Objectives
Toxoplasma infection during pregnancy can present a serious hazard to the fetus including lifelong disabilities of connatal infected children. This foodborne illness is a common burden worldwide. Prevention strategies of the health care providers are diverse. In Austria, the maternal toxoplasma screening has been implemented four decades ago. The aim of this study was to determine the cost-effectiveness of the maternal toxoplasma screening.

Methods
We developed a two arm decision-analytic model. One arm of the model assessed the costs and consequences of no prevention, while the other one evaluated the screening. The study population included pregnant women and offspring screened and treated for toxoplasma infection. The average number of births was 76,547 and 50,000 pregnant women were susceptible to infection. The analysis focused on lifetime consequences of the connatal infection. This encompassed direct costs (screening, cost of illness, maternal and pediatric treatment), indirect costs (changed job situation of parents, human-capital of dead individuals, blindness and special schools), quality-adjusted life-years (QALYs) and reduced expectation of life. Costs were presented per child and for the Austrian birth rate. Costs from published sources were used for 2012 from the societal perspective. QALYs, life-years (LYs) and costs were projected over a life-time horizon and discounted at 3% per anno.

Clinical Data
Serorelevance, probabilities of symptoms (symptomatic and asymptomatic) in the screening arm derived from the nationwide database of the reference center (Medical University of Vienna). The no screening probabilities of sources were modeled in accordance with the Stillwagon paper.

Resource Use and Costs
Data on the resource use of screening (IgG, IgM, amnioncentesis (PCR), newborn-test, head ultrasound, blood test, fundoscopy, ECG), maternal and pediatric treatment (medication, dosage and treatment duration) derived from the nationwide database of the reference center. Data on the resource use of symptoms was collected in two steps. First, the medical resources were derived by literature (e.g. disease specific guidelines). In a second step this literature review was verified by experts. Direct medical costs derived from a number of publicly available sources like outpatient clinic catalogue as well as the DRG catalogue (LKF) and official price lists for the Austrian Health insurance funds. Indirect Cost represent statistical and published data as well as own calculations. When necessary, prices were adjusted to 2012 prices using the consumer price index.

Results
Without screening, the total discounted societal cost (direct and indirect) amounts to 174.43 € per child screened (calculations based on the 76,547 newborns). This strategy resulted in a discounted quality-adjusted life expectancy of 31.124 QALYs and a quality-adjusted life expectancy without quality adjustment amounted to 31.128 life-years. The screening strategy accounted for 37.72 € and quality-adjusted life expectancy increase to 31.130 QALYs over lifetime. Total life expectancy without quality adjustment increased to 31.13 life-years. From the societal perspective, a universal screening program resulted in cost savings of 136.71 € per child. Screening results in 0.0087 QALYs gained and 0.002 LYs saved per child. The incremental cost-effectiveness ratio (ICER) amounts to -15,713.79 € from the societal perspective.

Table 1: Results, 2012

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Life expectancy 31.124 QALYs</th>
<th>ICER</th>
<th>LYs saved</th>
<th>Life expectancy 31.130 QALYs per birth cohort</th>
<th>LYs saved per birth cohort</th>
</tr>
</thead>
<tbody>
<tr>
<td>No-screening</td>
<td>31.13</td>
<td></td>
<td></td>
<td>31.13.5</td>
<td>2,382,719</td>
</tr>
<tr>
<td>Screening</td>
<td>31.13</td>
<td>0.0087</td>
<td>0.002</td>
<td>31.13.5</td>
<td>2,382,719</td>
</tr>
</tbody>
</table>

34.49 € out of the 37.72 € (total costs per child of the universal screening strategy) are screening and maternal treatment costs. 3.23 € accounts for follow up costs due to fetal disease. According to our calculations 5 pregnant women can be screened in order to treat one infected child.

Sensitivity Analysis
In the deterministic one-way sensitivity analyses (Figure 2), our results were robust to a wide range of plausible estimates of unit cost data. Cost savings persisted for the screening strategy in all variations of the sensitivity analyses. Unit costs of IgG exhibit a great influence on total costs (35 € - 43.3 €) per child in the screening arm. The incremental cost-effectiveness advantage for the screening strategy ranges between 16,026.44 € and -15,072.41 €. Among cost components, indirect costs show a greater influence on total costs than direct costs.

Conclusion
Funding the maternal toxoplasma screening saves money and is cost-effective for the society and the Austrian health care system.

References

Fig. 1: Model Design

Fig. 2A: Cost distribution No Screening

Fig. 2B: Cost distribution Screening

Fig. 3: Model Design

Fig. 4: Decision tree analysis

Fig. 5: Cost-effectiveness analysis

Fig. 6: Results, 2012

Fig. 7: Budget Impact

Fig. 8: Cost-effectiveness analysis