Lifestyle interventions for obese women before and during pregnancy: The effect on pregnancy outcomes
Ruifrok, A.E.

Citation for published version (APA):
Economic consequences of lifestyle and dietary interventions in pregnant women who are overweight or obese: A budget impact analysis.

A.E. Ruifrok, J. van 't Hooft, J.M. van Dongen, J.E. Bosmans, B.W.J. Mol, C.J.M. de Groot

Submitted
Economic consequences of lifestyle and dietary interventions in pregnant women who are overweight or obese: A budget impact analysis

A.E. Ruifrok
J. van ‘t Hooft
J.M. van Dongen
J.E. Bosmans
B.W.J. Mol
C.J.M. de Groot
M.N.M. van Poppel

Submitted
Abstract

Background
Globally, the incidence of obesity is increasing. Being overweight or obese during pregnancy increases the risk of complications for both women and their neonates. A recent meta-analysis showed that lifestyle interventions in pregnancy were associated with a reduced risk of pregnancy complications. A reduction in the number of maternal and neonatal complications might result in a decrease in health care cost during pregnancy.

Objectives
To describe the budget impact of lifestyle and dietary interventions in overweight or obese pregnant women, taking into account the reduced risk of pregnancy complications and their associated costs.

Design
Budget impact analysis, based on the results of a meta-analysis evaluating the effect of lifestyle or dietary interventions on pregnancy complications.

Population
Three hypothetical cohorts of 100,000 pregnant overweight or obese women: 100,000 receiving usual care, 100,000 receiving lifestyle intervention, and 100,000 receiving dietary intervention.

Main outcomes measures
Direct health care utilisation and costs related to maternal pregnancy complications.

Results
The expected costs of maternal complications in the cohort receiving lifestyle intervention were €580 million compared to €602 million in the usual care group, indicating a potential reduction of 3.5% in health care costs by lifestyle intervention. In the group receiving dietary intervention the expected costs were €515 million, indicating potential reduction of 14% compared to the group receiving usual care.

Conclusion
Lifestyle and dietary interventions do not only have a positive effect on maternal and neonatal health outcomes, but are expected to also have a substantial impact on the health care budget.
Introduction

Around the world the incidence of obesity is increasing. Globally, obesity has reached epidemic proportions, with more than 1 billion adults being overweight, of whom at least 300 million obese. The obesity epidemic is not restricted to industrialised societies, and the increase of obesity is often faster in developing countries than in the developed world.\(^1\)

Kelly et al.\(^2\) projected that the worldwide number of overweight people will increase from 937 million in 2005 to 1.35 billion in 2030 and the number of obese people from 396 million to 573 million individuals. The general increase in the prevalence of obesity resulted in a concurrent increase in the prevalence of maternal obesity in the last decades, from approximately 10% in 1990 to 20.5% in 2009 in the USA.\(^3-5\)

Being overweight or obese during pregnancy increases the risk of complications for both women and their neonates. Maternal obesity is associated with maternal mortality and morbidity including miscarriage, pre-eclampsia, gestational diabetes mellitus, and postpartum haemorrhage.\(^6-8\) Maternal obesity is further associated with neonatal mortality and morbidity, for example due to an increased risk of preterm birth, macrosomia and shoulder dystocia.\(^9\) In addition, offspring of obese mothers or mothers who gain excessive weight during pregnancy have an increased risk of developing childhood obesity.\(^10\) This indicates that the increase of pre-pregnancy maternal obesity, and excessive weight gain in pregnancy impose a large financial burden on health care resources.\(^11-13\)

A reduction of the number of maternal and neonatal complications, for instance by decreasing gestational weight gain, might therefore result in a decrease in health care cost during and after pregnancy.

A recent meta-analysis showed that lifestyle interventions (all interventions focussed on physical activity, diet, or combinations thereof) in pregnancy were associated with a reduced risk of pregnancy complications compared to usual care.\(^14\) Pre-eclampsia was reduced significantly (relative risk (RR) 0.74, 95% CI 0.60 to 0.92) and reductions in gestational diabetes mellitus, pregnancy induced hypertension and preterm birth were also found, but these reductions were not statistically significant. Also, sub-group analyses were performed to explore the effect of dietary and physical activity interventions separately. Dietary interventions resulted in significantly improved pregnancy outcomes compared with other interventions. However, this meta-analysis did not evaluate the cost-effectiveness of the interventions.

The effect of a lifestyle- or dietary intervention on cost is not clear, although insight in the possible cost reduction in overweight or obese pregnant women by lifestyle and dietary interventions is useful for implementation of these interventions.

The objective of this study is to estimate the potential economic benefits of providing a lifestyle or dietary intervention for overweight and obese women in pregnancy, taking into account the reduced risk of pregnancy complications.
Methods

We conducted a budget impact analysis estimating the financial impact of a lifestyle- or dietary intervention in pregnancy compared to usual care. We estimated expected costs for a hypothetical cohort of 100,000 pregnant overweight or obese women who received either usual care, a lifestyle intervention, or a dietary intervention.

One analysis consists of a budget impact of a lifestyle intervention (all types of lifestyle interventions combined) versus usual care in this hypothetical cohort by comparing the differences between risk of obstetrical complications in relation to their costs. In the next analysis, we describe the budget impact of a dietary intervention compared to usual care.

Data sources

The differences in risk of obstetrical complications were derived from a recently published meta-analysis. In short, this meta-analysis included 44 randomised controlled trials (including 7,278 women, no BMI restrictions) estimating the effect of lifestyle interventions (i.e. dietary and/or physical activity interventions) or dietary interventions only, in pregnant women with regard to maternal and neonatal outcomes. The reported intervention effects on specific complications of obesity, ranked as critically important by a Delphi Survey of clinicians with expertise in this specialty (Pre-eclampsia (PE), pregnancy induced hypertension (PIH), gestational diabetes mellitus (GDM), induction of labour (IOL), caesarean section (CS), preterm delivery and postpartum haemorrhage (PPH)) were used. Lifestyle interventions were associated with a reduced risk of PE (RR 0.74, 95%CI 0.60 to 0.92). Other (non-significant) intervention effects were reported: PIH (RR 0.89, 95%CI 0.64 to 1.25), GDM (RR 0.78, 95%CI 0.57 to 1.08), IOL (RR 1.12, 95%CI 1.00 to 1.26), CS (RR 0.93, 95%CI 0.85 to 1.01), preterm delivery (RR 0.78, 95%CI 0.60 to 1.02) and PPH (RR 0.90, 95%CI 0.57 to 1.42) (Table 1). Among the interventions, those based on diet were most effective and associated with higher reductions in maternal gestational weight gain and improved obstetric outcomes. The relative risks of these maternal outcomes from this meta-analysis were used for our budget impact analysis.

Costs

To estimate the cost of usual care, data of the STAN-trial was used. In this trial the effectiveness of the addition of ST analysis of the foetal electrocardiogram (ECG; STAN) to cardiotocography (CTG) for foetal surveillance during labour compared with CTG only was evaluated.

The average cost of a delivery in a hospital setting was estimated. This includes complicated and non-complicated deliveries and therefore showing a fair analysis of the average cost.

To establish the average costs of lifestyle interventions and dietary interventions, data from several trials were used, estimating a range
of these costs. The interventions in these studies reflect the average intensity and duration of interventions included in the meta-analyses of Thangaratinam. An average of €500 per woman was used for this analysis. In this calculation, the cost for personnel and direct non health care costs (travel costs, telephone costs, equipment) were included.

To estimate the costs of health care generated by the maternal complications, the data from cost-effectiveness analyses, estimating the impact of a single complication, alongside several Dutch randomised controlled trials were used as much as possible. These trials calculated costs with similar methods and from a health-care perspective.

For example, for the costs of hypertensive disorders we used the data of the cost-effectiveness analysis alongside the Hypitat trial. Similarly, we used cost data of the following studies: For the costs for induction of labour, we used the cost-effectiveness analysis alongside the PROBAAT trial, for the costs for haemorrhage postpartum data was used of the WOMB trial, and for the costs for preterm delivery data was used of the Apostel II trial. Costs related to GDM were derived of a prediction model evaluating the costs and effects of screening for gestational diabetes, including all healthcare related costs of treatment and post-delivery care of gestation diabetes. For the costs of caesarean section, no Dutch data were available, and the costs were estimated using an average of these costs stated in the literature. All costs were expressed in July 2013 Euro’s, using consumer pricing indices. Unit costs were estimated with different methods and sources, all according to recent guidelines on costing of healthcare services. A complete description of the cost estimates is provided by van Baaren et al.

**Incidences**

For the analysis, the incidence of every complication (PE, PIH, GDM, CS, IOL, PPH, preterm delivery) was needed. We used the data of the Dutch perinatal registration from 2012 for these incidences in the Netherlands. This database comprises a nationwide population-based registry: data of three medical registries (midwives, obstetricians and paediatricians/neonatologists) are combined. Data in this registry are available from 1985 onwards. As from 1999, the PRN has included approximately 95% of all 180,000 deliveries at >16 completed weeks of gestation in the Netherlands.

**Probabilities**

Thangaratinam et al. estimated the relative risks (RR) for pregnancy complications for usual care compared to lifestyle interventions, as well as for dietary interventions in comparison with usual care. In this analysis, these RRs were used in order to determine the effect of lifestyle interventions in overweight or obese women.
Analyses
The costs of the hypothetical cohort receiving usual care were compared to the costs of the cohort receiving a lifestyle intervention, defined by the differences in risk for developing maternal complications. The differences in costs were presented as relative cost differences and percentages.

In addition, an analysis was performed exploring the costs differences after dietary intervention only. Both analyses are presented as a base-case scenario.

We performed six univariate sensitivity analyses of all variables used in the base-case scenario (incidences, costs and relative risks), in which one factor at the time was varied to explore the robustness of the findings to assumptions and unit cost estimates. First, in model 1 and 2 we assessed the impact of variations in the incidence of maternal outcomes (with ranges of 25% decreased to 25% increased incidence for every outcome respectively). Second, in model 3 and 4 variations were made in the costs related to the maternal complications, with ranges of costs found in international literature compared to the Dutch costs. And lastly, in model 5 and 6 variations were made in the risks related to a lifestyle intervention, with ranges of 1 SD less to 1 SD higher relative risk.

In an extra analysis we estimated the break even point. This point reflects what the maximum cost of a lifestyle intervention (dietary and physical activity interventions) could be in order to have equal total health care costs compared to usual care. We performed this analysis in the first hypothetical cohort receiving usual care compared to the cohort receiving a lifestyle intervention, as the cost of these two cohorts are closest together. The break even point when analysing usual care compared to dietary intervention would be even higher.

Results
In the cohort of 100,000 overweight or obese women receiving usual care, 63,100 women were expected to suffer from pregnancy complications, compared to 60,741 women receiving lifestyle interventions (either dietary or physical activity interventions), and 53,852 women receiving dietary intervention only (Table 1).

In the group receiving usual care compared to women receiving lifestyle intervention, the number of women that were expected to suffer complications were higher for PE or PIH (9,100(14%) vs. 8,054(13%)), more often GDM (2,400 (4%) vs. 1,872(3%)), similar for CS (16,300 (26%) vs. 15,159 (25%)), similar for preterm delivery (7,400 (12%) vs. 5,772 (10%)), similar for PPH (6,200 (10%) vs. 5,580 (9%)) and less for IOL (21,700 (34%) vs. 24,304 (40%) (Table 1). Table 1 also shows the number of women that were expected to suffer complications when receiving dietary interventions.

Furthermore, the number of women that did not develop any of these complications were 36,900 (37%) women in the group receiving usual care, 39,259 (39%) in the lifestyle intervention group and 46,148 (46%) in the group receiving dietary intervention (Table 1).
<table>
<thead>
<tr>
<th>Outcome</th>
<th>Usual care</th>
<th>Lifestyle interventions</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>All intervention</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-eclampsia</td>
<td>300</td>
<td>14</td>
<td>0.74</td>
<td>0.60 to 0.92</td>
<td>222</td>
<td>10</td>
<td>0.67</td>
<td>0.53 to 0.85</td>
</tr>
<tr>
<td>Pregnancy induced hypertension</td>
<td>8,800</td>
<td>68</td>
<td>0.89</td>
<td>0.64 to 1.25</td>
<td>7,832</td>
<td>61</td>
<td>0.30</td>
<td>0.10 to 0.88</td>
</tr>
<tr>
<td>Gestational diabetes</td>
<td>2,400</td>
<td>14</td>
<td>0.78</td>
<td>0.57 to 1.08</td>
<td>1,872</td>
<td>11</td>
<td>0.39</td>
<td>0.23 to 0.69</td>
</tr>
<tr>
<td>Induction of labour</td>
<td>21,700</td>
<td>73</td>
<td>1.12</td>
<td>1.00 to 1.26</td>
<td>24,304</td>
<td>82</td>
<td>1.12</td>
<td>0.99 to 1.27</td>
</tr>
<tr>
<td>Caesarean section</td>
<td>16,300</td>
<td>82</td>
<td>0.98</td>
<td>0.85 to 1.01</td>
<td>15,159</td>
<td>76</td>
<td>0.93</td>
<td>0.84 to 1.04</td>
</tr>
<tr>
<td>Preterm delivery</td>
<td>4,400</td>
<td>285</td>
<td>0.78</td>
<td>0.60 to 1.02</td>
<td>5,772</td>
<td>222</td>
<td>0.68</td>
<td>0.48 to 0.96</td>
</tr>
<tr>
<td>Postpartum haemorrhage</td>
<td>6,200</td>
<td>11</td>
<td>0.90</td>
<td>0.57 to 1.42</td>
<td>5,890</td>
<td>10</td>
<td>0.90</td>
<td>0.57 to 1.42</td>
</tr>
<tr>
<td><strong>Total: complication</strong></td>
<td><strong>63,100</strong></td>
<td><strong>547</strong></td>
<td></td>
<td><strong>60,741</strong></td>
<td><strong>472</strong></td>
<td></td>
<td><strong>53,852</strong></td>
<td><strong>396</strong></td>
</tr>
<tr>
<td><strong>Total: no complication</strong></td>
<td><strong>36,900</strong></td>
<td><strong>55</strong></td>
<td></td>
<td><strong>39,259</strong></td>
<td><strong>58</strong></td>
<td></td>
<td><strong>45,146</strong></td>
<td><strong>69</strong></td>
</tr>
<tr>
<td><strong>Cost of intervention</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total health care costs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 1.** Effect of lifestyle interventions on pregnancy complications compared to usual care: number of complications and costs
We analysed the total health care cost of in each of our three cohorts of 100,000 women. The total expected health care costs for the cohort receiving usual care was €602 million and €580 million for the cohort receiving a lifestyle intervention, which is a relative reduction of 3.5% in comparison with usual care. When analysing the financial impact of dietary interventions, the total expected health care costs were €515 million, a relative reduction of 14% compared to the cohort receiving usual care (Table 1).

Sensitivity analysis
In summary, sensitivity analyses indicated that in only one of the models (model 6) the results were substantially altered. An overview of the sensitivity analysis are shown in table 2 and 3.

If the incidences of the complications were decreased and increased by 25% (models 1 and 2), the difference in expected total health care costs of women receiving usual care compared to lifestyle intervention would be €3 million and €39 million respectively, in favour of the cohort receiving a lifestyle intervention. In models 3 and 4, variations were made in the costs related to the maternal complications, with ranges of costs found in international literature compared to the Dutch costs. When no reliable data was found in the literature, a 25% decrease (model 3) or 25% increase (model 4) in cost of the complication was used. The differences in expected total health costs in these two models in women receiving usual care compared to lifestyle intervention was €2 million and €66 million respectively, in favour of the cohort receiving a lifestyle intervention.

When assuming a variation in the risks related to lifestyle intervention, with ranges of 1 SD less (model 5) to 1 SD higher (model 6) relative risk, the differences in expected health costs were €151 million (in favour of lifestyle intervention) and -€109 million (in favour of usual care) respectively.

In the sensitivity analysis assessing the effect of dietary intervention compared to usual care, models 1 to 5 were in favour of the cohort receiving dietary intervention. Again, only model 6 was in favour of usual care. This is to be expected due to the fact that by increasing 1SD, most of the relative risks change from <1.0 to >1.0. Crossing the 1 in this case means that a lifestyle intervention is causing more obstetrical complications compared to usual care.

Break even point
We estimated a break even point at €710, meaning that a lifestyle intervention (dietary and physical activity interventions) can cost up to €709.99 and still result in lower costs when compared to usual care.

Discussion
In this budget impact analysis, we found that in overweight and obese pregnant women, lifestyle interventions could potentially reduce the annual health care costs related to the most common pregnancy
Table 2. Sensitivity analysis lifestyle interventions

<table>
<thead>
<tr>
<th>Sensitivity analysis</th>
<th>Total health care costs (€ million)</th>
<th>Cost differences (€ million)</th>
<th>Difference (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Usual care</td>
<td>Lifestyle intervention</td>
<td></td>
</tr>
<tr>
<td></td>
<td>including intervention costs</td>
<td>costs</td>
<td></td>
</tr>
<tr>
<td>Model 1; minus 25% incidence</td>
<td>488</td>
<td>485</td>
<td>3</td>
</tr>
<tr>
<td>Model 2; plus 25% incidence</td>
<td>714</td>
<td>675</td>
<td>39</td>
</tr>
<tr>
<td>Model 3; decreased costs</td>
<td>473</td>
<td>471</td>
<td>2</td>
</tr>
<tr>
<td>Model 4; increased costs</td>
<td>979</td>
<td>913</td>
<td>66</td>
</tr>
<tr>
<td>Model 5; minus 1SD RR</td>
<td>601</td>
<td>450</td>
<td>151</td>
</tr>
<tr>
<td>Model 6; plus 1 SD RR</td>
<td>601</td>
<td>710</td>
<td>-109</td>
</tr>
</tbody>
</table>

Table 3. Sensitivity analysis dietary interventions

<table>
<thead>
<tr>
<th>Sensitivity analysis</th>
<th>Total health care costs (€ million)</th>
<th>Cost differences (€ million)</th>
<th>Difference (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Usual care</td>
<td>Lifestyle intervention</td>
<td></td>
</tr>
<tr>
<td></td>
<td>including intervention costs</td>
<td>costs</td>
<td></td>
</tr>
<tr>
<td>Model 1; minus 25% incidence</td>
<td>293</td>
<td>262</td>
<td>31</td>
</tr>
<tr>
<td>Model 2; plus 25% incidence</td>
<td>429</td>
<td>356</td>
<td>73</td>
</tr>
<tr>
<td>Model 3; decreased costs</td>
<td>284</td>
<td>255</td>
<td>29</td>
</tr>
<tr>
<td>Model 4; increased costs</td>
<td>585</td>
<td>489</td>
<td>96</td>
</tr>
<tr>
<td>Model 5; minus 1SD RR</td>
<td>361</td>
<td>244</td>
<td>117</td>
</tr>
<tr>
<td>Model 6; plus 1 SD RR</td>
<td>361</td>
<td>374</td>
<td>-13</td>
</tr>
</tbody>
</table>

complications by 4% to 14%. This is equivalent to €22 to €87 million per 100,000 women depending on the type of intervention.

When estimating health care costs, a cost-utility analysis would be preferred in order to estimate the ratio between the cost of an intervention and the benefit it produces in terms of quality adjusted life years (QALYs). In this study a budget impact analysis approach was chosen rather than a cost-utility analysis due to the lack of substantial data on QALYs) for all reported outcomes. Especially in obstetrical care, most outcomes are transient (e.g. gestational diabetes and gestational hypertension will be over after pregnancy), and information on the number of QALYs associated with such conditions is lacking. We therefore choose the more pragmatic budget impact approach, in which solely the interventions’ impact on health care costs is explored.
Limitations of this analysis

First, the incidences of maternal outcomes used in the present study are based on Dutch incidences of all pregnant women derived from a national cohort and thus including underweight, normal weight, and obese women. We know, however, that the incidences of most maternal outcomes are higher in overweight and obese women than in the general population. For instance, the incidence of 2.3% of GDM is underestimated in the data of the Dutch perinatal registration, as in this database it is not compulsory to give this information. Other studies have shown that the average incidence of GDM is more likely to be around 5% in all pregnant women. In overweight and obese women the incidence is expected to be even higher, since BMI is one of the most important risk factors for developing GDM. When implementing a higher incidence of GDM, for example of 5%, the costs could be decreased by €24 million in the cohort receiving lifestyle intervention compared to usual care, resulting in an relative reduction of 3.9% in annual costs.

Several assumptions had to be made for this budget impact analysis. We estimated the average costs for a lifestyle intervention, based on data from other studies. These studies reflect the average intensity and duration of interventions included in trials used in the meta-analyses of Thangaratinam et al.

Furthermore, the analyses were based on the costs related to maternal complications in the Netherlands, whereas these costs might differ internationally. Also, various assumptions had to be made for the risk reduction of pregnancy complications. Some of the treatment effects used in this analysis were not statistically significant. However, we felt that this is the best data available at this moment. As we did not want to overestimate our results, it was decided to use all the outcomes for our analysis, and not only the outcomes which were statistically significant in the meta-analyses of Thangaratinam et al.

In our sensitivity analysis we have shown that despite these limitations, our analysis is robust; only one of the models substantially altered the results.

Furthermore, not all effects of lifestyle interventions for overweight and obese pregnant women could be taken into account. For example, we have limited this budget analysis to the most important maternal complications during pregnancy and delivery, which were considered to be the critically important outcomes in a Delphi Survey. Effects on other pregnancy or neonatal complications have not been included, nor were effects on the long term health of mother and child. The latter was due to the fact that little is known about the long-term effects of lifestyle interventions during pregnancy. Moreover, trials assessing the long-term effect of lifestyle interventions in the overall population show different outcomes: ranging from a positive effect up to three years, to no effect after two years.
Interpretation of the findings
The effect in the cohort receiving only dietary interventions was higher compared to a mix of all types lifestyle interventions. We do not have an explanation for this other than the fact that physical activity interventions might have resulted in smaller effects. Compliance may have been better in trials that evaluated the effect of a dietary intervention only. This may be due to the relative simplicity and perceived safety of such interventions in contrast to physical activity interventions in pregnancy.\textsuperscript{14,36,37} Also, in the trials included in the meta-analysis of Thangaratinam et al.,\textsuperscript{14} no information was found on the compliance to the intervention.

Despite the assumptions we had to make, both lifestyle intervention and dietary intervention are likely to result in a substantial reduction in healthcare costs. Costs related to sick leave in pregnancy were not included in this budget impact analyses, although it is known that sick leave is a major cost driver, also in pregnancy\textsuperscript{38,39} and that obesity is related to higher sick leave in general.\textsuperscript{40-43}

Implications for practice
As women are in regular contact with health care workers in the antenatal period, implementation of lifestyle interventions would be reasonably easy. Women and health care workers should become more aware of the increased risk of maternal complications when being overweight or obese. The best route to implement lifestyle advice would then be by collaboration between general practitioners, gynaecologists, midwives, health insurance companies and other health care workers (e.g. dieticians, physiotherapists).

Conclusion
Lifestyle interventions do not only improve maternal and neonatal health outcomes, but also could potentially reduce healthcare expenditures in overweight and obese pregnant women substantially. We would suggest to conduct cost-effectiveness analyses alongside randomised controlled trials evaluating the effect of lifestyle interventions for pregnant women who are overweight or obese.
References


