efficiency at work and difficulties with job performance.

Estimates of unit costs such as visits to care professionals, hospitalisations, residential treatments, contact with judicial authorities and medication use were based on the Dutch guideline prices (Hakkaart-Van Roijen, 2002; Bouwmans et al., 2012). The publication by Bouwmans and colleagues gives a complete

overview of the Dutch reference prices. For direct costs related to the intervention (MST), no reference price was available, and therefore it was estimated through the review of (time) investment on the part of the professionals, including training, overheads, communication with relevant others. These activities were valued based on average salary costs; travel expenses of the MST professionals were added.

Costs related to parental productivity loss were computed based on the overall mean hour productivity costs for men and women, calculated according to the human capital approach (Drummond et al., 2005; Bouwmans et al., 2012). Multiplying volumes of resource use by their corresponding unit prices resulted in the associated costs. Costs were calculated in euros, at 2011 prices.

### Statistical analyses

Descriptive statistics were used to present the background characteristics of the adolescents included in each group and of their parents. EQ-5D, CBCL and YSR data were described. Paired t-tests were used for *post hoc* comparisons within groups. Unpaired t-tests were used for comparisons between groups. Mean costs per adolescent/parent were calculated for each group. Because of skewed distributions, no statistical testing could be performed for between-group cost differences.

In the cost-effectiveness analysis, mean costs were linked to the EQ-5D, CBCL and YSR scores. By dividing the between group difference in costs by the difference in effect, according to the formula (Costs MST − Costs TAU)/(Effects MST − Effects TAU), an incremental cost-effectiveness ratio (ICER) was computed (Drummond et al., 2005). This ICER depicts the amount of money that has to be invested to gain 1 point improvement on the scales mentioned.

Complete cost and effect pairs were used, and uncertainty surrounding the ICERs was estimated using bootstrapping of the cost and effect pairs. Bootstrap re-sampling, with 5000 replications of the trial data, was used to estimate alternative 95% confidence intervals (CI), based on the 2.5th and 97,5th percentile of the rank-ordered bootstrap estimates.

In addition, a cost-effectiveness plane was constructed, depicting the 5000 bootstrap replicates, divided over four quadrants (NE: more effective and more costly; NW: less effective and more costly; SW: less effective and less costly; SE: more effective and less costly). Finally, a cost-effectiveness acceptability curve (CEAC) was generated to present the probability that MST is cost-effective over a range of willingness-to-pay (WTP) thresholds that a decision-maker might consider acceptable (Fenwick et al., 2004; Drummond et al., 2005).

## Results

*Background characteristics*

Fifty-one adolescents were included in the MST group and 65 in the TAU group. Table 1 shows the demographic characteristics of these adolescents and their parents. About 2/3 of adolescents in each group were male. Mean age at inclusion was 16 years in both groups (range 12–18 years). Slightly more of the MST (92%) than the TAU group (80%) had Dutch nationality, but this was not a significant difference. Similar proportions of adolescents in each group lived with one parent (because of divorce) (44% MST; 53% TAU). Regardless, the mother almost invariably completed the parental questionnaire (84% MST, 83% TAU). Nearly half of parents had completed primary education only (47% MST; 46% TAU).

*Primary outcome*

Table 2 shows the changes in the primary outcome within treatment groups and the differences in scores between treatment groups. The quality of life (EQ-5D) from the perspective of the adolescent showed an overall improvement of 0.02 points in the MST group. In the TAU group an overall difference of −0.02 points (worsening) was observed. From the perspective of the parents, similarly, there were no significant within or between group differences in adolescent quality of life.

Table 1: Background characteristics of adolescents and parents by treatment group

|  | MST<br>$n = 51$ | TAU<br>$n = 65$ |
|---|---|---|
| **Adolescent** |  |  |
| Age [mean (sd) at inclusion] | 16 (1.36) | 16 (1.17) |
| Gender; $n$ (% male) | 31 (62) | 44 (67) |
| Ethnicity; $n$ (% Dutch) | 46 (92) | 51 (80) |
| Family situation; $n$ (% divorced) | 22 (44) | 33 (53) |
| **Parent** |  |  |
| Age [mean (sd) at inclusion] | 46 (6.79) | 44 (7.17) |
| Gender; $n$ (% male) | 8 (16) | 11 (17) |
| Education; $n$ (% per level) |  |  |
| Primary | 24 (47.1) | 30 (46.0) |
| Secondary | 10 (19.6) | 24 (36.5) |
| Higher professional/university | 12 (22.6) | 9 (14.3) |
| Other | 5 (9.8) | 2 (3.2) |

MST- Multisystemic Therapy; TAU- Treatment As Usual; SD- Standard deviation.

Table 2: Effects of treatment per treatment group, 6 months after treatment, corrected for baseline scores and difference between groups

|  | MST<br>(n = 51) | TAU<br>(n = 65) | Difference | p |
|---|---|---|---|---|
| EQ-5D adolescent mean (SD)* | 0.02 (0.13) | −0.02 (0.30) | 0.04 | ns |
| EQ-5D parent mean (SD)* | 0.03 (0.19) | 0.02 (0.19) | 0.01 | ns |
| YSR aggression mean (SD)** | −1.53(8.93) | −1.16(5.67) | 0.37 | ns |
| CBCL aggression mean (SD)** | −2.70(7.10) | −2.64(7.48) | 0.06 | ns |
| YSR delinquency mean (SD)** | 0.24(7.77) | 0.95 (5.46) | 0.71 | ns |
| CBCL delinquency mean (SD)** | 1.90(5.14) | 2.77(5.20) | 0.87 | ns |

MST- Multisystemic Therapy; TAU- Treatment As Usual; EQ-5D- EuroQol 5 dimensions; YSR- Youth Self Report; CBCL- Child Behavior Check List.
*Points of change on the scale. Positive values indicate improvement.
**Points of change on the scale. Negative values indicate improvement.

Table 2 also shows that there was a tendency towards aggression reducing in both groups, but again no significant advantage for the MST group, whether rated by the adolescent or the parent. The tendency was towards deterioration in delinquent behaviours, from both the adolescents' and parents' perspectives, but, again, neither within nor between group changes were significant.

Table 3: Mean costs (€) for adolescents and parents by treatment group, and cost difference

|  | MST<br>Directly after treatment<br>(n = 38) | TAU<br>Directly after treatment<br>(n = 45) | Difference* |
|---|---|---|---|
| Costs per adolescent | 13,430€ | 15,201€ | −1771€ |
| Costs per parent (direct) | 481€ | 442€ | 39€ |
| Cost per parent (productivity losses) | 90€ | 32€ | 58€ |
|  | 6 months after treatment<br>(n = 20) | 6 months after treatment<br>(n = 14) |  |
| Costs per adolescent | 4144€ | 9674€ | −5530€ |
| Costs per parent (direct) | 381€ | 324€ | 57€ |
| Cost per parent (time of work) | 405€ | 00 | 405€ |

MST- Multisystemic Therapy; TAU- Treatment As Usual.
*A negative difference indicates lower costs in MST group compared to TAU.

## Costs

There was no difference in baseline costs between the intervention groups. Table 3 shows the mean costs per adolescent and parent for each group. At the end of the intervention (T2), cost data were available for 38 adolescents in the MST group and 45 in the TAU group. Mean costs per adolescent were 13,430€ in the MST group and 15,201€ in the TAU group. This difference was accounted for by higher costs for institutional care in the TAU group. Costs borne by the parents were much lower: 481€ in the MST group and 442€ in the TAU group; mean costs of lost productivity were 90€ and 32€ respectively.

Six months after the end of the intervention, 20 adolescents in the MST group and 14 in the TAU group were available for the cost analysis. Mean total costs per adolescent in the MST group were 4144€ compared to 9674€ in the TAU group. Higher costs for institutional care in the TAU group explain this difference. Costs to the parents were comparable for MST (381€) and TAU (324€). Mean loss of productivity costs amounted to 405€ in the MST group, while none of the parents in the TAU group reported a productivity loss.

## Cost-effectiveness

The results of the cost-effectiveness analyses are shown in Figure 1. For the EQ-5D, the point estimate of the ICER amounted to 384,633€, which indicates cost savings and gains in quality of life. The alternative 95% CI, based on the 2.5th and 97th percentile of the rank-ordered bootstrap estimates was 2,001,433 to 2,024,681€. The cost-effectiveness plane shows that the southeastern (SE)
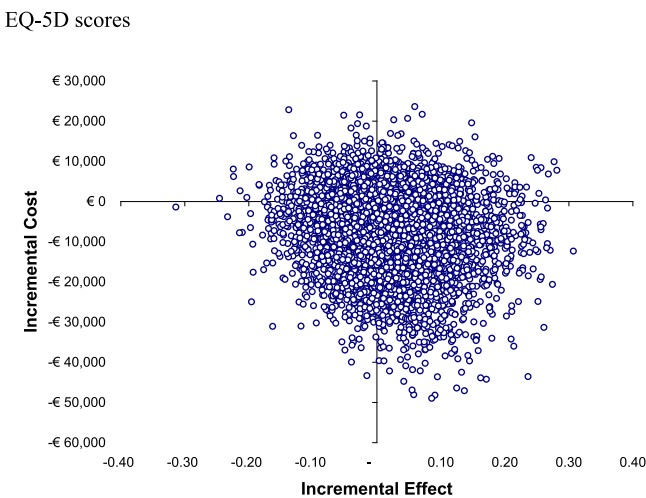
EQ-5D scores



**Figure 1:** Cost-effectiveness plane of incremental costs versus incremental EQ-5D scores

quadrant contains most bootstrap estimates (45% versus 13% NE, 12% NW and 30% SW).

The CEAC (figure not shown) indicated that, without additional investment, the chance that MST would be more cost-effective than TAU is 75%. This chance does not increase with a WTP threshold. This is because of the lower costs of MST.

## Discussion

Our study in a European setting of the costs and effects of multisystemic treatment compared with 'TAU' showed that there was no difference between the approaches in their effect on adolescents' or parents' rating of the quality of the lives of these adolescents, nor in their antisocial behaviours, but there was a significant difference impact. Overall costs from a societal perspective were about 50% less for MST compared to TAU.

Our finding that, in the Netherlands, MST offered no significant advantage over usual treatment for adolescent experience or behaviour seems at first sight to be at odds with published literature to date. Schaeffer and Borduin (2005) found recidivism rates of 50% (compared to pre-treatment) in the MST group but 81% in the TAU group, and over 50% fewer arrests and days in confinement in the MST group. Borduin and Dopp (2012) found a recidivism rate of 35% in the MST group (compared to pre-treatment), but 55% in the TAU group. In the UK, Butler and colleagues (2011) showed similar reductions in overall offending for MST and TAU groups, but a significant reduction in non-violent offending over 18 months in the MST group. It is likely that these between study differences can be accounted for by differences in the 'TAU' condition. In the Netherlands, our TAU adolescents had routinely received family focused therapy in addition to any basic community supervision or social support interventions, whereas in the other studies such as the study by Klietz et al. (2010) compared MST to a community outpatient treatment for juvenile offenders.

Findings of a cost benefit from MST are more mixed across national boundaries, even where 'TAU' may include more elaborate interventions. Cary et al. (2013), examining costs in the UK Butler trial, found that at 18-month follow-up the MST group had incurred lower costs in relation to criminal activity (£9428/ 11,264€ MST; £11,715/13,997€ TAU) and services provided by youth offending teams (YOTs) (£3402/4065€ MST; £4619/5519€ TAU). Delivering the MST had, though, cost more than services delivered by staff other than the YOTs teams (£5687/6795€ MST; £4619/5519€ TAU). Thus, the net benefits for the MST group at 18-month follow-up were £1222/1460€ per person. This compares with the net saving six months after MST in our study of 1771€, even though there was no cost saving from reduced criminal activity in our study. By contrast, another European study (Olsson, 2010) showed that, in Sweden, direct

medical costs of MST were, on average, 105,400 Swedish kroner (SEK)/11,800€ per youth. Although MST was associated with a direct benefit in terms of participant out-of-pocket expenses of 1000SEK/112€ per youth, and costs of other interventions reduced by about 62,100SEK/7000€ per youth, these benefits did not offset the costs of MST. Olsson concluded that MST came with a net financial cost to society of 44,500SEK/5000€ per youth after two years. Differences in perspective [direct medical (including only costs of health care services) versus societal (also including costs outside the health care sector, such as productivity losses of the parents)] and methods (cost-benefit versus cost-effectiveness) may at least partly explain this difference from our finding. A US study (Klietz et al., 2010) showed reductions in expenses ranging from 75,110$ to 199,374$ per MST participant. This very substantial reduction may be accounted for by the fact that, in this study, MST was compared with individual therapy. The Butler/Cary study in the UK is likely to be more comparable to ours in that the standard approach of YOT teams in the UK includes extensive, multicomponent interventions that are consistent with the complex mental health needs of this population (Chitsabesan et al., 2006).

*Strengths and limitations*

Cary and colleagues (2013) expressed concern about a number of limitations in their economic evaluation methods, which expressed the situation in terms of cost-offset and took a narrow economic perspective, which only included those services recorded by the YOTs involved in the study. Their results therefore excluded contact with other health education or social services, which may have been involved in the care of these young people. In addition, their outcomes included no generic outcome measures and data quality support. We overcame some of these issues in our study. First, we performed a full cost-effectiveness study, prospectively designed and performed alongside the RCT, in which we adopted a societal perspective (wide scope) as well as the more narrow one of the individual costs. Second, the outcome measures chosen in our cost-effectiveness analysis included the EQ-5D, which is a generic measure of preference often used in health economic studies and therefore allows for comparison of outcomes across diverse interventions.

There are, nevertheless, some limitations to our study. First, the number of participants was small, which may be partly a consequence of the randomised design, which is rather unusual in this field of intensive youth care. Second, we had missed data on costs for quite a large number of participants, which may again follow from unfamiliarity with this sort of experimental design in this field. Third, we were only able to report on a rather short follow-up period of six months. Finally, there is the problem of any sort of standard for TAU in this field. Most of our participants were in receipt of family focused therapy, which is only

one type of usual care in the Netherlands, and so findings may not be generalisable to other alternative strategies to MST.

*Implications*

Our study adds weight to the case that MST is superior to routine community management of young offenders, even when the latter includes some specific psychological component. At worst it can be said that MST has never been shown to be disadvantageous to such young people in terms of their experienced quality of life and reoffending, at best other studies have suggested it conveys benefit in these terms. We found that it has some cost advantages for the individual and his/her family and substantial cost benefits for wider society. This is an exceptionally difficult component to compare internationally. We recommend further research to confirm our findings, which still show rather wide margins of error, and efforts by researchers to collaborate across national boundaries on such work.

**Acknowledgements**

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