

Cost-Effectiveness-Analysis of the new-born screening in Austria

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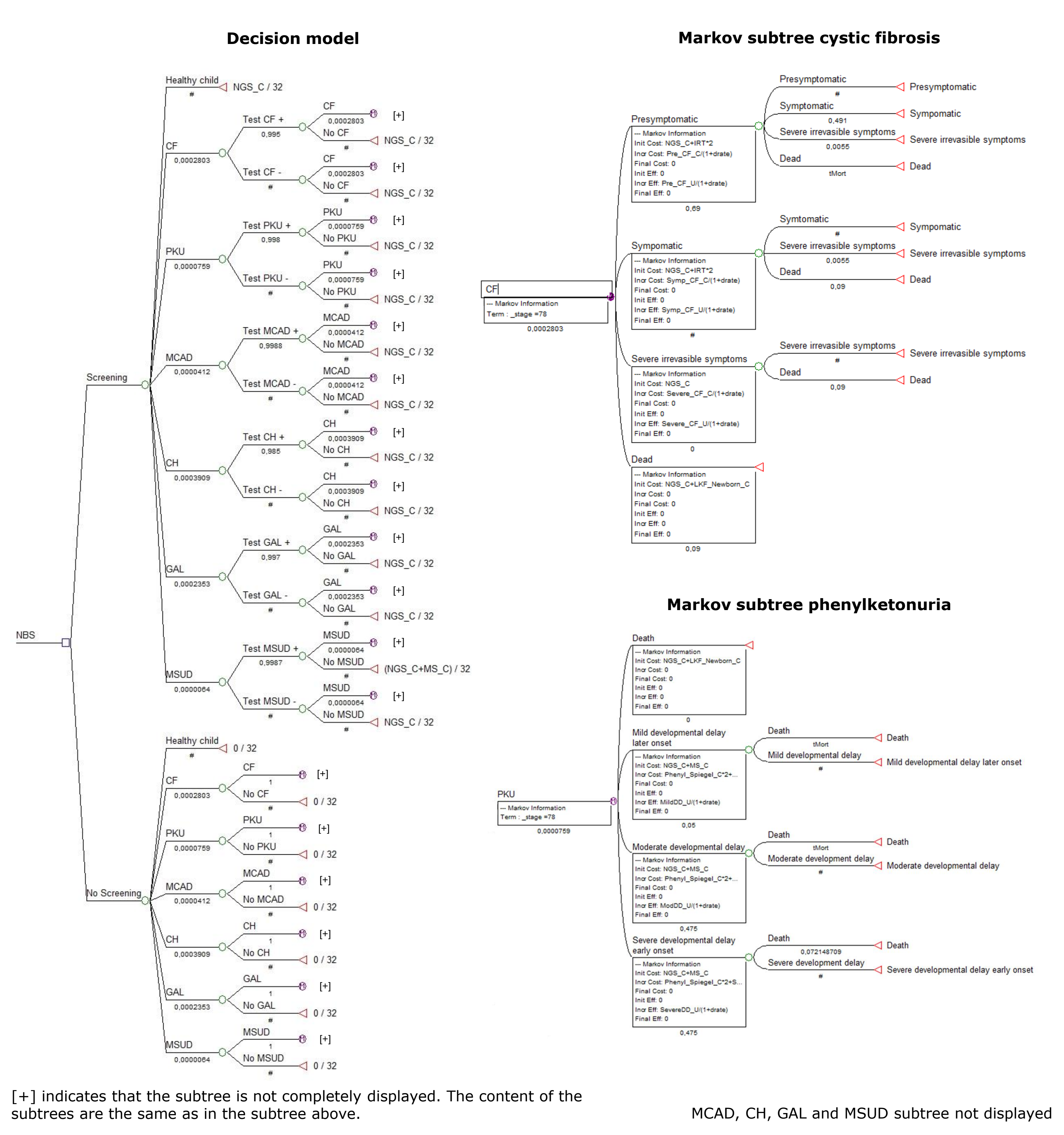
Objectives

Since more than 45 years, a preventive program for the detection of congenital metabolic and endocrine diseases is carried out successfully in Austria. The goal is to investigate every new-born a few days after birth to initiate a quality assured therapy as quickly as possible. Since 1966, this program is carried out by the Federal Ministry of Health at the University Clinic for Child and Adolescent Medicine, Medical University of Vienna. The aim of this study was to determine cost-effectiveness of the new-born screening.

Methods

We developed a decision-analytic model, which include specific Markov processes for the core disorders: cystic fibrosis (CF), phenylketonuria (PKU), medium-chain acyl-CoA (MCAD), congenital hypothyroidism (CH), galactosemia (GAL) and maple syrup urine disease (MSUD). Costs and health benefits were estimated for a cohort of new-borns in Austria (77,761 births per year). The analysis focused on lifetime consequences. This encompassed direct costs (including screening costs and cost of illness), quality-adjusted-life-years (QALYs) and reduced expectation of life. Costs were presented per child and for the Austrian birth cohort. Costs from published sources were used (2014 Euro) from the health care systems perspective. QALYs, life-years (LYs) and costs were projected over a life-time horizon and discounted at 3% per year.

Fig. 1: Model Design



Source: IPF own developed

Clinical Data

Incidence rates of each disease were derived from the nationwide database of the reference center (Medical University of Vienna) and included data over 10 years. Probabilities of sequelae, mortality rates and quality adjusted survival rates were derived from the literature.

Resource Use and Costs

Resource use and cost of screening were derived from the nationwide database of the reference center. Data on the resource use of the included diseases and sequelae were 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 insurances funds. Indirect Cost represent statistical and published data as well as own calculations. When necessary, prices were adjusted to 2014 prices using the consumer price index.

Results

Without new-born screening, the total direct cost amounts to 201.04 € per child screened (calculations based on the 77,761 newborns). This strategy resulted in a discounted quality-adjusted life expectancy of 31.91 QALYs. The corresponding life expectancy without quality adjustment amounted to 31.93 life-years. The screening strategy accounted for 20.11 € and quality-adjusted life expectancy increase to 32 QALYs over lifetime. Total life expectancy without quality adjustment are 32 life-years. From the health care systems perspective, a newborn screening program resulted in cost savings of 180.93 € per child. Screening results in 0.09 QALYs gained and 0.07 LYs saved per child. The incremental cost-effectiveness ratio (ICER) amounts to -2,086.03 € from the health care systems perspective. The incremental costs of screening ranged from 12.308 € (MCAD) to 291.332 € (PKU) in case of disease detection.

Tab. 1: Results, 2014

Strategy	Lifetime costs per infant (€)	QALYs per infant	ICER	LYs per infant	Lifetime costs per birth Cohort (€)	QALYs per birth cohort	LYs per birth cohort
No- screening	201.04	31.91		31.93	15.63 m	2,481,614	2,482,915
Screening	20.11	32.00	Dominant	32.00	1.56 m	2,488,358	2,488,397
Difference	180.93	-0.09		-0.07	14.07 m	-6,744	-5.482

Source: IPF own calculations MS/MS testing costs amounts 20.07 Euro.

Transferred to the entire birth cohort, new-born screening is able to reduce total costs of 14.07 million € from the Austrian health care systems perspective each year. Screening results in 6,744 QALYs gained and more than 5,482 LYs saved for the entire birth cohort.

Tab 2: Results on disease basis Total costs per infant , 2014

Disease	Incremental costs	Incremental QALYs	ICER
CF	29,69	-0,007	Dominates
PKU	2,01	-0,001	Dominates
MCAD	-19,60	-0,001	19,512.60
CH	30,66	-0,004	Dominates
GAL	56,73	-0,298	18.686.30
MSUD	-18,77	-0,001	Dominates

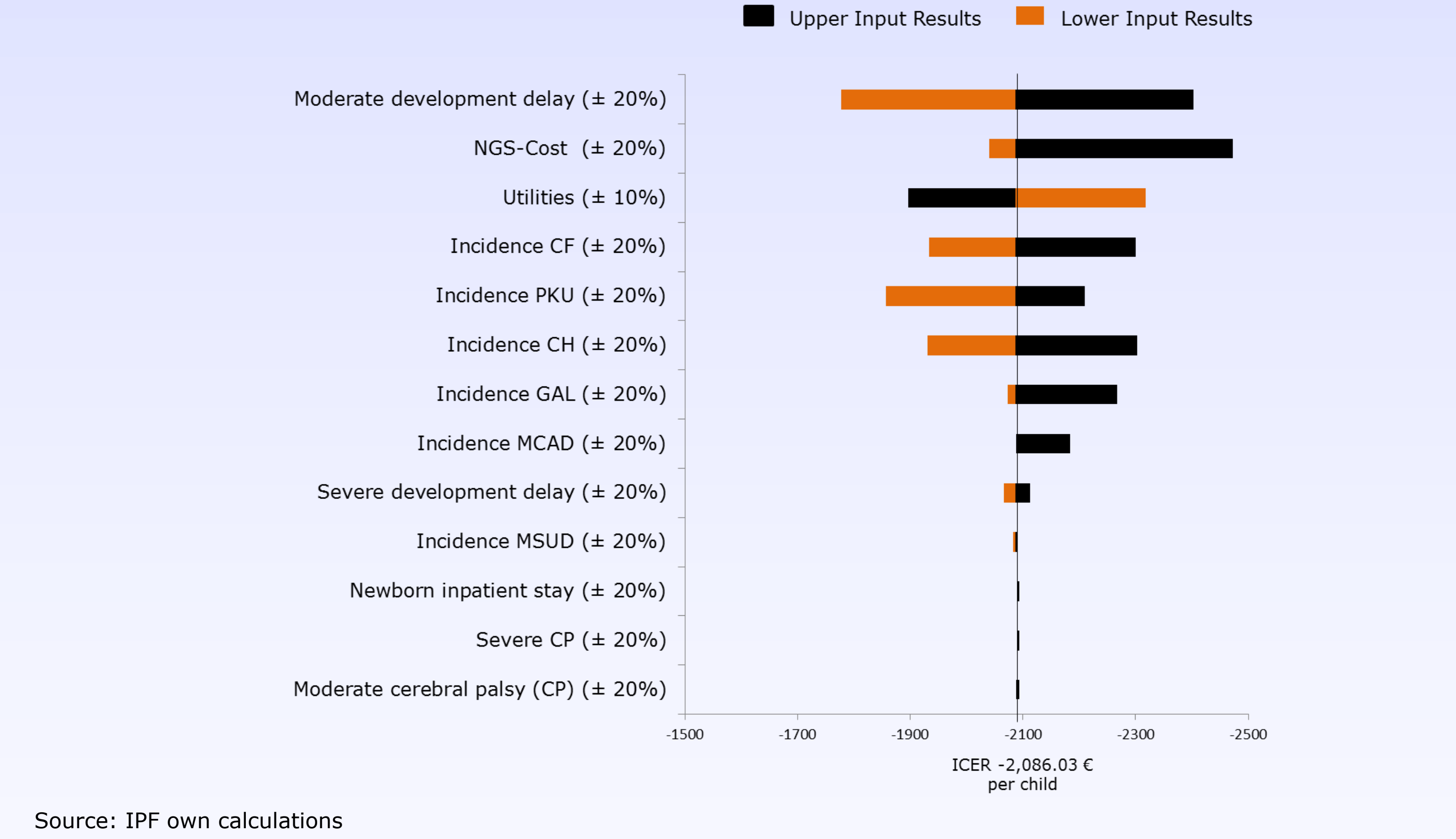
Source: IPF own calculations

Tests marked as “Dominates” save money and improve outcome relative to no testing. Table 1 demonstrates that the total panel is able to save money and improve outcome.

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 new-born screening strategy in all variations of the sensitivity analyses. Costs for moderate development delay and the NBS costs exhibit the great influence on total costs . Variation of the NBS costs are associated with a rang of costs (16,1€-24,12€) per child in the NBS arm. The incremental cost-effectiveness advantage for the screening strategy ranged between -1.653,13€ to 2.039,80€.

Fig. 2: Deterministic one-way sensitivity analysis



Source: IPF own calculations

Conclusion

Funding the new-born screening saves money and is cost-effective for the Austrian health care system.

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Additional Literature with the author