



Economic analysis of universal CMV antenatal screening

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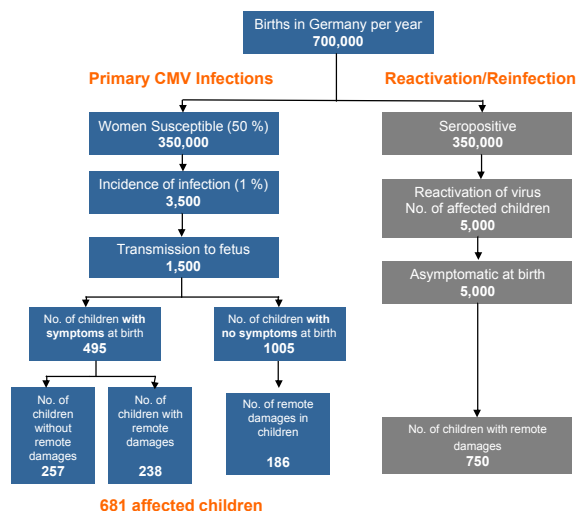
Health Economic Analysis of CMV screening on pregnancy

- ▶ It may seem puzzling that an **economist is interested** in the topic of **CMV screening**. However, the reasons are obvious:
 - ⇒ *CMV is the most prevalent congenital disease*
 - ⇒ *Currently no mandatory screening programs any European country exist*
 - ⇒ *Costs of a diagnostic strategy arise for the whole tested population, while benefits affect only a subpopulation.*
 - ⇒ *Costs arise today but the benefit occur in the future.*
- ▶ The **aim of the study** is to develop a model which allows estimation of the burden of disease over lifetime. The purpose of this model is to answer the following questions:
 - ⇒ *to evaluate the Burden of Disease (over the lifetime) due to a CMV infection*
 - ⇒ *to measure the burden of disease by estimating the costs resulting due to a CMV infection*
 - ⇒ *Assessing the financial impact due to introduction of a screening program.*

Health Economic Model

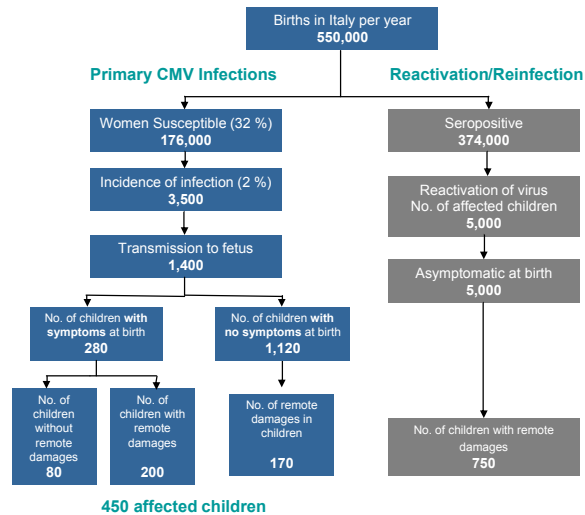
- ▶ The model represents a **Cost-of-illness model** which measures the whole economic burden of a disease and estimates the maximum amount that could potentially be saved or gained if a disease could be eradicated
- ▶ This model is incidence-based, that means it estimates lifetime costs - it measures the costs of an illness from onset over the lifetime.
- ▶ Incidence costs include the discounted, lifetime medical, morbidity, and mortality costs for the incident cohort
- ▶ The model was first developed for **Germany** and then for **Italy**. The model design allows further country adoptions.

Epidemiology – Germany



- ▶ In Germany, seropositivity rate is around 50%
- ▶ The risk of sero-conversion during pregnancy is 1%
- ▶ Congenital infection resulting from primary infection is less than 50%.
- ▶ Every year 495 infants are born with symptomatic congenital CMV and another 186 infants are asymptomatic at birth but will develop abnormalities later in life

Epidemiology – Italy



- ▶ In Italy, seropositivity rate is around 68%
- ▶ The risk of sero-conversion during pregnancy is 2%
- ▶ congenital infection resulting from primary infection is around 40%.
- ▶ Every year 280 infants will be born with symptomatic congenital CMV and 170 infants are asymptomatic at birth but develop abnormalities later in life

Incidence of Sequelae

- ▶ Incidence rates of sequelae were derived from the published literature for the first postnatal month and later on.
- ▶ The burden of disease model allows the appearance of more than one symptom.

Symptoms after birth respective within the first postnatal month	Base case
petechiae	0.44
IUGH (Intrauterine growth retardation)	0.36
icterus	0.34
hepatosplenomegalie	0.33
hearing loss	0.40
intracranial calcification	0.28
microcephalus	0.28
inexplicable abnormalities	0.23
pneumonia	0.08
hemolytic anemia	0.08
chorioretinitis	0.07
convulsions	0.07
prematurity	0.05
birth weight (>2500g)	0.03
hepatitis	0.02
hydrocephalus	0.002
death	0.06

Symptoms: sequelae (later than the first postnatal month)	Base case
hearing loss	0.23
mental retardation	0.1
cerebral paresis	0.04
convulsions	0.02
developmental disorder	0.06
chorioretinitis	0.02
microcephalus	0.015
death	0.007

Which costs are included? Direct Cost

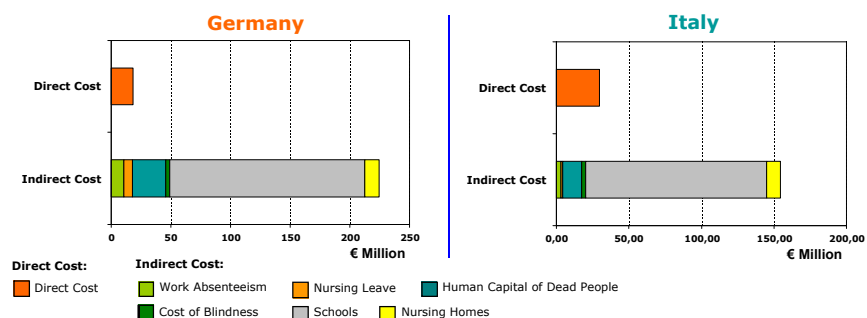
- ▶ The **medical resource use** was determined on the basis of literature-research and externally validated by experts.
- ▶ Cost pertain to year 2008 (Germany) and 2010 (Italy) data
- ▶ **Direct Cost:**
 - ⇒ Direct medical cost
 - » Consultations
 - » Inpatient cost
 - » Medication
 - » Treatment cost
 - » Lab tests
- ▶ The cost calculation considers mild and severe courses of sequelae

Which costs are included? Indirect Cost

- ▶ **Indirect Cost** encompasses:
 - ⇒ Impact of care-on-job situation of parents (until the children's age of 18)
 - ⇒ Work absenteeism (Human capital approach)
 - ⇒ Nursing Leave
 - ⇒ Human capital of dead people
 - ⇒ Indirect Cost of blindness (from the age of 18 on)
 - ⇒ Cost of schools for blind, deaf and handicapped people
 - ⇒ Cost of nursing homes for severe handicapped people

Cost-of-illness of CMV in Germany and Italy

- ▶ The average total lifetime cost-of-illness for
 - ⇒ Germany amount to € 243 Mio. (discounted) and € 766.444 per child
 - ⇒ Italy € 184 Mio. (discounted) and € 717.851 per child



- ▶ Direct costs of € 117.587 per child in Italy exceed the German costs of € 59.506
- ▶ Indirect costs per child are lower in Italy than in Germany (€ 600.264 versus € 706.938)

Global Screening of pregnant women to prevent congenital CMV-infection

- ▶ Secondary prevention:
 - ⇒ Serological testing of all pregnant women.
 - ⇒ Prevention with CMV hyper-immunoglobulin. According to Nigro et al. the application may lead to reduction of transmission from 50% to 3%.



- ▶ Cost for implementing a global screening program for all pregnant women:
 - ⇒ Germany: about 42 Mio. € for testing, and another 19 Mio. € for subsequent treatment.
 - ⇒ This may prevent 640 out of a total of 681 primary congenital CMV infections in Germany
 - ⇒ Italy: about 5 Mio. € for testing and another 9 Mio. € for subsequent treatment.
 - ⇒ This may prevent 423 of a total of 450 primary congenital CMV infections in Italy

Impact through screening

- ▶ A global screening program for primary CMV infections during pregnancy will result in huge savings for the health caresystem and the society i :



- ▶ A screening program is suitable to reduce future costs and disease burden of affected infants and parents in both countries studied so far.

Conclusion

- ▶ According to the estimation of the present health economic model the implementation of a screening program for CMV in pregnant women in Germany and also in Italy is regarded as highly cost effective from a societal point of view.
- ▶ Factors which support or reject a screening strategy are manifold and can be discovered in an economic model:
 - ⇒ Seroprevalence
 - ⇒ Number of children with remote damages
 - ⇒ Incidence rates of sequelae
 - ⇒ Screening costs
- ▶ At present, **very few health economic analyses in the field of diagnostics are available**. From a public health perspective this would be worthwhile.