Objectives
The goals of in-vitro fertilization techniques are to deliver a healthy child, where even a twin pregnancy is regarded as an adverse outcome. The economic impact of multiple births is an important policy consideration.

Methods
We estimated the potential cost savings by reducing the number of multiple pregnancies and births in Canada over the next five years. The direct medical costs included clinical management costs of singleton, twin and higher order multiple (HOM) pregnancies, hospital delivery costs of mothers and their offspring by multiple birth, term and preterm birth and the costs of disabilities due to preterm birth weight. The analysis was conducted from the perspective of a third party payer in Canada. All parameters were based on the recently published literature. The results were expressed as age-specific net costs per live birth.

Results
Given the reductions in multiple birth rate equivalent to those reached recently by selected European countries, we estimated that, over the next five years in Canada, the proportions of singletons, twins and higher order multiples (HOM) could be reduced from 71.2%, 27.5% and 1.3% to 66.2%, 23.6% and 0.4%, respectively. The potential cost savings are estimated to reach $236 million. The over-40 net cost per live birth could be reduced by $10,328. For women aged 35-39 and over 40, the net cost reductions would be $17,023 and $10,749, respectively. The bulk of net cost reductions (over 70%) would be attributable to reductions in disability costs related to preterm/low birth weight births.

Conclusions
In the context of limited resources and an ever-expanding need for healthcare services, prudent policies regarding multiple birth reductions are highly desirable.

Background
As outlined above, assisted reproductive technologies (ART) and in-vitro fertilization (IVF) in particular, are associated with multiple pregnancies, thus, contributing to healthcare cost expansion. Multiple pregnancies increase the risk of early delivery and low birth weight leading to increased maternal and fetal mortality and subsequent lifelong child disability costs with an increased need for medical and social support. Evidence-based medical literature suggests that reducing the number of multiple births would result in better health outcomes for the baby and the mother and lower healthcare costs. From a medical perspective, every pregnancy is always considered to be high-risk. Substantial evidence has been applied to reduce the risks of multiple births in order to decrease the health care and disability costs, some predominantly by the public sector. International data (6-7) indicate that the number of embryos transferred is influenced by IVF funding policies and can be changed over time. The literature is divided on strategies for reducing the number of embryos that can be transferred to a woman in Canada.

Cost-effectiveness of reducing multiple births: in-vitro fertilization strategies in Canada

Abstract
A Markov decision-analytic model was developed to estimate the potential cost savings by reducing the number of multiple pregnancies and births in Canada over the next five years (Figure 1). The projected costs were developed for current practice, consisting predominantly of private funding (HOM and singleton scenarios), and for suggested implementation of the multiple birth reduction scenario (Multiple Birth Reduction Scenario). The reduction in multiple births was taken from the recent 1990 Canadian study (1). Similar results are reported in other selected European countries where a decrease of multiple births have been reported alongside an unchanged pregnancy rates (1-4). IVF utilization rates and costs were obtained from the published sources (5-15). The costs include the costs of initial IVF treatments, clinical management costs of singletons, twins and HOM pregnancies, costs of pregnancy loss, the hospital costs of vaginal and caesarean deliveries among mothers and newborns, costs of disabilities of singleton, twin and HOM newborns, and the lifetime costs of disabilities related to preterm and low birth weight among singleton, twin and HOM babies. All costs were expressed in the 2005 Canadian dollars.

Table 1: Base-case results

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Total Cost</th>
<th>Lifetime disability costs</th>
<th>Cost per live birth</th>
<th>% singleton live births</th>
<th>% twins live births</th>
<th>% triplet live births</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Practice Scenario</td>
<td>$1,088 million</td>
<td>$337 million</td>
<td>$62,196</td>
<td>86.6%</td>
<td>12.8%</td>
<td>0.6%</td>
</tr>
<tr>
<td>Multiple Birth Reduction Scenario</td>
<td>$1,154 million</td>
<td>$532 million</td>
<td>$77,424</td>
<td>71.2%</td>
<td>27.5%</td>
<td>1.3%</td>
</tr>
<tr>
<td>Net difference</td>
<td>-$66 million</td>
<td>-$194 million</td>
<td>-$15,228</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Discussion
In the base-case, assuming that there is no decline in live births, the potential long-term total cost savings resulting from the reduction of multiple births have been estimated at $178 million per year. Reducing variations in live birth between 10% and 33% would result in decreased net cost savings per live birth ranging from $11,787 to $337 million. The economic analysis projects not only short-term costs of multiple pregnancies but also included the lifetime disability costs of preterm and low birth weight newborns. There is a paucity of data on long-term outcomes and costs related to preterm birth, disability and social support among premature births born with IVF (16-22). As long term outcomes and disability costs are one of the crucial parameters in the economic perspectives governing the magnitude of estimated cost savings, more data are urgently needed. Decisions regarding resource allocation in healthcare should be made with adequate understanding of the future cost consequences. A requirement of many regulatory bodies in Canada to reduce the potential impact of a new legislative proposal through a costing analysis and its projected costs. Thus, not only clinical outcomes are patients' preferences, but costs must also be considered when assessing the impact of a new program.

Conclusion
The potential long-term cost savings resulting from reductions of multiple births equivalent to those achieved in selected European countries, compared with current private provision in Canada, have been estimated to reach $10,258 per live birth. In the context of limited resources and the ever-expanding need for healthcare services, prudent policies regarding multiple birth reductions are highly desirable.

Selected References