The impact of substance abuse treatment modality on birth weight and health care expenditures

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Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

Health technology
Programmes for the treatment of substance abuse in pregnant women were examined:

- detoxification only (minimal treatment comparison group);
- methadone only (long-term methadone therapy and counselling in outpatient clinics);
- residential only (long-term stabilisation in therapeutic communities and recovery homes);
- outpatient only (group, individual and family counselling in outpatient, intensive outpatient and day treatment clinics);
- and
- residential/outpatient (outpatient counselling either concurrently with or following discharge from a residential facility).

The authors stated that these programmes usually consist of prenatal care, parenting skill training, testing for human immunodeficiency virus, education, housing assistance, family therapy, child care and case management.

Type of intervention
Patient care management.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised pregnant women eligible for substance abuse treatments.

Setting
The setting was primary care. The economic study was carried out in the state of Massachusetts, USA.

Dates to which data relate
The effectiveness and resource use data were gathered from October 1994 to December 1996. The price year was 1998.

Source of effectiveness data
The effectiveness evidence was derived from a single study.

Link between effectiveness and cost data
The costing was carried out prospectively on a sub-sample of women who were involved in the effectiveness study.

**Study sample**
The use of power calculations to determine the sample size were not reported. An initial sample of 600 women (representing 627 pregnancies) was first identified, but only women whose data were matched with treatment records of the Bureau of Substance Abuse Services were considered. Thus, the final sample comprised 445 women. There were 170 cases in the detoxification only group, 56 cases in the methadone only group, 63 cases in the residential only group, 79 cases in the outpatient only group, and 77 women in the residential/outpatient group.

**Study design**
This was a prospective cohort study, which was carried out in several centres in the state of Massachusetts. The women were followed for 9 months before the birth and 6 months after. Three trained interviewers administered the study questionnaire at baseline and 90, 180 and 270 days post-intake. Seventy-four women completed at least one follow-up interview, 51% completed two follow-up interviews, and 29% completed all four interviews.

**Analysis of effectiveness**
The analysis of the effectiveness considered only those women who completed the follow-up assessment. The primary health outcome was birth weight. The secondary health outcomes were:

- the percentage of low and very low birth-weight babies;
- weeks of gestational age;
- the rates of premature, very premature, and small for date births;
- the Apgar score at 1 and 5 minutes;
- the mode of delivery (vaginal, Caesarean or other); and
- the infant gender.

The study groups were comparable at baseline, but differences were found in terms of the drug of choice. Since no randomisation was carried out, several multiple regressions were conducted to adjust for baseline factors that could represent predictors of birth weight.

**Effectiveness results**
The birth weight was 2,864 g in the detoxification only group, 2,955 g in the methadone only group, 2,963 g in the residential only group, 3,026 g in the outpatient only group, and 3,072 g in the residential/outpatient group.

The percentage of low birth-weight babies ranged from 12.7 to 25.9%.

The rate of very low birth-weight babies ranged from 0 to 1.8%.

The weeks of gestational age ranged from 37.70 to 38.79.

The rate of premature births ranged from 14.3 to 27.1%.

The rate of very premature births ranged from 0 to 1.8%.

The rate of small for date births ranged from 4.8 to 9.4%.

The Apgar score ranged from 7.78 to 8.18 at 1 minute, and from 8.82 to 9.04 at 5 minutes.
The rate of vaginal delivery ranged from 56.9 to 83.1%, the rate of Caesarean delivery ranged from 15.5 to 26%, and the rate of other deliveries ranged from 1.4 to 12.1%.

The rate of male infants ranged from 43.5 to 53.6%.

None of the differences in the effectiveness outcomes reached statistical significance.

The regression analysis showed that women in the residential/outpatient group delivered infants that were 190 g heavier than those delivered by women in the detoxification alone group.

The mother's weight was the variable most closely associated with increases in the infant's birth weight.

Women readmitted to detoxification during pregnancy delivered infants who were 121 g lighter than those who were not readmitted.

The analysis of intermediate variables suggested that treatment modalities indirectly affected birth weight by promoting better nutrition and discouraging substance abuse during the gestational period.

**Clinical conclusions**
The effectiveness analysis showed that all programmes for substance abuse in pregnant women led to an improvement in birth weight and most clinical outcomes of the infant. The residential/outpatient group led to the greatest birth weight, mainly when compared with less intense treatment modalities (e.g. detoxification only).

**Measure of benefits used in the economic analysis**
The summary benefit measure was the birth weight. This was derived directly from the effectiveness study.

**Direct costs**
Discounting was not relevant since the costs per patient were incurred during 15 months overall. The unit costs were not reported separately from the quantities of resources used. A breakdown of the costs was not provided. The health services included in the economic evaluation were substance abuse treatment and health care resources. The cost/resource boundary of the study was that of the health care payer (the Massachusetts Department of Public Health). The costs were estimated from actual Medicaid claims. The resource use data were estimated using actual data coming from a sub-sample of women who were involved in the effectiveness study (346 clients). All the costs were presented in 1998 values using the medical care component of the Consumer Price Index.

**Statistical analysis of costs**
Statistical tests of the costs were not carried out and the costs were treated deterministically. Despite the fact that the authors mentioned standard deviations of the costs, the total expenditures were presented as point estimates. Likewise in the effectiveness analysis, multiple regressions were carried out considering total costs as the dependent variable, to estimate the influence of several baseline predictors on total expenses, while controlling for intake differences between the groups.

**Indirect Costs**
The indirect costs were not considered in the analysis.

**Currency**
US dollars ($).

**Sensitivity analysis**
Sensitivity analyses were not carried out.

**Estimated benefits used in the economic analysis**
See the 'Effectiveness Results' section.

**Cost results**
The total health care costs were $15,573 in the detoxification only group, $23,530 in the methadone only group, $29,445 in the residential only group, $17,068 in the outpatient only group, and $32,884 in the residential/outpatient group.

The regression analysis showed that women in the residential/outpatient group were $17,211 more expensive than women in the detoxification only group.

**Synthesis of costs and benefits**
An incremental cost-effectiveness ratio was calculated to combine the costs and benefits of the interventions under evaluation. The coefficients from the regression analysis were used. The outpatient group dominated (both more effective and less costly than) both the residential only group and the methadone only group.

The residential/outpatient intervention required an additional investment of $15,423 to achieve a 51 g increment in birth weight ($302/g).

The outpatient treatment led to an increment of 139 g for an additional $1,788 ($13/g) in comparison with detoxification only women.

The mother's age was the only factor that was unambiguously and positively related to both increases in birth weight and reductions in total expenses for all treatments. Having delivered a pre-term infant in the past was the only variable that was associated with a reduction in birth weight and an increase in the costs.

**Authors' conclusions**
Regardless of treatment modalities, all programmes, with the exception of the strategy 'detoxification only', led to improvements in birth weight. Women in the outpatient only group were associated with the lower costs, which made this intervention the most cost-effective.

**CRD COMMENTARY - Selection of comparators**
The authors did not provide an explicit justification for the five treatments that were compared in the study. However, all of them represent actual strategies for the support of pregnant women in conditions of substance abuse. In particular, the authors stated that the strategy of 'detoxification only' represented a minimum intervention. You should decide whether they represent valid comparators in your own setting.

**Validity of estimate of measure of effectiveness**
The analysis of the effectiveness used a prospective cohort study. The authors attempted to overcome the problems relating to the lack of randomisation by carrying out a regression analysis, which tried to adjust for the impact of baseline and intermediate prognostic factors. The length of and loss to follow-up were reported, as were the demographic and social characteristics of the participants. The method of sample selection was based on matching data, but it was not stated whether some women refused to participate from the initial study sample. The main limitation to the internal validity of the analysis was the fact that power calculations were not carried out and there was no evidence that the initial study sample was appropriate for the study question. The study groups were comparable at baseline, but statistically significant differences were observed for choice of substance.
Validity of estimate of measure of benefit
The summary benefit measure was derived from the effectiveness analysis. The use of birth weight represents a treatment-specific measure, which is hardly comparable with the benefits of other health care interventions.

Validity of estimate of costs
The perspective adopted in the study was clear. The costs were derived from Medicaid databases, which covered all the costs relevant to the health care payer. Thus, it was likely that all the relevant categories of costs were included in the analysis. However, a breakdown of the cost items was not provided and this negatively affects the replication of the economic study. The price year was reported, therefore aiding reflation exercises in other settings. The cost estimates were likely to have been treated deterministically and no sensitivity analyses were carried out. Thus, the cost estimates were specific to the study setting. However, the authors carried out regression analyses, as they did in the effectiveness study, to assess which baseline factors were significantly associated with the estimated total costs.

Other issues
The authors compared their findings with those from other published studies and observed similar results. However, the issue of the generalisability of the study results to other settings was not addressed and sensitivity analyses were not conducted. Consequently, the external validity of the analysis was low and caution is required when extrapolating the results to other contexts or populations. Indeed, the study results should be limited to pregnant women in conditions of substance abuse with baseline characteristics (e.g. ethnic group or type of drug) comparable to the study participants.

Implications of the study
The study results showed that outpatient only treatment led to an increase in birth weight at the least cost. Thus, more expensive strategies (e.g. outpatient/residential) should be offered to women with unstable housing and violent environment situations. The authors stressed that since age was a key factor for the effectiveness of the interventions, it could be worthwhile to fund programmes that can reach pregnant women in condition of substance abuse at younger ages.

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