

**NATIONAL HEPATITIS B VACCINATION
PROGRAMME:
COST-BENEFIT ASSESSMENT OF
INTRODUCTION OF UNIVERSAL HBV
VACCINATION OF NEWBORNS IN BULGARIA**

VHPB Country Meeting
“Burden and prevention of viral hepatitis in Bulgaria”
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INTRODUCTION

- In August 1991 Bulgaria was one of the first countries which decided to introduce mandatory universal immunization of all newborns.
 - 3-5% HBsAg carrier prevalence
 - More than 30% of population with serological evidence of HBV infection
 - Evidence of perinatal transmission (18.8 – 23.4% of HBsAg positive pregnant women are found to be HBeAg positive)
 - Significant acute HBV infection incidence and mortality rate

- In 1992 the HBV vaccine was included in the National Immunization Schedule as a routine children immunization.

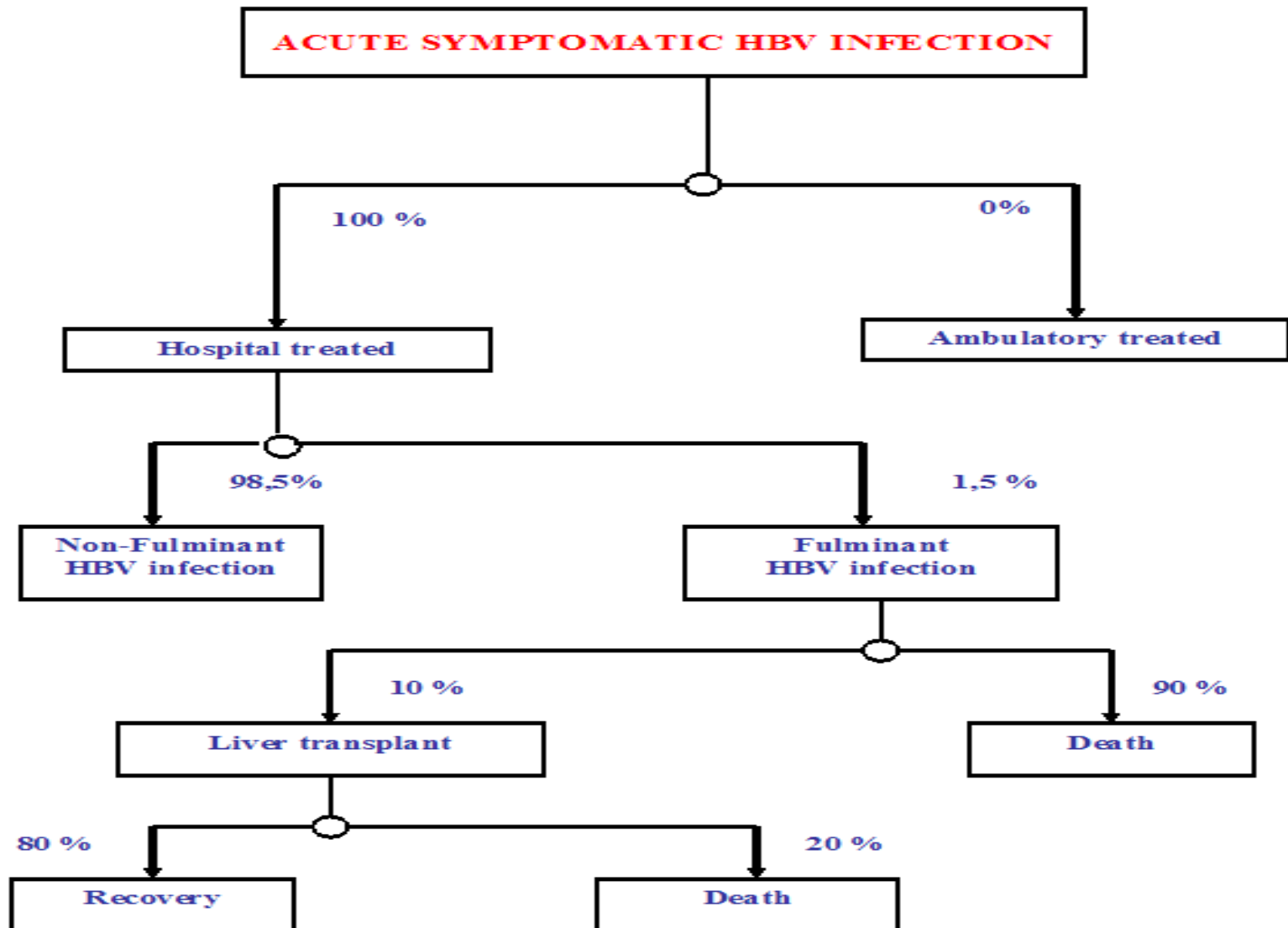
PURPOSE OF THE STUDY

The aim of the study is to present a model-based economic assessment of introduction of universal infant HBV vaccination in Bulgaria by using cost-benefit analysis and comparing two vaccination strategies: “without vaccination” and “universal vaccination of all newborns”.

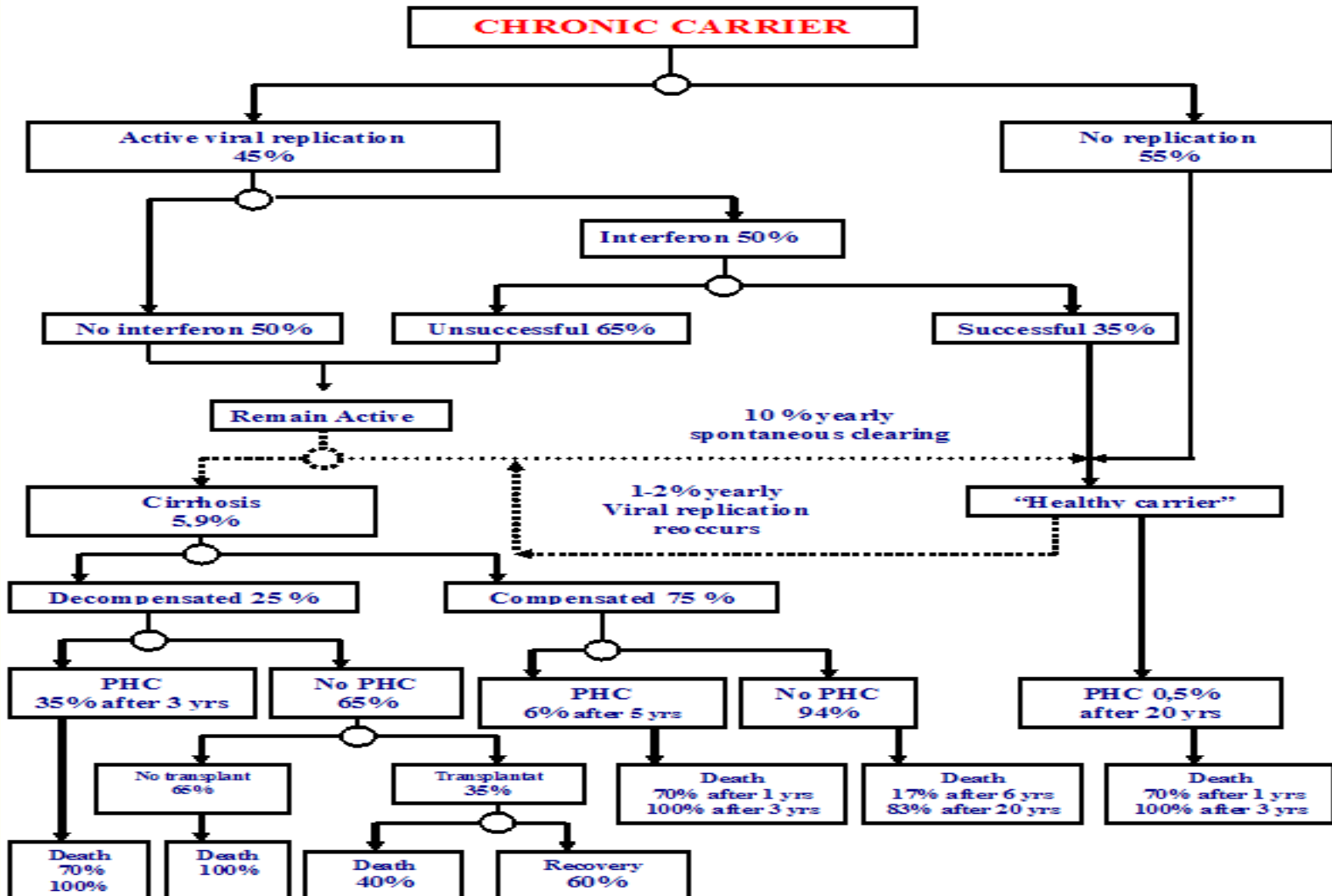
MATERIALS AND METHODS

- The time horizon of the assessment covers a period of 100 years
- A static model of the acute and chronic HBV infection evolution is applied for calculation
- “Decision tree” method is used for construction of the model
- The probabilities of moving between different stages of HBV infection are estimated from published studies in Bulgaria and other countries

MATERIALS AND METHODS



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➤ The demographic, epidemiological and vaccination input setting are estimated from official statistics and published data

Birth cohort size (in 1992)	88 000
Age-specific mortality rate (%)	1.46 – 12.33
Age-specific HBV prevalence	1.0 – 40.0
Vaccine efficacy (%)	
• First dose	40.0
• Second dose	80.0
• Third dose	99.0
Vaccination schedule	0 – 1 – 6 months
Length of protection	100 years
Vaccination coverage (%)	95.0

MATERIALS AND METHODS

- The perspective of the study is budgetary viewpoint. Only direct costs and benefits are included in the assessment
- All future costs and benefits are discounted with 5% rate
- The direct medical costs of treating of acute and chronic HBV infection are estimated on the basis of financial reports and hospital files at Infectious Diseases Hospital, Gastroenterology ward of the Fifth City Hospital and City Oncology Dispensary in Sofia for period 1993 – 1998
- Official data from public tenders for purchase of HBV vaccine of the Ministry of Health are used for vaccination costs assessment

MATERIALS AND METHODS

- The capital costs (equipment, building and land) as well as the direct non-medical costs are not taken into account
- Health services, home visits, laboratory tests and hospital stay are estimated on the basis of Regulation 22 and Amendment of Regulation 22 of the Ministry of Health
- All medical costs are expressed in monetary units – Bulgarian New Lev (BGN)

MATERIALS AND METHODS

➤ Cost-benefit analysis

$$\text{Benefit to Cost Ratio (BCR)} = \frac{\sum_{t=1}^{100} B_i}{\sum_{t=1}^{100} C_i}$$

B — benefits of programme “universal infant vaccination”
= Costs without vaccination - Costs with vaccination

C — costs of programme “universal infant vaccination”
= Costs of vaccination

➤ Sensitivity analysis

RESULTS

Direct costs (BGN) of treating per clinical acute and chronic HBV case

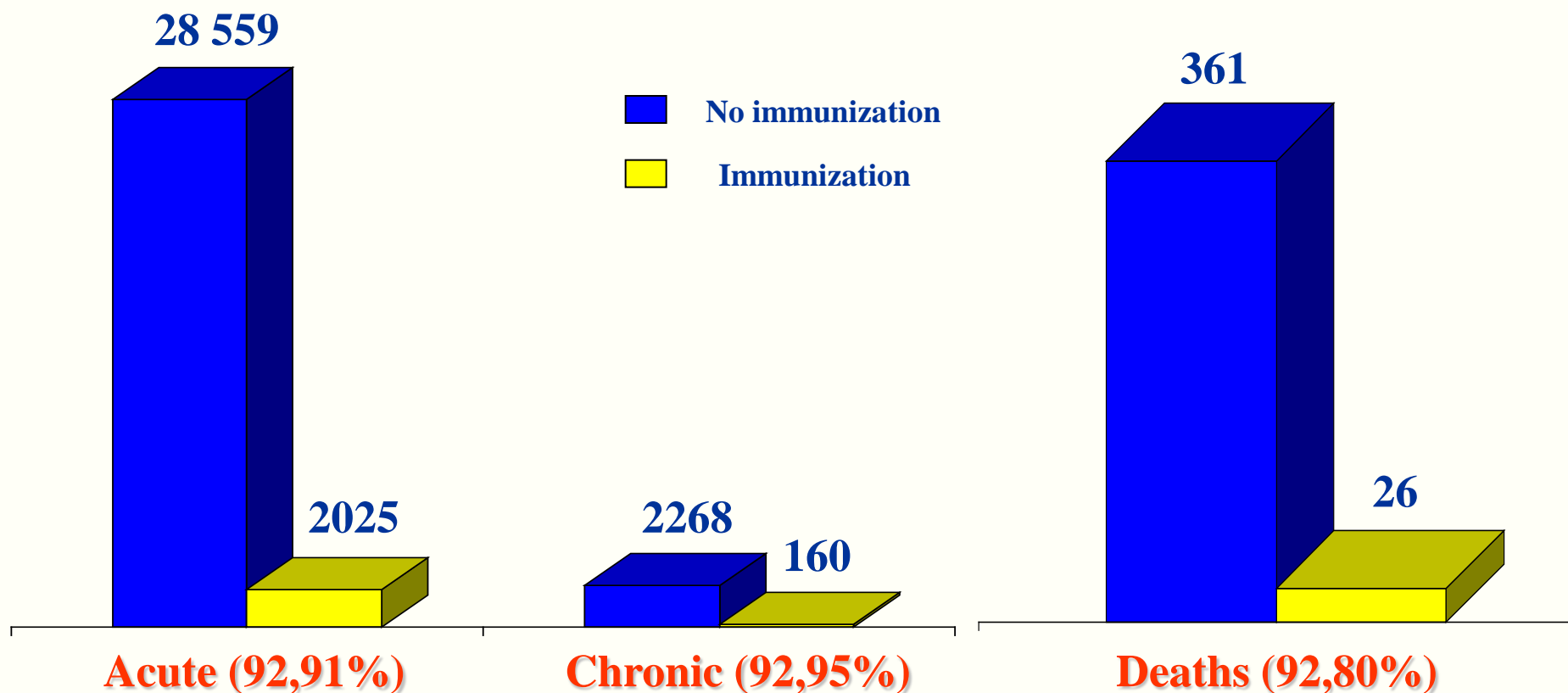
Acute HBV infection	
Non fulminant	289.00
Fulminant	263.58
Chronic HBV infection	
Active viral replication no interferon	876.37
Active viral replication interferon	3253.38
Compensated cirrhosis	404.45
Decompensated cirrhosis	903.38
Primary hepatocellular carcinoma	1449.72

Direct costs (BGN) for immunization with HBV vaccine per newborn

Vaccine	1 dose	3 doses
Engerix B	7.69	23.07
Euvax	5.72	17.16

RESULTS

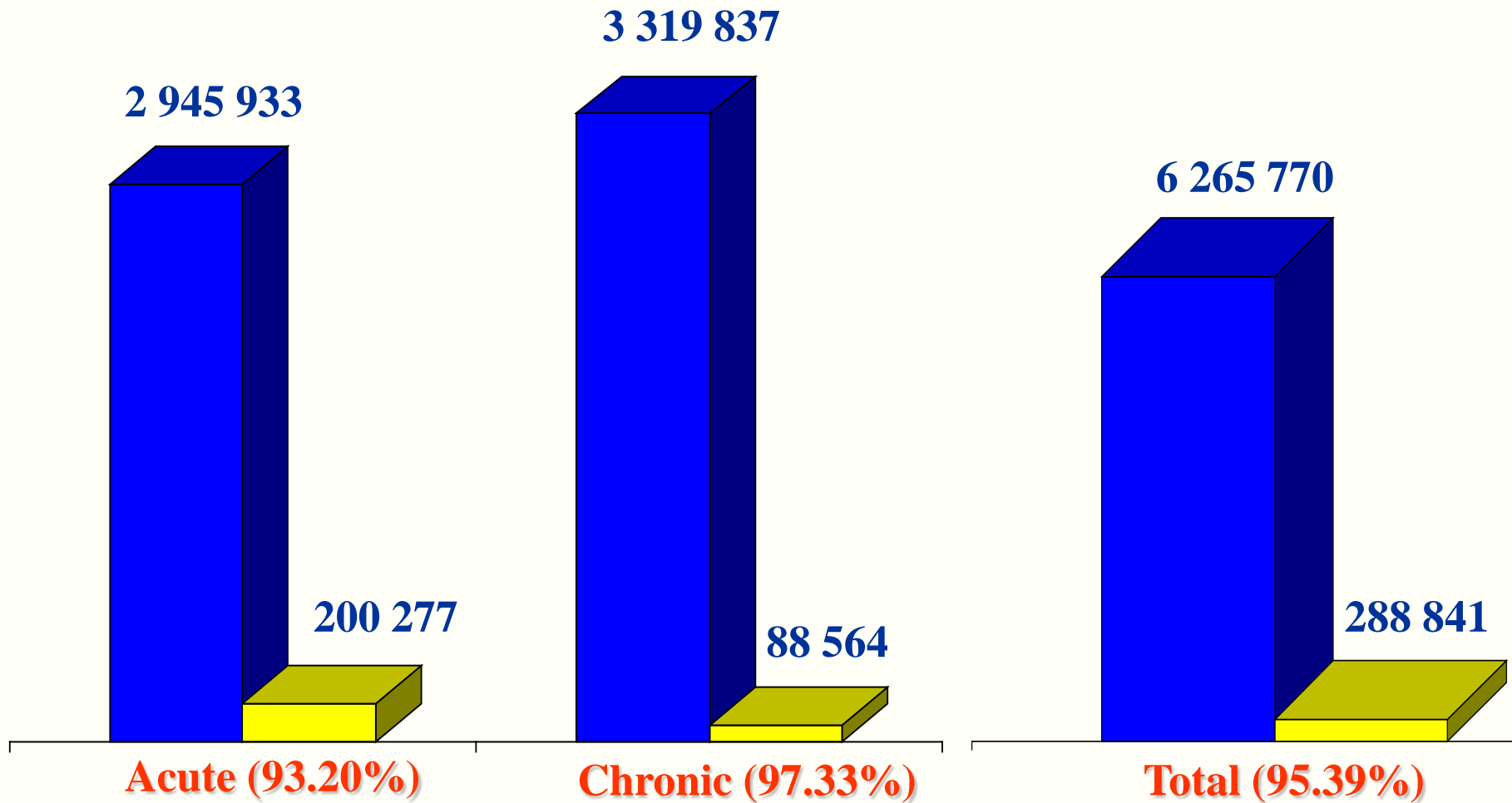
*Expected number of HBV cases and deaths
Accumulated yearly number per 1 cohort for 100 years*



RESULTS

Economic burden of HBV infection

Direct medical costs (BGN) related to HBV infection



RESULTS

Cost-benefit analysis

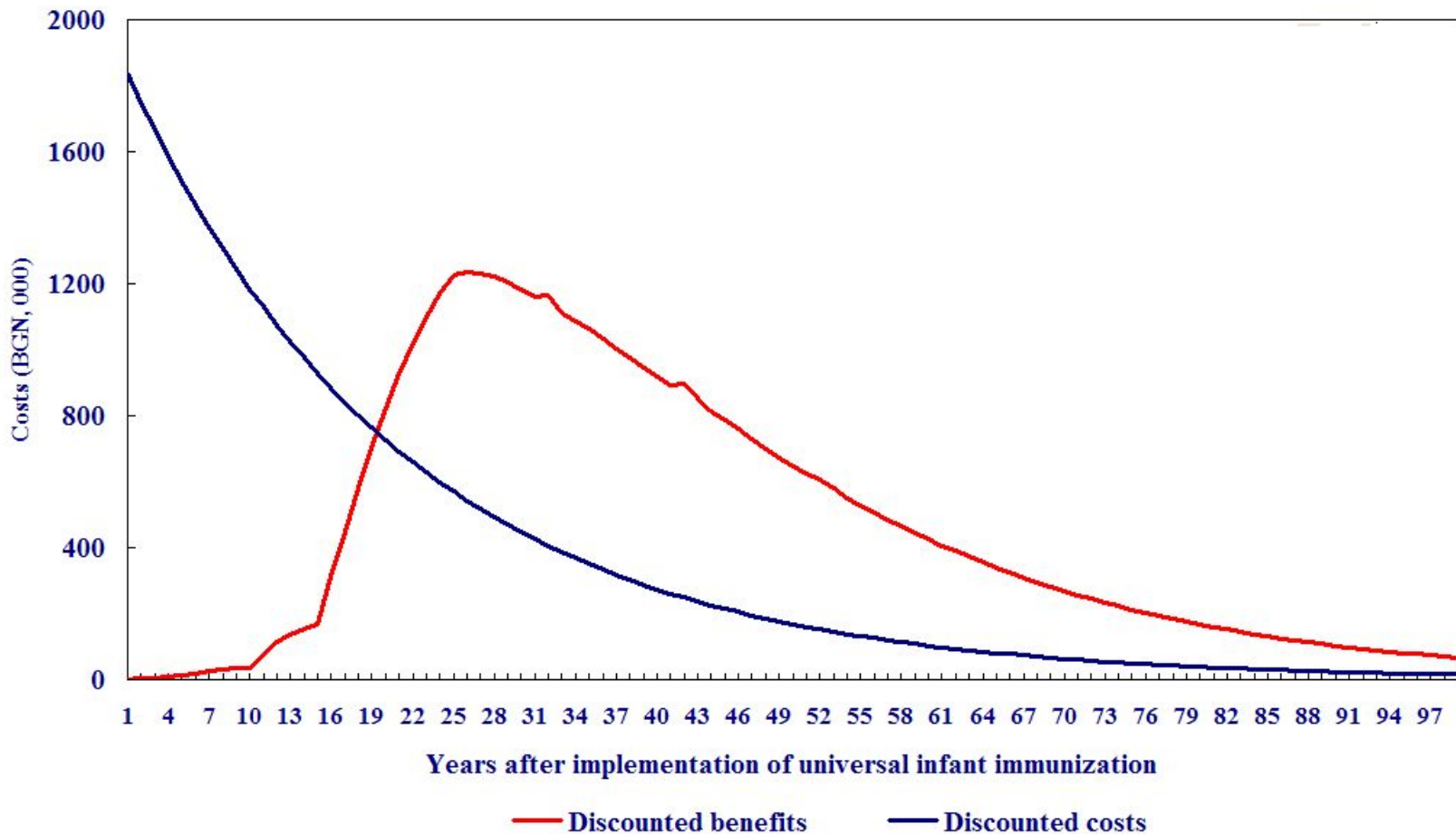
Discounted benefits (BGN) **46 157 094**

Discounted costs (BGN) **38 279 712**

Benefit to cost ratio (BCR) = 1.21

RESULTS

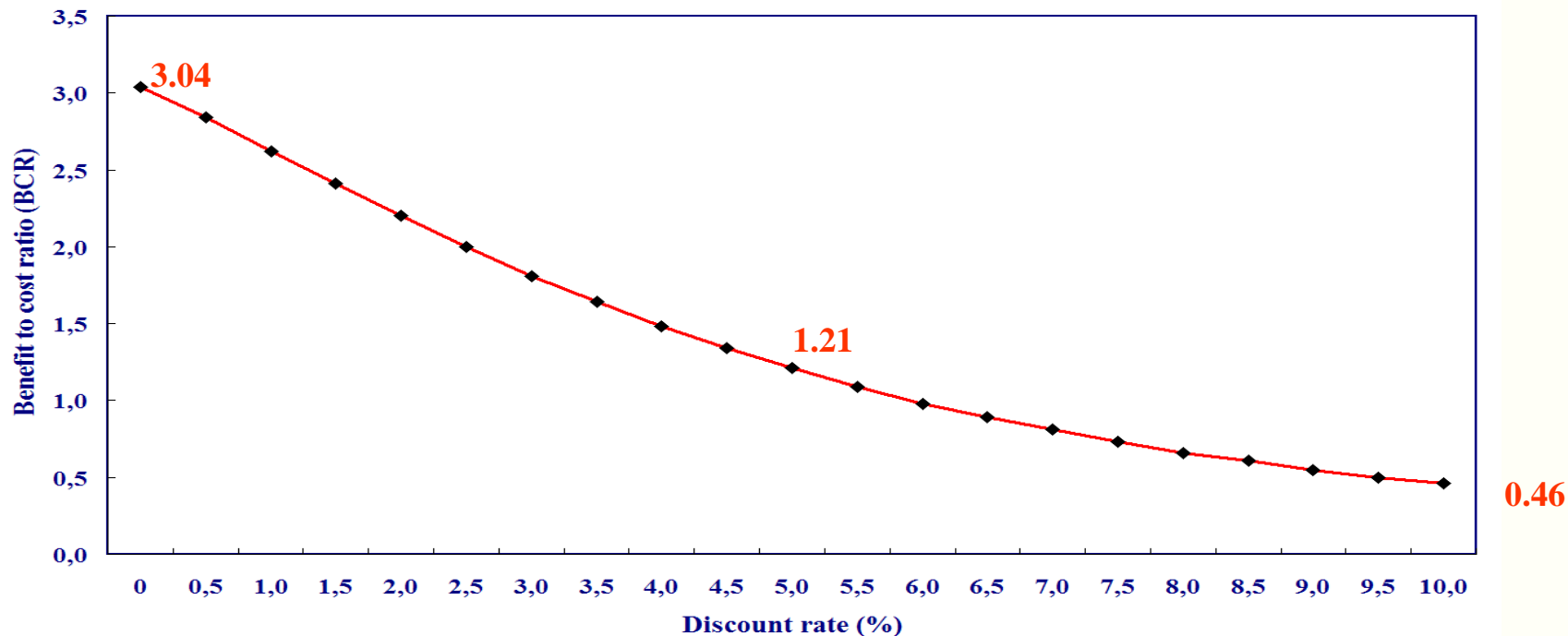
Discounted costs and benefits (BGN000) by years after implementation of universal infant immunization



RESULTS

Sensitivity analysis

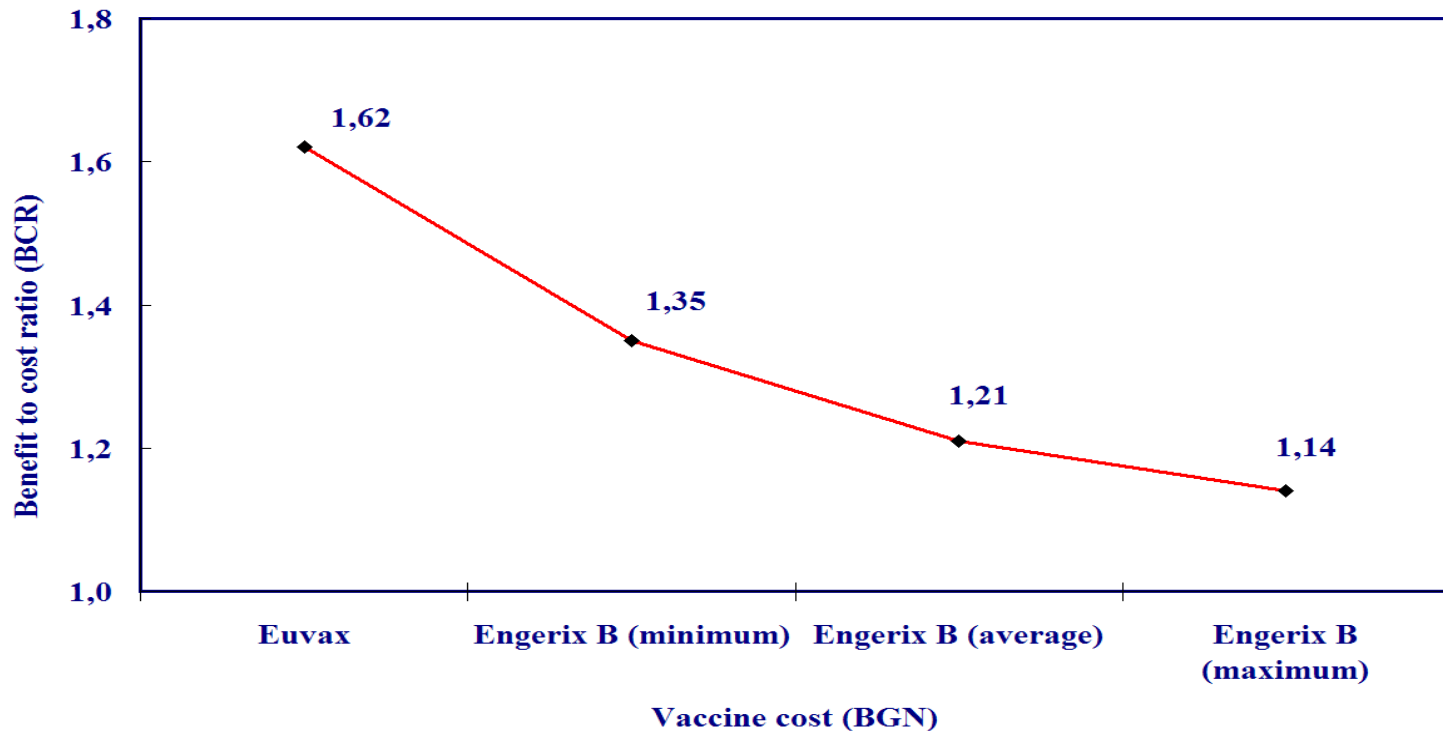
Effect of discount rate on benefit to cost ratio



RESULTS

Sensitivity analysis

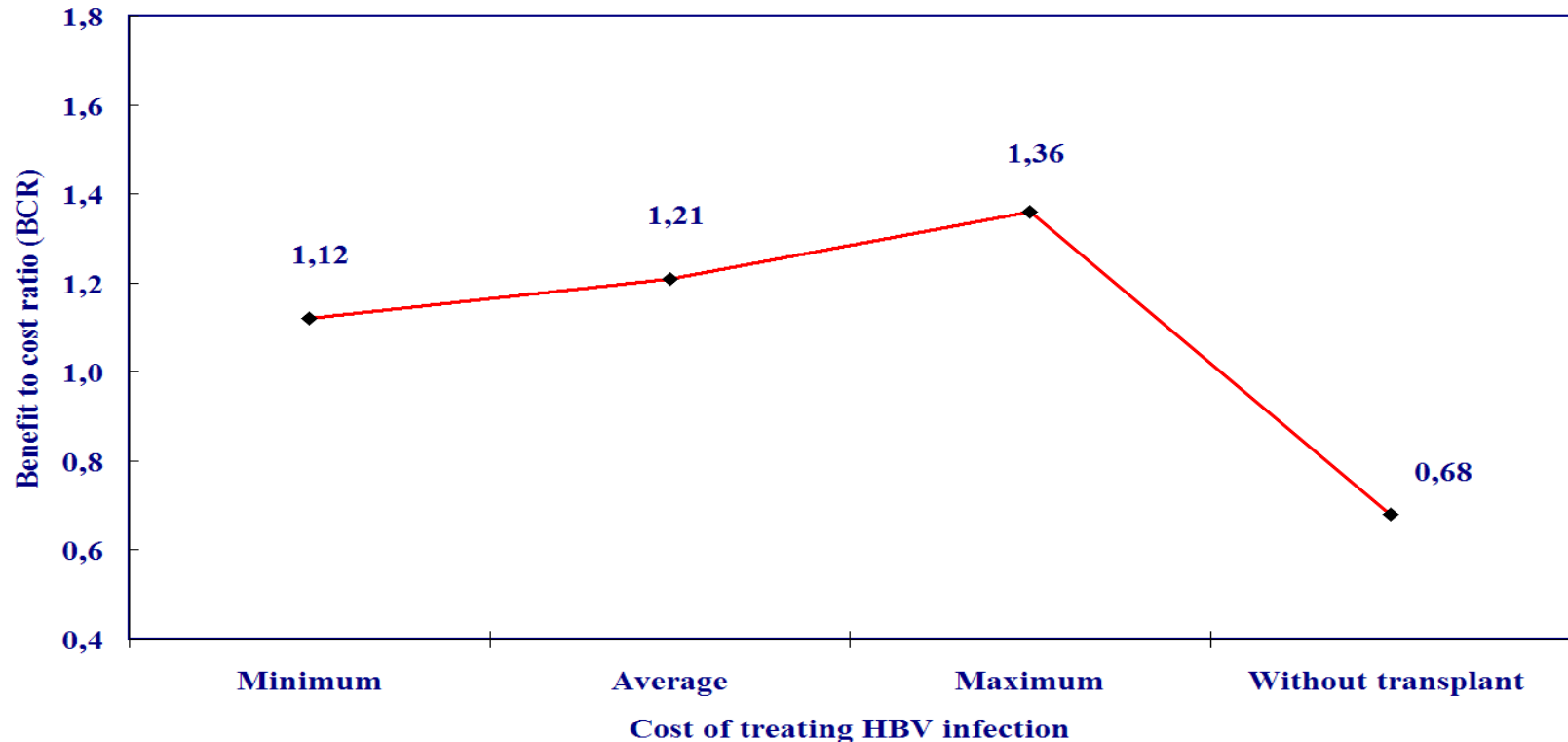
Effect of vaccine cost on benefit to cost ratio



RESULTS

Sensitivity analysis

Effect of cost of treating HBV infection on benefit to cost ratio



CONCLUSIONS

1. The presented results show that the vaccination programme of universal immunization of all newborns against HBV infection in Bulgaria will reduce significantly not only direct medical losses but also the economic burden of the disease
2. The economic evaluation of introduction of universal infant immunization in Bulgaria is substantially underestimated
3. The low costs for treatment of different stages of HBV infection negatively influence the assessment of the benefit of introduction of the immunization programme
4. The economic effect of the universal infant immunization strategy will be realized after 19 years when the benefits of the programme will exceed its costs
5. The results of economic evaluation are in conformity with epidemiological data confirming the high effectiveness of the immunization programme introduced in 1992 in Bulgaria