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RESEARCH

# Cost-Effectiveness of the Mindfulness-Based Childbirth and Parenting Program for Pregnant Women With Fear of Childbirth

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## ABSTRACT

**Objective:** To examine the cost-effectiveness of the Mindfulness-Based Childbirth and Parenting (MBCP) program compared with enhanced care as usual (ECAU).

**Design:** Randomized controlled trial.

**Setting:** Midwifery settings in the Netherlands, April 2014 to July 2017.

**Participants:** Subset of pregnant women with high levels of fear of childbirth ($N = 54$: randomized to MBCP, $n = 32$, or to ECAU, $n = 22$) who were selected from the parent study because they completed all four cost questionnaires.

**Methods:** We measured self-reported health care and non-health care costs. A subset of participants from the parent study completed the questionnaires at all four assessment points. We used the Wijma Delivery Expectancy Questionnaire to measure fear of childbirth and used the EuroQol-5D to measure quality of life. We used these measures of effect together with societal costs in the primary cost-effectiveness analyses. In the secondary cost-effectiveness analyses, we used different estimates of effects and costs to test the robustness of the primary analyses.

**Results:** In all but one scenario, MBCP was more effective and cost less than ECAU. As indicated by the acceptability curves, the likelihood of MBCP being cost-effective varied within a range of 70% to 98%.

**Conclusion:** Our findings indicate that MBCP is a cost-effective intervention to reduce fear of childbirth in pregnant women. Important next steps are to replicate the study in countries with different health care systems and to explore the potential for further integration of MBCP into midwifery care.

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*(Continued)*

The World Health Organization (2018) stressed the need for nonclinical interventions to reduce cesareans. Fear of childbirth (FOC), a negative emotional state characterized by high stress levels and maladaptation to pregnancy and childbirth, might be an important factor to target. Based on a systemic review by Nilsson et al. (2018) that included 24 articles in which FOC was measured in nine countries in Europe, Australia, Canada, and the United States, the authors found prevalence rates of FOC from 6.3% to 14.8%. Fear of childbirth was associated with psychological problems, including stress, anxiety, and depression, and with prolonged labor, longer labor, use of epidural anesthesia, and obstetric complications (Dencker et al., 2019). Nonclinical interventions designed to reduce FOC in pregnant women have the potential to elevate rates of unmedicated childbirth and simultaneously lower the occurrence of cesareans.

The aim of mindfulness-based interventions (MBIs) is to increase open and nonreactive attention to the present moment by practicing mindfulness exercises. Mindfulness-based interventions have been evaluated for use with a range of mental health problems (Creswell, 2017). Perhaps one of the most well-known MBIs is the group-based Mindfulness-Based Stress Reduction program developed by Kabat-Zinn (1982), which was initially designed for use

**Mindfulness-based interventions for pregnant women can decrease fear of childbirth, but it is unclear whether these interventions are cost-effective.**

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with patients with chronic pain. Since then, more MBIs have been developed with the same program structure but with adaptations for specific populations. Researchers reported positive effects of MBIs on physical and psychological health outcomes (Creswell, 2017). In addition, in a recent meta-analysis, Abdolalipour et al. (2023) found evidence that MBIs improved childbirth self-efficacy and reduced FOC. However, limitations of studies on MBIs include uncontrolled within-group designs and/or small sample sizes.

Pan and colleagues (2019) randomized pregnant women at 13 to 28 weeks gestation to the Mindfulness-Based Childbirth and Parenting (MBCP) program ($n = 39$) or traditional childbirth education ($n = 35$). The MBCP program was conducted in a group format consisting of 8 to 15 participants who gathered for 8 consecutive weeks, and each session lasted 3 hr. The primary objective was to enhance awareness through a series of meditation exercises. The authors found that participants in MBCP scored lower on measures of stress and depression and higher on mindfulness and childbirth self-efficacy after treatment compared with the control group. Veringa-Skiba et al. (2022) randomly assigned pregnant women with high FOC at 16 to 26 weeks gestation to MBCP ($n = 75$) or enhanced care as usual (ECAU; $n = 66$). The MBCP program was delivered as a group-based intervention that consisted of nine weekly 3-hr sessions in which the participants and their partners participated in a range of meditation exercises. The authors found that the participants in the MBCP group had lower FOC scores after treatment and fewer births with medical intervention compared with the ECAU group. The results of these two studies suggest that MBCP may be an effective intervention to decrease FOC and increase rates of natural childbirth.

A next step toward more widespread implementation of MBCP is to evaluate the costs of the intervention. Nieminen and colleagues (2017) compared health care use and costs of 43 women with severe FOC with those of 107 women with low FOC. They found that, on average, women with severe FOC used more health care resources and societal costs (defined as the sum of all health care and non-health care costs) were higher for women with severe FOC than for women with low FOC. More specifically, postpartum costs, including longer stays on the maternity ward, and sick leave costs were higher for women with severe FOC. Thus, severe FOC seems to be associated with higher societal costs, which suggests that if severe FOC can be effectively targeted, societal costs may be lowered. Therefore, research is needed to determine the cost-effectiveness of mindfulness-based interventions to target FOC.

In cost-effectiveness studies, effects and costs of a new intervention are compared with effects and costs of care as usual to determine whether the new intervention is cost-effective. Such information can be an important factor for policy and health care insurance companies. However, to our best knowledge, no cost-effectiveness studies on MBIs that target FOC in pregnant women have been conducted, and only two psychoeducation interventions have been evaluated. First, a group-based psychoeducation intervention that consists of six 2-hr sessions and includes information about the birth process and relaxation exercises was evaluated by Rouhe et al. (2015) and Toohill et al. (2017). Both author groups concluded that psychoeducation was recommended because the costs of the intervention did not differ from those of conventional treatment and more uncomplicated vaginal births occurred in the psychoeducation group. Turkstra et al. (2017) conducted an economic evaluation of a psychoeducation intervention that consisted of two individual counseling sessions by telephone in which the current expectations and feelings of the pregnant woman were reviewed, and she was supported with information about the birth process and helped to develop strategies for a positive birth experience. The chances of the psychoeducation intervention surpassing standard care in terms of enhancing quality of life were merely 12%, and the probability of the psychoeducation intervention being more cost-effective was 58%.

In summary, the high prevalence of FOC in pregnant women is linked to adverse outcomes. The MBCP program may be a promising intervention for addressing FOC in women, but its adoption in midwifery practice requires a careful evaluation of costs. Therefore, we examined the cost-effectiveness of MBCP compared with ECAU.

# Methods

## Design

In the parent study (Veringa et al., 2016; Veringa-Skiba et al., 2022), we conducted a randomized controlled trial using block randomization in which one group received MBCP and the control group received ECAU. Participants were pregnant women at 16 to 26 weeks gestation who experienced high FOC, which we defined as a score of 66 or higher on the Wijma Delivery Expectancy Questionnaire (W-DEQ-A; Wijma et al., 1998, 2002). Participants were recruited via midwifery practices in two urban areas in the Netherlands. The study had four assessment points: Time 1 (T1) pre-intervention (participants were included at 16–26 weeks gestation), Time 2 (T2) post-intervention (after 9 weeks of MBCP/ECAU), Time 3 (T3) after childbirth (2–4 weeks after birth), and Time 4 (T4) 16-week follow-up. Information about birth and childbirth outcomes was derived from medical files. We gathered data from April 2014 to July 2017, obtained informed consent from all participants, and received approval from the ethics review board of the Faculty of Social and Behavioral Sciences at the University of Amsterdam (No. 2013-CDE-3064) to conduct the study. The trial is registered in the Dutch Trial Register (No. 4302).

## Participants

In the parent study, we assessed 219 women for eligibility and excluded 78 ($n = 36$ did not meet inclusion criteria and $n = 42$ declined to participate; Veringa-Skiba et al., 2022). Therefore, the sample for randomization consisted of 141 participants (MBCP $n = 75$; ECAU $n = 66$). For the current cost-effectiveness study, cost data could not be reliably estimated following imputation methods for missing data; therefore, only the participants who completed all four cost questionnaires were included ($n = 54$). We compared the subset of participants in the current study with the participants who were excluded for baseline characteristics (e.g., age, education level, FOC) and the intervention effect on FOC and found no significant differences (see Supplementary Tables S1, S2, and S3), which indicated that our subsample is likely to be representative of the total sample.

## Setting

We recruited participants via several midwifery practices in the Netherlands at which prenatal, natal, and postpartum care is delivered. Women can choose between giving birth in the home and a hospital childbirth, and both are under the responsibility of independent midwives, consistent with the midwifery-led model of care. In the event of complications, anticipated or otherwise at any time during pregnancy, childbirth, or postpartum, women are referred to obstetric care in the hospital, known as obstetrician-led care. Both types of care (i.e., midwifery-led care and obstetric) receive a fixed amount of money for the care that they provide to the pregnant women, but note that obstetrician-led care is more expensive.

## Interventions

**Mindfulness-Based Childbirth and Parenting program.** The MBCP program is an adaption of the Mindfulness-Based Stress Reduction program (Kabat-Zinn, 1990). The MBCP program was developed by Bardacke (2012) for expecting parents. In this program, formal and informal mindfulness meditations are combined with the knowledge of psychobiological processes regarding pregnancy, childbirth, breastfeeding, and postpartum adjustment and the psychobiological needs of infants. The purpose of MBCP is to reduce stress during pregnancy, cultivate mindfulness skills that help women to deal with pain and FOC, and cultivate general mindfulness skills such as wisdom, kindness, and connection. For this study, the program included nine weekly 3-hr sessions that were provided by experienced midwives certified in MBCP. Participants were considered to have completed the program if they attended at least five of the nine sessions. All participants in the current study fulfilled this criterion.

**Enhanced care as usual.** We enhanced care as usual for this study by adding two structured consultations on FOC that consisted of an explanation of the biopsychosocial model (Engel, 1977) and the childbirth plan of the Royal Dutch Organization of Midwives. Participants were considered to have completed ECAU when they attended at least one of two sessions. All participants in the current study fulfilled this criterion.

## Measures

**Costs.** To measure costs, we used a standard perinatal health care costs questionnaire in which participants were retrospectively asked how often they had contact within the health care system, how many days they were absent from work, and the number of hours they obtained support from friends and family. The cost questionnaire was completed during all four assessments, at which

we asked participants to look back retrospectively over the preceding 3 months. Consequently, this encompassed the entirety of the pregnancy and the duration of maternity leave. Other researchers also used a retrospective cost questionnaire (Bodden et al., 2018; Sleed et al., 2005; van Steensel et al., 2014), and good correspondence between self-reported cost questionnaires and retrieved medical data has been reported (e.g., Bouwmans et al., 2013; Sleed et al., 2005). We followed the Dutch guidelines for cost research (Hakkaart-van Roijen et al., 2015). We calculated costs based on a societal perspective, which means that all possible costs were considered irrespective of who paid them. This included health care costs (e.g., visit to the general practitioner, hospital, medication use) and non-health care costs (e.g., loss of work hours, daily activities, help from family and friends). We created a unit costs list (see Supplementary Table S4) and used shadow prices if an official price unit was not available. A shadow price is an estimated value of a product or service that is not on the market; in other words, we estimated the price for informal care based on the price for domestic care. We used the friction cost method to calculate productivity losses. The friction cost method only considers costs for productivity losses during a (friction) period when the replacement for an employee has not yet been found. We calculated the total costs per participant by multiplying individual resource usage by the unit price. We respected inflation correction by adjusting all costs to the Consumer Price Index of 2017. We calculated intervention costs for participants in MBCP and ECAU (see Supplementary Table S4).

**Effects.** To assess the effects of the intervention, we administered questionnaires during all four assessments. Fear of childbirth was measured by the W-DEQ (Wijma et al., 2002). The W-DEQ is a 33-item self-report measure that is used to assess anticipated (W-DEQ-A) and experienced (W-DEQ-B) levels of FOC. Response options are rated on a 6-point Likert scale from 0 = *not at all* to 5 = *extremely*. A total score ≥ 66 on the W-DEQ-A indicates high FOC (Wijma et al., 2002), and this threshold was used in the current study. The W-DEQ has construct validity, with internal consistency and split-half reliability that exceed .87 (Wijma et al., 1998). We assessed quality of life with the EuroQol-5D (EQ-5D; EuroQol Group, 1990). The EQ-5D consists of five dimensions (items) of health-related quality of life: self-care, mobility, activities, pain/discomfort, and anxiety/depression. Scores range from 1 to 3 (1 = *no problems,* 2 = *some problems,* and 3 = *severe problems*). The EQ-5D has construct validity and test–retest reliability above .73 (Brooks & EuroQol Group, 1996). A health index (utility score) can be derived by adding preference weights (Lamers et al., 2006). The health index can be used to calculate quality adjusted life years (QALYs). QALYs assign a value reflecting a participant's health index for that time period. These values lie from 0 (indicating death) to 1 (indicating full health).

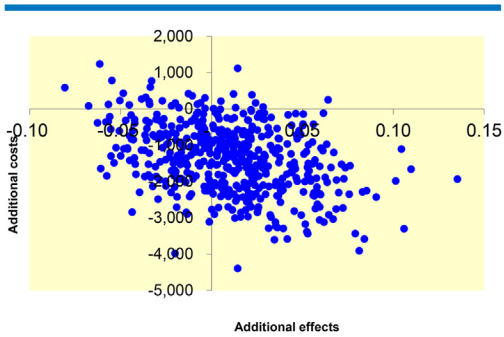


**Figure 1.** Cost-effectiveness plane for fear of childbirth.

## Statistical analysis

We first assessed the effects and costs of the MBCP and ECAU separately. To evaluate differences in the presence of high FOC (W-DEQ score ≥ 66) between conditions (MBCP vs. ECAU), we used chi-square analyses. To evaluate differences in QALYs, we used nonparametric Mann–Whitney *U* tests. To examine differences in costs, we used bootstrap analyses. Second, we evaluated the combined outcomes of costs and effects using a societal perspective (all costs—health care and non-health care costs—were included). In the primary analyses, we calculated two incremental cost-effectiveness ratios (ICERs) that represent (a) the cost per participant with a normal level of FOC (W-DEQ score < 66) and (b) the cost per QALY. Next, we performed bootstrap analysis to reflect the uncertainty around the incremental cost-effectiveness ratios (e.g., Briggs et al., 2002), resulting in two cost-effectiveness planes: a cost-effectiveness plane in which the measure of effect was FOC (Figure 1) and a cost-effectiveness plane in which the measure of effect was QALY (Figure 2). The y-axis in the cost-effectiveness plane reflects the difference in costs between MBCP and ECAU, and the x-axis represents the difference in effect. Taking the y-axis and x-axis together, a cost-effectiveness

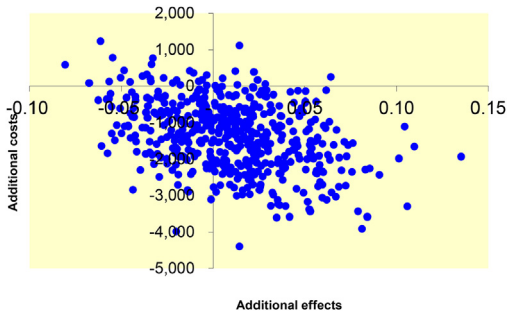


**Figure 2.** Cost-effectiveness plane for quality adjusted life years (QALY).

plane can be divided into four quadrants (e.g., see Rudmik & Drummond, 2013). Cost-effectiveness acceptability curves (Supplementary Figures S1 and S2) were used to represent the probability that MBCP is cost-effective at a range of ceiling ratios (i.e., the amount of money that society must be willing to pay for a pregnant woman without clinical FOC per QALY).

Secondary analyses were performed to evaluate the robustness of the primary cost-effectiveness analyses (Briggs et al., 1997). As different estimates of effect, we used (a) satisfaction with labor measured by the Salmon's Item List (Salmon & Drew, 1992; a score $>$ 70 was used as an indicator for a positive birth experience; Spaich et al., 2013), (b) postnatal depression measured by the Edinburgh Prenatal Depression Scale (Cox et al., 1987; a cutoff of 10 was used to indicate a clinical score; Bergink et al., 2011), and (c) parenting stress measured by the Nijmeegse Parental Stress Index–Short Form (Brock et al., 1992; a "high" score following the norms in the manual was considered clinical). As different estimates of costs, we followed a health care perspective and calculated total costs (i.e., societal costs + costs related to the child). In addition, we identified one extreme value regarding costs, and therefore we reanalyzed the data leaving this extreme case out.

Finally, we calculated the average amount of money that the midwives received for taking care of pregnant women and compared this between the MBCP and ECAU conditions.

## Results

The sample for this cost-effectiveness study consisted of 54 participants who were randomized to MBCP ($n$ = 32) or ECAU ($n$ = 22). We found no significant differences in baseline variables between participants in MBCP and ECAU (see Table 1) or significant differences between conditions with respect to costs measured at pre-assessment. The bootstrapped cost difference between conditions at pre-assessment was €−801, 95% confidence interval (CI) [€−2,777 to €1,082] (the average exchange rate of 1 euro in 2017 was 1.13 USD).

There were no statistical differences between the two conditions in terms of societal costs, health care costs, or non-health care costs (see Table 2). Among the health care costs subcategories, relatively high mean childbirth costs were observed in ECAU (compared with MBCP). Among the non-health care costs subcategories, costs for sick leave and loss of daily activities (compared with the other subcategories) were high in both groups. Costs related to help from family and friends were also high in both groups but seemed particularly high in ECAU. Costs were not equally distributed in time; costs were highest (particularly for ECAU) at T3 (covering costs due to mode of childbirth). With regard to the effects, no statistical differences were found between MBCP and ECAU (see Supplementary Table S5).

The ICER derived from W-DEQ data revealed that MBCP outperformed ECAU in terms of cost-effectiveness. Specifically, the effect of MBCP was 0.19 higher, and the overall costs were €6,004 lower (Table 3). The cost-effectiveness plane (Figure 1) demonstrated that most of the point estimates (92%) were found on the right side of the vertical axis, indicating a high probability that MBCP is more effective than ECAU. In addition, most point estimates (88%) were found below the horizontal axis, indicating a high probability that MBCP costs less than ECAU. More specifically, 7% of the ICERs were falling in the South-West quadrant (MBCP is less effective, and costs are lower), 1% in the North-West quadrant

**The Mindfulness-Based Child and Parenting program appears to be a cost-effective intervention to reduce fear of childbirth in pregnant women.**

(MBCP is less effective, and costs are higher), 11% in the North-East quadrant (MBCP is more effective, and costs are higher), and 81% in the South-East quadrant (MBCP is more effective, and costs are lower) (Table 3). The cost-effectiveness acceptability curve (Table 3 and Supplementary Figure S1) demonstrates that MBCP has a probability of 88% of being cost-effective (when the willingness to pay extra money equals zero). The probability of being cost-effective increases as the willingness to pay increases (Table 3 and Supplementary Figure S1).

The ICER based on the costs per QALY demonstrated that MBCP was dominant to ECAU; the effect of MBCP was 0.01 higher, and costs were €6,004 lower (see Table 3). The cost-effectiveness plane (Figure 2) demonstrated that more than half of the point estimates (64%) were found on the right side of the vertical axis, indicating that the probability that MBCP is more effective than ECAU is quite uncertain. However, most point estimates (80%) were found below the horizontal axis, indicating a rather high probability that MBCP costs less than ECAU. For the distribution of the point estimates across the four quadrants, see Table 3. The cost-effectiveness acceptability curve (Table 3 and Supplementary Figure S2) demonstrated that MBCP has a probability of 89% of being cost-effective when the willingness to pay for a QALY equals zero. This probability stays rather stable across different willingness to pay thresholds (Table 3 and Supplementary Figure S2).

In the secondary analyses, we evaluated the robustness of the findings from the primary analyses by varying the estimates of effect and costs (see Table 3). In all but one of the scenarios, MBCP was dominant to ECAU (more effects and less costs), with probability rates of MBCP being cost-effective compared with ECAU ranging from 70% to 98% at a willingness to pay equal to zero (Table 3). The exception was when postnatal depression was used as a measure of effect. In this scenario, 61% of the point estimates felt on the left side of the y-axis demonstrated lower effectiveness for MBCP compared with ECAU. However, MBCP still had a rather high probability (86%) of being cost-effective in this scenario due to lower costs in MBCP.

**Table 1: Baseline Characteristics of the Participants in MBCP and ECAU**

| | MBCP ($n = 32$) | | ECAU ($n = 22$) | | |
|---|---|---|---|---|---|
| Characteristic | *M* | *SD* | *M* | *SD* | *p* |
| Age, years | 32.90 | 4.37 | 33.02 | 4.51 | .93 |
| Gestational age, weeks | 39.63 | 1.89 | 39.87 | 1.22 | .60 |
| FOC (W-DEQ-A total score) | 98.03 | 23.61 | 98.27 | 21.73 | .97 |
| Health-related index (EQ-5D) | 0.74 | 0.20 | 0.72 | 0.19 | .77 |
| | *n* | % | *n* | % | |
| Educational level | | | | | .32 |
| Middle | 4 | 12.5 | 5 | 22.7 | |
| High (bachelor's degree) | 28 | 87.5 | 17 | 77.3 | |
| Born in the Netherlands | | | | | .94 |
| Yes | 25 | 78.1 | 17 | 77.3 | |
| No | 7 | 21.9 | 5 | 22.7 | |
| Parity | | | | | .24 |
| Nulliparous | 25 | 78.1 | 14 | 63.6 | |
| Multiparous | 7 | 21.9 | 8 | 36.4 | |

*Note.* MBCP = Mindfulness-Based Childbirth and Parenting; ECAU = enhanced care as usual; FOC = fear of childbirth; W-DEQ-A = Wijma Delivery Expectation Questionnaire; EQ-5D = EuroQol-5D.

**Table 2: Costs for Participants in MBCP and ECAU (in 2017 Euro)**

| | MBCP ($n = 32$) | | ECAU ($n = 22$) | | |
|---|---|---|---|---|---|
| Resource | M | SD | M | SD | Mean IC [95% CI] |
| *Health care* | | | | | |
| General practitioner | 70.11 | 117.69 | 106.16 | 120.55 | |
| General practitioner outside working hours | 28.22 | 80.71 | 14.32 | 36.88 | |
| First aid (hospital) | 24.84 | 78.47 | 48.17 | 132.77 | |
| Medical specialist | 26.18 | 59.04 | 25.39 | 51.24 | |
| Hospitalization | 924.38 | 1,668.72 | 1,438.72 | 1,749.13 | |
| Paramedic/psychological care | 349.10 | 552.89 | 307.22 | 602.02 | |
| Midwife | 499.78 | 203.19 | 630.73 | 228.50 | |
| Gynecologist | 420.82 | 718.42 | 355.43 | 664.88 | |
| Mode of childbirth | 1,917.83 | 1,204.59 | 3,003.93 | 1,308.06 | |
| Postnatal care | 104.77 | 206.61 | 38.11 | 101.27 | |
| Home care | 0.00 | 0.00 | 339.45 | 1,538.21 | |
| Prescribed medication | 9.80 | 21.09 | 22.74 | 40.48 | |
| Intervention costs | 566.64 | 0.00 | 377.76 | 0.00 | |
| Subtotal (euro) | 4,942 | 2,904 | 6,708 | 3,834 | −1,399 |
| Conversion USD | 5,584 | 3,281 | 7,580 | 4,332 | [−4,111 to 1,609] |
| *Non-health care* | | | | | |
| Loss of activities | 2,108.62 | 3,567.14 | 2,948.94 | 5,700.23 | |
| Sick leave | 4,276.06 | 7,610.78 | 4,010.39 | 9,412.21 | |
| Sick leave partner | 1,638.03 | 1,780.85 | 2,356.16 | 2,410.52 | |
| Help family/friends | 1,823.34 | 3,499.10 | 5,292.54 | 12,550.31 | |
| Domestic help | 3.13 | 17.68 | 66.23 | 236.66 | |
| Other expenses | 365.56 | 660.23 | 122.27 | 102.95 | |
| Intervention costs: Participants' time | 386.64 | 0.00 | 42.96 | 0.00 | |
| Subtotal (euro) | 10,601 | 9,476 | 14,839 | 22,264 | −4,415 |
| Conversion USD | 11,979 | 10,708 | 16,768 | 25,158 | [−15,397 to 4,348] |
| *Costs over time* | | | | | |
| T2 | 4,376 | 4,975 | 6,092 | 12,507 | |
| T3 | 8,768 | 4,779 | 12,569 | 10,213 | |
| T4 | 2,399 | 5,548 | 2,886 | 4,752 | |
| Societal costs (euro) | 15,543 | 11,134 | 21,547 | 24,056 | −5,919 |
| Conversion USD | 17,564 | 12,581 | 24,348 | 27,183 | [−29,038 to 9,503] |

*Note.* MBCP = Mindfulness-Based Childbirth and Parenting; ECAU = enhanced care as usual; IC = incremental cost (cost difference between MBCP and ECAU); CI = confidence interval; T2 = Time 2 (pre- to post-intervention period); T3 = Time 3 (before to after childbirth period); T4 = Time 4 (after childbirth to follow-up period).

With regard to the midwives' perspective, the average amount of money the midwives received for providing care to a participant in the MBCP condition was €1,324 compared with €1,125 in the ECAU condition. The bootstrapped mean difference in the average amount of money between conditions was significant, with incremental cost = €193 (95% CI [€15 to €371]).

**Table 3: Effects, Costs, and Cost-Effectiveness Analyses of MBCP Versus ECAU**

| | MBCP | | ECAU | | | % ICERs Falling in Quadrant of CE Plane | | | | Probability (%) That MBCP Is Cost-Effective at WTP | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Effect | Costs | Effect | Costs | ICER | SW | NW | NE | SE | €0 | €5K | €10K | €20K |
| Primary analyses | | | | | | | | | | | | | |
| FOC | .69 | 15,543 | .50 | 21,547 | Dominant | 7 | 1 | 11 | 81 | 88 | 91 | 93 | 95 |
| QALY | .55 | 15,543 | .54 | 21,547 | Dominant | 28 | 9 | 2 | 62 | 89 | 89 | 89 | 88 |
| Secondary analyses | | | | | | | | | | | | | |
| Health care costs | | | | | | | | | | | | | |
| FOC | .69 | 4,942 | .50 | 6,708 | Dominant | 7 | 0 | 2 | 90 | 98 | 99 | 98 | 96 |
| QALY | .55 | 4,942 | .54 | 6,708 | Dominant | 39 | 3 | 1 | 68 | 96 | 95 | 94 | 91 |
| Total costs (societal + child costs) | | | | | | | | | | | | | |
| FOC | .69 | 18,333 | .50 | 22,258 | Dominant | 6 | 2 | 22 | 70 | 76 | 81 | 84 | 89 |
| QALY | .55 | 18,333 | .54 | 22,258 | Dominant | 20 | 19 | 6 | 56 | 75 | 75 | 75 | 74 |
| Societal costs without one extreme case | | | | | | | | | | | | | |
| FOC | .69 | 15,544 | .52 | 17,320 | Dominant | 8 | 3 | 27 | 61 | 70 | 78 | 84 | 89 |
| QALY | .55 | 15,544 | .54 | 17,320 | Dominant | 31 | 25 | 6 | 38 | 70 | 68 | 67 | 66 |
| Societal costs with other outcomes | | | | | | | | | | | | | |
| Satisfaction childbirth | .69 | 15,544 | .64 | 21,548 | Dominant | 27 | 6 | 6 | 62 | 89 | 88 | 88 | 87 |
| Postnatal depression | .69 | 15,544 | .73 | 21,548 | €150,952 | 52 | 9 | 6 | 33 | 86 | 85 | 84 | 80 |
| Parenting stress | .91 | 15,544 | .77 | 21,548 | Dominant | 10 | 1 | 12 | 78 | 87 | 90 | 92 | 95 |

*Note.* MBCP = Mindfulness-Based Childbirth and Parenting; ECAU = enhanced care as usual; ICER = incremental cost-effectiveness ratio; CE = cost-effectiveness; WTP = willingness to pay; SW = South-West; NW = North-West; NE = North-East; SE = South-East; K = thousand (000); FOC = fear of childbirth; QALY = quality adjusted life years.



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## Discussion

This study was the first to evaluate the cost-effectiveness of MBCP versus ECAU for pregnant women with high FOC. Results indicate that the probability that MBCP is cost-effective was 88% considering W-DEQ scores and was 89% considering QALYs, which are quite high probabilities. Secondary analyses mostly confirmed the findings of the primary analyses.

Although costs and effects did not differ between MBCP and ECAU when they were analyzed separately, the cost-effectiveness analyses demonstrated that MBCP had a higher chance of being more effective than ECAU and costs were lower. This finding is in line with other studies demonstrating the effectiveness of MBIs for pregnant women with high FOC (Duncan & Bardacke, 2010; Goodman et al., 2014; Guardino et al., 2014; Pan et al., 2019). When considering the costs for MBCP and ECAU, we noticed relatively high childbirth costs and non-health care costs in ECAU. The higher childbirth costs in ECAU can be explained by significantly more unmedicated childbirths in the MBCP condition than in the ECAU condition (Veringa-Skiba et al., 2022). Subsequently, participants in the ECAU condition may have had longer recovery periods due to these medicated childbirths (e.g., recovery after a cesarean), which in turn may be related to more help from family and friends.

Considering the effects and costs together, it seems that MBCP is a cost-effective intervention to treat FOC in pregnant women. However, some issues need to be considered. First, when examining the different measures of effect in the primary analyses (W-DEQ and QALY), it needs to be noted that the difference in effect between MBCP and ECAU regarding QALYs was very small. An important distinction here is the use of condition-specific measures of effect (W-DEQ) versus a more generic measure (EQ-5D). Some authors have suggested that the EQ-5D might not be responsive enough to measure change (e.g., see review by Payakachat et al., 2015; Turkstra et al., 2017). Second, for one scenario (postnatal depression), we found a low probability that MBCP is more effective than ECAU. An explanation for this finding is that the MBCP was not specifically targeting depression or depressive symptoms but instead primarily focused on targeting FOC. Prior to intervention about one third of the participants had high scores, and this percentage had not changed after the intervention. In addition, note that the difference in effect regarding postnatal depression between MBCP and ECAU was rather small. Third, in the scenario where one case (with extreme high costs) was excluded from analysis, MBCP was still dominant compared with ECAU, but the chance of MBCP being cost-effective dropped to 70%. This finding makes the interpretation of the results more uncertain, and therefore a replication of the study (with a larger sample size) is recommended.

### Limitations

In the current study, we used a subsample ($n = 54$, 38.3%) instead of the total sample ($N = 141$). The use of a smaller subsample might have led to less power to compare differences in effect between MBCP and ECAU (i.e., in the total sample, significant differences on W-DEQ and other outcomes were found in favor of MBCP; Veringa-Skiba et al., 2022). Considering cost differences, usually larger sample sizes are needed to handle the uncertainty regarding the large variability in costs. However, power calculations regarding sample sizes for economic evaluations are not straightforward (Al et al., 1998; Briggs, 2000), and there are methodological analyses—such as bootstrap analyses—that can be used to handle the uncertainty in cost-effectiveness studies (e.g., see Briggs et al, 2002; Marshall & Hux, 2009).

Regarding the representativeness and generalizability of the results, it should be noted that countries differ in their costs for health care systems and that the Netherlands has a quite unique system compared with other Western countries regarding childbirth care, which makes it uncertain how well our results generalize to other countries with different health care systems. To illustrate, compared with other countries, midwife involvement in the Netherlands is quite high and medical intervening is low (Patah & Malik, 2011), which might be related to lower health care (childbirth) costs. However, considering the results of the current cost-effectiveness study, if health care costs and medical intervening in other countries are higher, the probability that MBCP would be cost-effective compared with care as usual may potentially be even higher in other countries. That is, medical intervening (e.g., epidural procedure, instrumental intervening, having a cesarean)—as compared with (spontaneous) vaginal delivery—will likely be related to (high) additional costs in all countries (Backes & Scrimshaw, 2020; Fahy et al., 2013), and because we have seen that costs related to

**Maternity care providers should be trained to use the Mindfulness-Based Child and Parenting program and standard instruments to screen for fear of childbirth.**

childbirth are larger in ECAU than in MBCP, we might carefully speculate that also in other countries MBCP may be cost-effective.

## Implications

The findings of this study have two important implications. First, because we found that MBCP is more effective than ECAU in decreasing FOC, we recommend that MBCP become the standard of care in midwifery practices. By delivering MBCP in groups, more pregnant women (and their partners) can be reached in a shorter time with less costs (compared with individual trajectories) while also benefitting from a community of others experiencing the same challenges. Second, before the intervention, screening for FOC should be undertaken to identify pregnant women with high FOC. Although we used the W-DEQ as one of our instruments, it is' worth noting that other measures, such as the single-item Fear of Childbirth–Postpartum–Visual Analogue Scale (Veringa-Skiba et al., 2021), might offer a more efficient alternative. If a significant FOC is detected, the implementation of MBCP could be considered to reduce this fear. By proactively screening for high FOC and providing MBCP when necessary, potential cost savings can be achieved.

## Conclusion

From a societal and health care perspective, we found MBCP to be a cost-effective intervention to treat FOC in pregnant women. A next step is to replicate the findings in other health care systems and investigate how MBCP can be further integrated into midwifery care.

## SUPPLEMENTARY MATERIAL

Note: To access the supplementary materials that accompany this article, visit the online version of the *Journal of Obstetric, Gynecologic, & Neonatal Nursing* at http://jognn.org and at https://doi.org/10.1016/j.jogn.2023.10.004.

## CONFLICT OF INTEREST

The authors report no conflicts of interest or relevant financial relationships.

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