



Return on Investment: Prevention in mental health

Exercise programs for the prevention of post-natal depression

Background

Maternal mental health has been recognised by the World Health Organization as a major public health issue (1). Post-natal depression (PND) (the onset of depression after giving birth and up to 12 months post-delivery (2)) affects 16% of new mothers in Australia (3). PND is associated with decreased enjoyment in life, social withdrawal, insomnia, self-harm, and in some instances infant harm (4). PND also impacts infants' cognitive, behavioural and social development (5) and can have damaging effects on the mental health of partners and other children (6). As the child of a mother affected by PND grows, additional healthcare and conduct disorder costs have been estimated at \$6.2M per year (7). New mothers experiencing PND are twice as likely to suffer future depressive episodes after the birth (8) which can lead to long term disability and incapacity to work. PND is associated with higher use of health services and lost productivity directly impacting government costs. In 2012, the costs of PND in Australia were estimated at \$94 million per annum (9).

For the majority of women, PND starts within the first 12 weeks after delivery. Symptoms can include feeling depressed, mood swings, insomnia, confusion, guilt, and suicidal ideation. Around 8% of mothers will continue to experience depressive symptoms after the child's first birthday (10). If left untreated, PND can develop into severe clinical depression and, in a small number of cases, lead to suicide (11). The risk factors associated with PND include a history of depression, low social support, low self-esteem and low income (12, 13). Physical inactivity has been associated with an increased risk for PND symptoms, while exercising has been associated with decreased risk (14). Managing weight and engaging in physical activity is often difficult for women in the period before and after birth (15) and nearly all (99.9%) post-natal women are insufficiently active at three months post birth (16). Exercise based interventions could therefore result in the physical benefits of managing weight, as well as mental health benefits for women and their babies.

Intervention modelled

There is little evidence for the effectiveness of exercise interventions to prevent PND for women who are at high risk, as trials have tended to be focussed on treatment (17). The available evidence is based on exercise programs for the prevention of PND being offered universally, that is, to all women post-delivery not just those at a higher risk. The intervention chosen for this analysis is based on three studies with a total of 323 participants offering exercise classes at least four weeks after giving birth (18-20). The proportion of women who did not develop PND due to the intervention was 23%. This was used as the basis of the effectiveness measure.

The type of exercise class varied and included walking or other cardiovascular and aerobic exercise, or strength training. The average number of sessions was four and women were able to bring their babies to the classes.

The primary outcome of this evaluation is the return on investment (ROI) ratio. The ratio includes the cost of the intervention in relation to any cost savings (both healthcare cost savings and the monetary value of avoiding absences from work, staff not functioning fully at work and staff turnover). Cost effective interventions using this decision criterion have a ROI greater than \$1, this means that the cost savings are greater than the costs of the intervention e.g. a ROI of \$1.50 means that for every \$1 invested \$1.50 is gained).

Assumptions

It was assumed that the cost of the exercise sessions included recruitment of participants, delivery of the exercise program and the cost of venue hire. The assumptions used to analyse the base case scenario are outlined below.

Recruitment. A flyer would be given to women during the first routine visit to a maternal health nurse. Based on trial participation rates, it was assumed that 50% of women receive the flyer and 50% of those who received the flyer would participate.

Exercise classes. Four exercise classes are offered which are assumed to be one hour, with a class size of 10 women. The hourly rate for an instructor was valued at \$75 per hour (21, 22). Renting a group exercise room was estimated at \$60 per hour (22). It is assumed that the government pays for the cost of the exercise classes.

Cost savings. We used two estimates of healthcare cost savings to calculate the ROI. One estimate was based on a study that reports yearly costs of depression and includes antidepressant medication and mental health related service use of \$191.80 (23). The second estimate also included hospital costs and community services, totalling \$1,475 per woman with PND per year (3).

Productivity cost savings include lost productivity time costs, and costs of workplace absence due to illness (24), taking into account average weekly wages of women, their employment status and the length of maternity leave taken after childbirth (25, 26). An average employee replacement cost of \$7,183 was also included (23). Productivity cost savings, including replacement costs for women who do not return to work, amounted to \$8,270 in year one and \$9,710 in subsequent years due to more women returning to work one year after the birth. The longer term effects of these interventions on PND are not well investigated. Therefore, the outcomes for women meeting the criteria for the intervention are reported using two time periods, one year and five years.

Alternative scenarios

Several scenarios were tested as alternatives to how the intervention could be implemented.

Scenario 1) Offering eight sessions of exercise instead of four.

Scenario 2) Providing transport to disadvantaged groups. Transport was costed for 25% of participants for 4 sessions, based on a 20km trip at \$0.66 per km (27).

Scenario 3) Providing childcare for women who attend the exercise classes. Childcare for babies or siblings was costed at \$12 per 1.5 hour session (28, 29). We assumed that 50% of women would not require this service as 30% of children aged zero to four years in Australia have access to informal care (30) as well as having the option of bringing their baby to the class. For example, walking classes would be suitable for bringing prams. These costs would be covered by governments.

Scenario 4) Combining Scenarios 1) 2) and 3) for eight sessions of exercise.

Scenario 5) Combining Scenarios 1) 2) and 3) for four sessions of exercise.

Results

Cost effectiveness findings

When four exercise classes are offered to prevent PND there is a positive ROI in both periods, with a ROI of 1.90 in the one year model and 2.54 in the five year model (Table 1). This means that for every \$1 paid to run the intervention there will be a return of \$1.90 in the first year after the intervention and \$2.54 after five years. The intervention costs a total of \$5.5M or \$36 per woman. The ROI would be even greater using less conservative healthcare cost savings.

Exercise for the prevention of PND is estimated to prevent **1,705 cases of PND** over five years with the majority prevented in year one. The larger returns after five years reflect the increase in productivity cost savings due to reduced absenteeism and job turnover.

Table 1. Summary of results for exercise programs to prevent PND

	Based on conservative healthcare savings		Based on higher estimates of healthcare	
	1 year	5 years	1 year	5 years
Intervention costs (Government)	\$5.54M	*	*	*
Cost saving (total)	\$4.97M	\$8.47M	\$6.55M	\$10.49M
Productivity cost savings	\$10.28M	\$13.71M	*	*
Healthcare cost savings	\$0.24M	\$0.30M	\$1.81M	\$2.32M
ROI	1.90	2.54	2.19	2.90
Cases of PND prevented	1,313	1,705	*	*
Depression free days	311,118	342,192	*	*
Savings per case of PND prevented	\$4,030	\$5,240	\$5,320	\$6,490

Notes: ROI: return on investment per \$1 invested, * no change to costs or outcomes from the base case (conservative healthcare savings)

Results from alternative scenarios

A summary of the results from the different scenarios are presented at Table 2. For each scenario, the ROI was greater than 1 after five years, meaning that the intervention was cost effective. Only Scenario 4, offering eight sessions with transport and childcare included, had ROIs less than 1 after one year but were still greater than 1 after five years.

Table 2. Summary of results of sensitivity analyses for exercise programs to prevent PND

Scenario	Cost per person	Intervention costs	ROI - 1 year (low HC)	ROI - 5 year (low HC)	ROI - 1 year (high HC)	ROI - 5 year (high HC)
Base case (4 classes)	\$36	\$5.54M	1.90	2.54	2.19	2.90
1. Includes 8 exercise classes	\$50	\$7.85M	1.36	1.81	1.56	2.07
2. Include transport costs for 25% of mothers	\$42	\$6.54M	1.65	2.20	1.90	2.52
3. Include childcare costs for 50% of mothers	\$47	\$7.35M	1.47	1.96	1.69	2.24
4. Combination of scenarios 1,2, and 3 (8 classes)	\$60	\$13.26M	0.80	1.07	0.93	1.23
5. Combination of base case and scenarios 2 and 3 (4 classes)	\$53	\$8.25M	1.30	1.73	1.49	1.98

Notes: 'low HC' indicates conservative healthcare cost savings, 'high HC' indicates less conservative estimates.

Implementation considerations

While evidence on cost effectiveness is the focus of this project, there are other criteria apart from cost effectiveness that can influence whether and to what degree interventions are likely to be rolled out in routine practice. These criteria are not captured in the technical cost effectiveness results but are very important from a decision making context. Some of these considerations are summarised in the Table below. The colour coding of each criterion is an attempt to visually summarise whether these secondary considerations impact on the results in a positive or negative way (red = negative, amber = uncertain, green = positive). A code of 'green' implies that the secondary consideration strengthens the case for investing in the intervention. A code of 'amber' means that the secondary consideration reduces certainty in the case for investing and a code of 'red' means that these considerations do not support investment in the intervention.

Implementation considerations		Overall Rating
Potential secondary effects	The results are conservative, as they do not capture all the potential consequences, such as improvements in anxiety and physical health in the mother, the possible improvements in physical, mental and cognitive health of the infant and subsequent potential impacts as they age – which have been estimated at \$6.2M per year (7). Any impacts on carers in terms of less caring required is likely to have a further positive impact given the estimated costs for informal carers in Australia is substantial (31).	Positive
Equity	This has the potential to reduce inequities due to the risk factors for PND being associated with more disadvantaged groups, such as those who are unemployed and have housing and financial difficulties. In Australia PND was found to be less common among women with higher levels of education and women who were working (32). However, there is a need to promote access to this intervention for low socioeconomic groups. Analysis of the intervention to include transport and childcare costs shows that the intervention is cost effective, even if these additional costs are included.	Positive
Strength of evidence	The quality of evidence across the small number of individual studies was generally low, with high or unknown risk of bias. Follow up time post intervention varied from 2 to 12 months. It is uncertain whether this intervention leads to significant increases in physical activity.	Negative
Acceptability	Participation rates from the trials averaged 50%. The dropout rate from the intervention groups in the studies averaged 33% indicating that the majority of women (67% retention rate) were willing to use the intervention. Child minding costs for 50% of participants has been included in the sensitivity analysis, which may increase participation.	Positive
Feasibility	Mother and baby exercise classes already exist in some areas and gyms offer childcare services. Given the existing infrastructure, it would not be difficult to roll out interventions which mimic those described here.	Positive
Sustainability	Unclear what the funding mechanism of this intervention is likely to be therefore the sustainability of this intervention is unclear.	Uncertain

Recommendations

Given the positive ROI results found by the current analyses it is recommended that exercise programs for the prevention of PND be piloted in real world settings with a view to a large scale roll out if the effectiveness is maintained in line with the modelling. A well designed pilot would build the evidence base for the effectiveness of the intervention which is currently uncertain.

Take home messages

For policy makers and funders, exercise classes for the prevention of PND are a relatively inexpensive program to run and appear to be good value for money, with positive ROI in the short and medium term as well as the potential for the program to have additional physical benefits for new mothers. However it is not clear if the effectiveness in preventing PND may be due to increased social contact rather than the exercise alone. Also, short term interventions may not have lasting or significant increases in physical activity. Therefore considering that exercise delivers both physical and mental health benefits, and the negative impacts PND can have across two generations, further trials to increase physical activity in women for the prevention of PND are warranted.

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