

# INCREMENTAL COSTS ANALYSIS OF PREMATURETY IN HUNGARY

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## INTRODUCTION

Over the past hundred years, the significant changes in the morbidity structure and the reduction of infectious diseases have played an important role in reducing infant mortality. At the same time, there has been a social need to keep newborns with poorer viability, i.e. with low birth weight or prematurity. The societal changes have had two opposing effects: improved social and economic status decreased, while increasing maternal age and fertilization interventions increased the risk of preterm birth. As a result of modern interventions, more and more preterm infants survived the critical first weeks of life, but the long term consequences of immaturity became increasingly apparent. The treatment of a wide variety of complications required the involvement of a wide range of disciplines [1, 2, 3]. Several studies demonstrated that the costs of treatment of premature babies are significantly higher than those of mature babies both during the first hospital treatment [4, 5, 6, 7, 8, 9] and in later ages [6, 5, 10, 11].

## OBJECTIVE

The objectives of this research were:

1. To analyze prematurity-related health expenditures of the public payer in Hungary
2. To analyze the incremental costs of prematurity complications and
3. To model the health expenditure consequences of decreases in prevalence of preterm birth

## METHODS

Inpatient, outpatient and pharmaceutical care expenditures of the National Health Insurance Fund of Hungary were analyzed that were paid for children who (1) were born between January 1, 2009 and December 31, 2010 and (2) whose gestational age was  $\geq 25$  weeks. The gestational age was determined based on the time elapsed between the date of the mothers' alpha-fetoprotein screening test on the 17th weeks of gestation and the date of the birth.

In the descriptive analyses, costs per capita were calculated in each subgroup of the children. The costs were analyzed by gestational age (weeks), by chronologic age, by the type of funded care, and by the prematurity complications. In addition, the costs consequences of hypothetical change in distribution of gestation ages (toward more mature infants) were modelled. Unit costs in Hungarian Forints (HUF) were converted to Euro with the average of exchange rates between 2009 and 2016 (294 HUF/Euro).

## RESULTS

### Population

Overall 93,124 infants were involved in the analysis including 8.6% premature babies (from which 0.25%, 1.0% and 7.3% were extremely, very and moderately preterm infants, respectively). A vast majority (99.7%) of the infants survived until the end of the first year of life and 99.6% until the end of their 6th year of life. The 1-year survival rates were 61–76% for extremely, 89–95% for very and 98–99% for moderately premature babies.

### Overall expenditures of the public payer

In the first 6 years of life, the public payer overall paid 141.5 million Euro for inpatient, outpatient and drug care for all children included in this research, of which 69.9 million Euro (49.3%) was paid in the first half year of life. The total 6-year and the first half year costs of premature babies represented 38.3% and 25.4% of the total costs while the costs paid for very and extremely premature babies were 17.3% and 10.3% of the total costs.

### Total per capita costs in the first 6 years of life

A strong negative relationship was shown between gestational age and the total costs per capita in the first 6 years of life (Fig. 1). The costs of care of children born at 26 weeks were the most (28,470 Euro/capita) and the costs of children born at 41 weeks the least (1,130 Euro/capita). The inpatient, outpatient and pharmaceutical costs showed similar negative relationship with gestational age

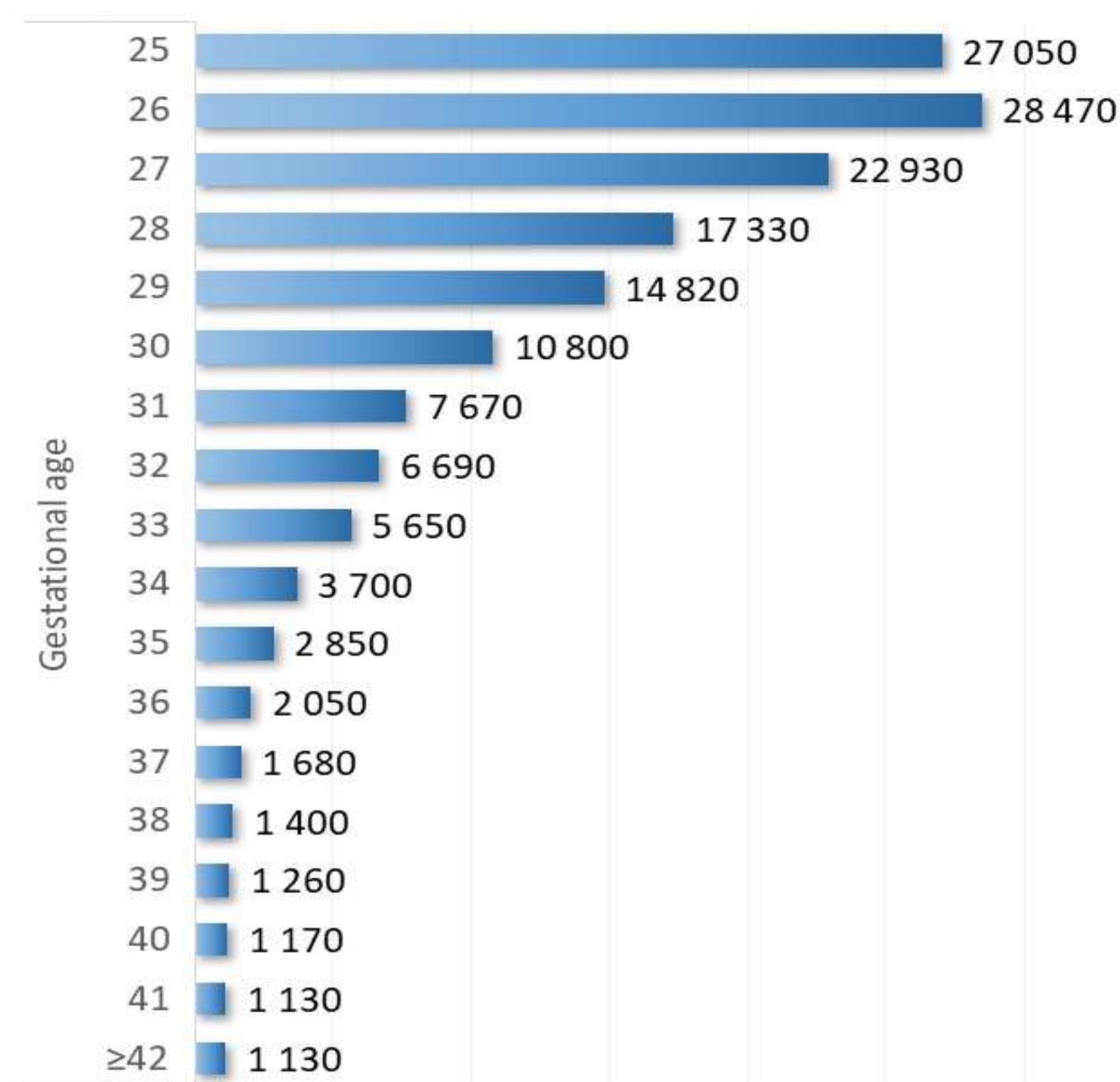


Figure 1. Total costs per capita (rounded, Euro) by gestational ages (weeks) in the first 6 years of life

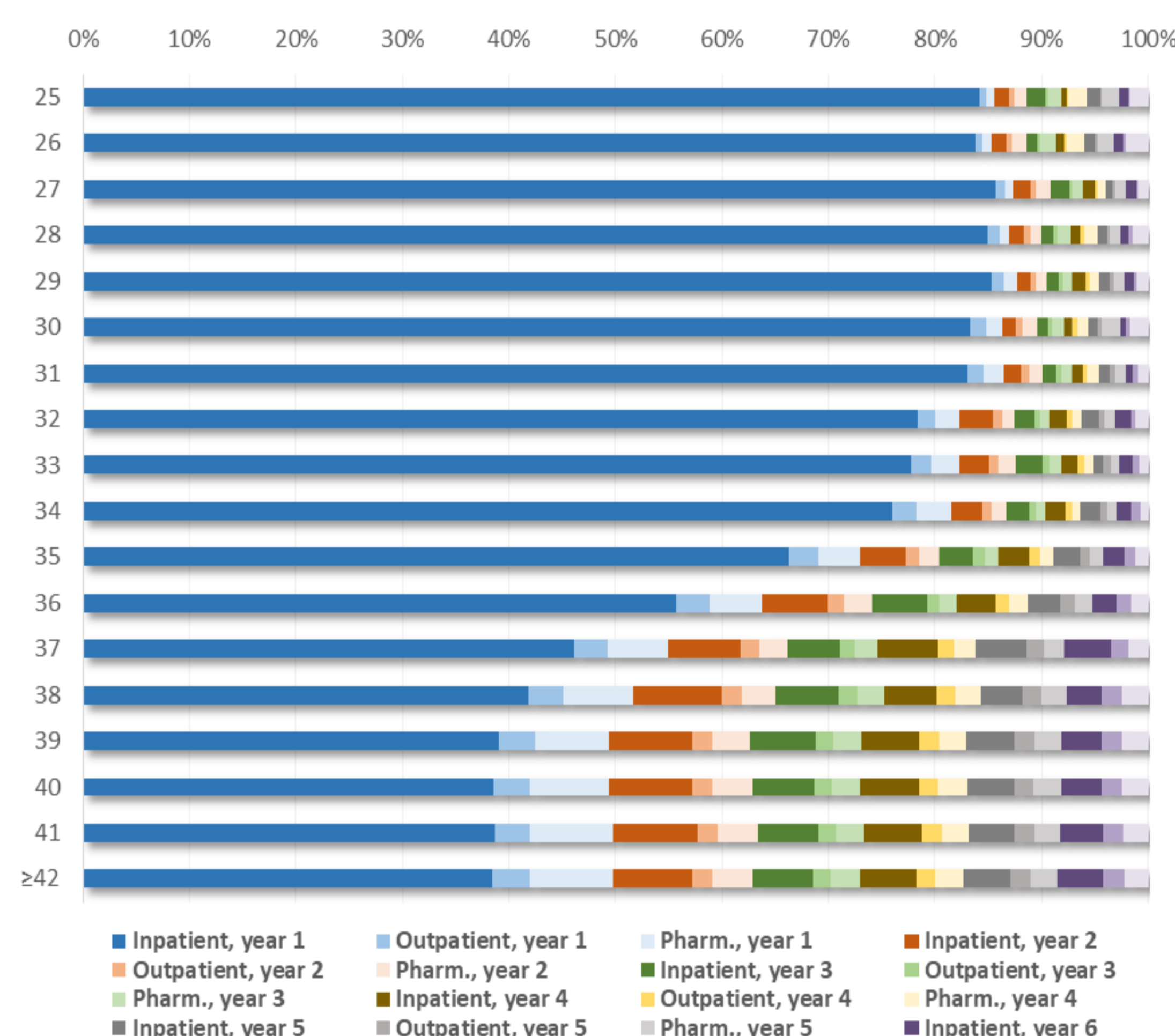


Figure 2. Share of yearly inpatient, outpatient and pharmaceutical costs by gestational ages (weeks). Pharm: pharmaceutical

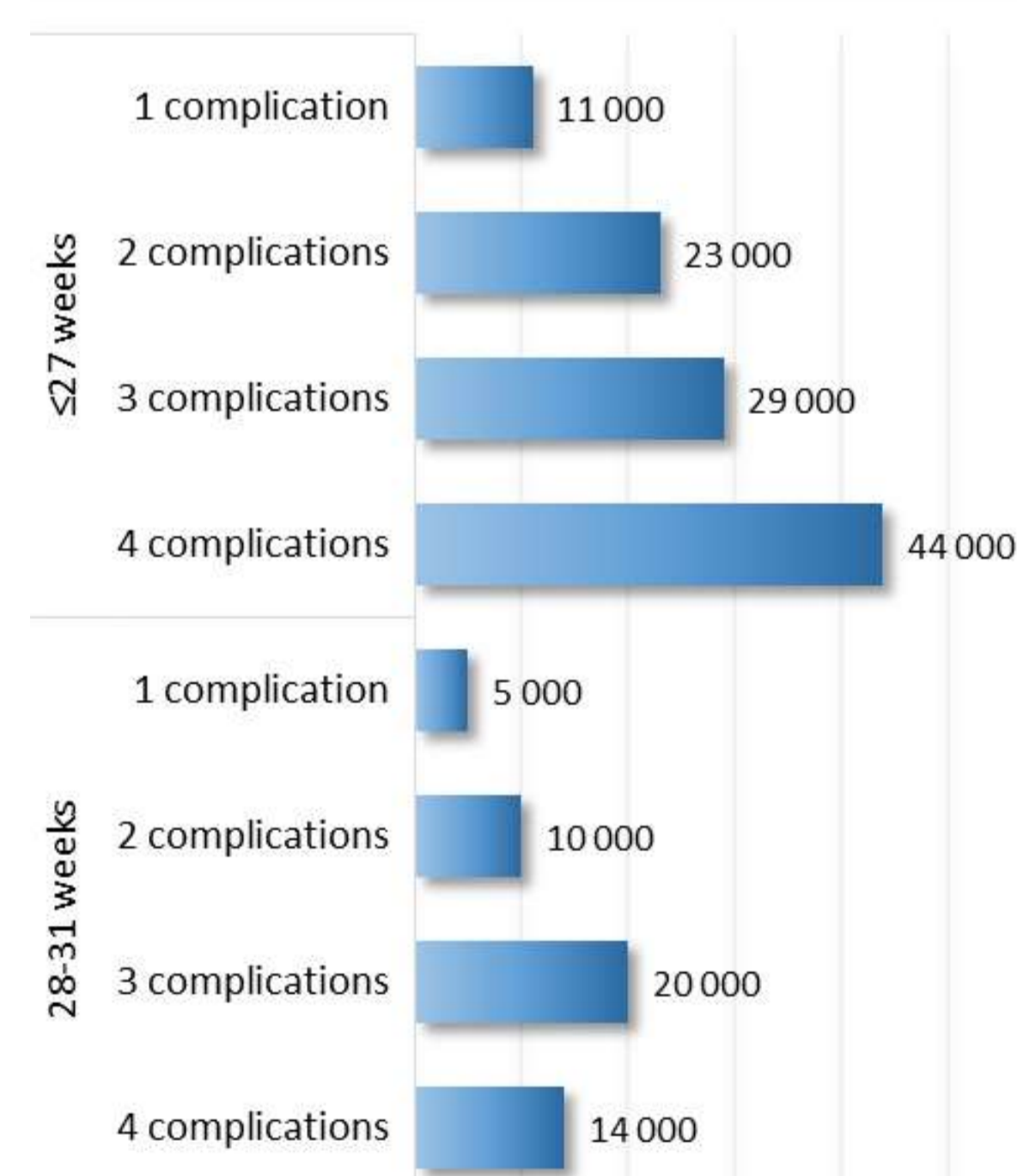


Figure 3. The total costs per capita in the first 6 years of life in children with 1 to 4 complications compared to those without complication in very and extremely premature infants (rounded, Euro)

### Share of costs by gestational and chronologic age, and the financed care

Proportions of yearly inpatient, outpatient and pharmaceutical costs for each gestational age are summarized in Fig. 2. The costs of the first year of life represented the highest proportion in all gestational ages. When the total costs for the whole were further broken down by types of care, inpatient costs in the first year had the largest share at each gestational age: more than 80% in infants born at 25–31 weeks, 50–80% in infants born at 32–36 weeks, and one third to one half in term/post-term infants

### Extra costs of the care infants with particular prematurity complications

Association could be demonstrated between the numbers of prematurity complications (retinopathy of prematurity, necrotizing enterocolitis, bronchopulmonary dysplasia and intraventricular bleeding and periventricular leukomalacia) and the costs per capita in the first 6 years of life (compared to those without complications) both in extremely and very premature infants (Fig. 3).

### Shift of gestational age structure toward of more mature infants

The cost consequences of changes in gestational age were modelled: 1 week prolongation of pregnancy was hypothesized in 50% of infants born at 25–27 weeks (scenario 1), at 25–31 weeks (scenario 2) and at 25–36 weeks (scenario 3). Supposing that 50% of all premature infants (scenario 3) have 1 week longer pregnancy, almost 5 million Euro can be saved in the first 6 years and 70–90% of all saved costs could be saved in the first 6 months of life (Fig. 4).

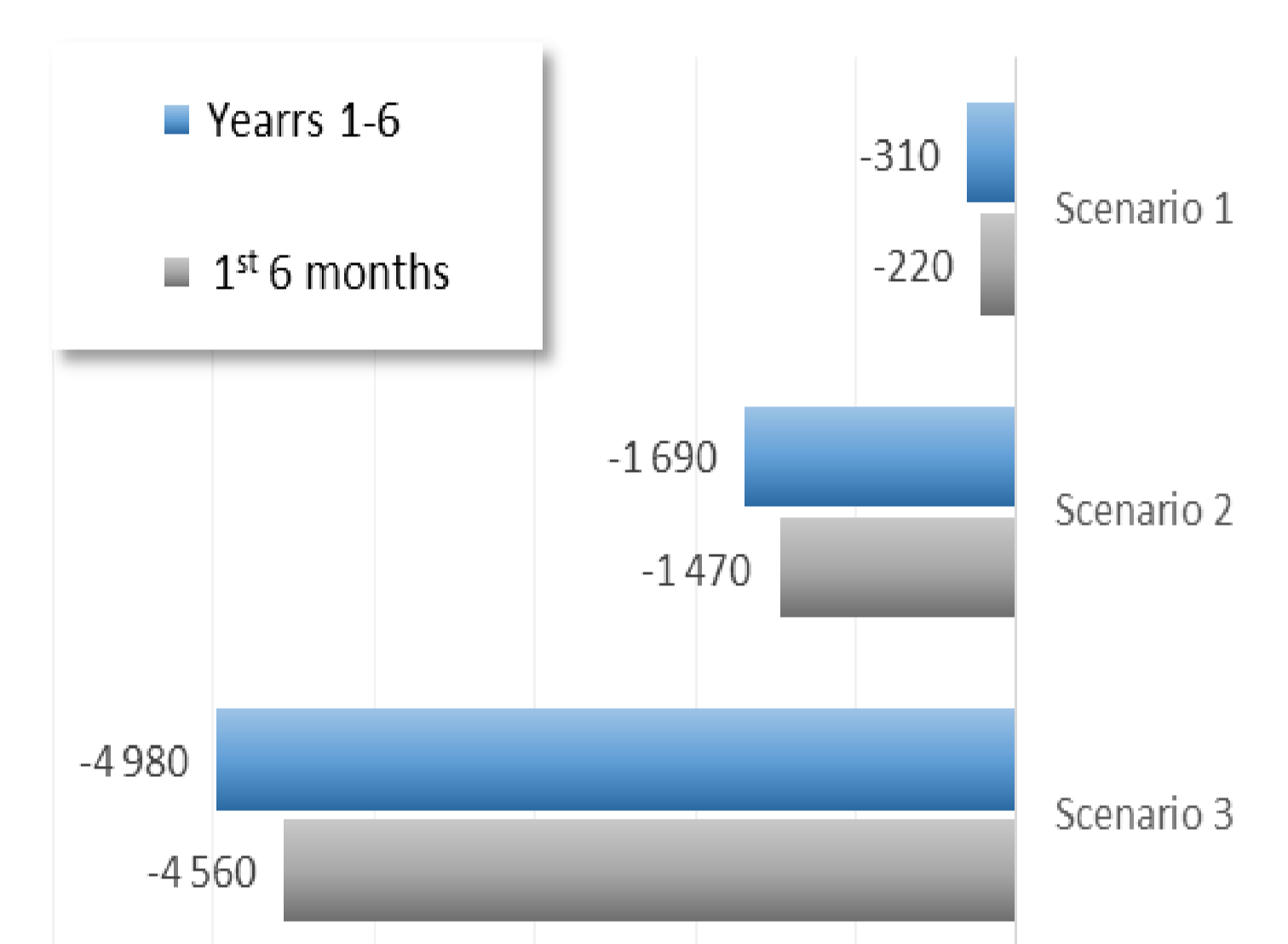


Figure 4. The effects of shift of gestational age structure toward more mature infants supposing that 50% of infants in each gestational age had prolonged pregnancy by 1 additional week (rounded, thousand Euro)

## CONCLUSIONS

- A strong negative relationship between maturity of infants and the public payer's first 6 year inpatient, outpatient and pharmaceutical costs could be demonstrated.
- Children born preterm who represented 8.6% of the study population required almost 40% of the public payer expenditures paid in the first 6 years of life of this population and 1.25% children born very or extremely preterm required 17.3% of the total expenditure in the first 6 years of life.
- Irrespective of gestational maturity, the largest share of the total 6-year public payer expenditure was in the first year inpatient costs: 40% for mature infants and over 80% for extremely and very preterm infants.
- Association could be demonstrated between the numbers of prematurity complications and costs per capita.
- Prevention programs that involve a wide range of care systems would result in significant save in the public payer expenditures.

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