

# Mehrwerte gesundheitsökonomischer Evaluationen von Impfungen

RKI-Symposium „Berücksichtigung gesundheitsökonomischer Evidenz bei  
der Einführung neuer Impfungen in Deutschland“

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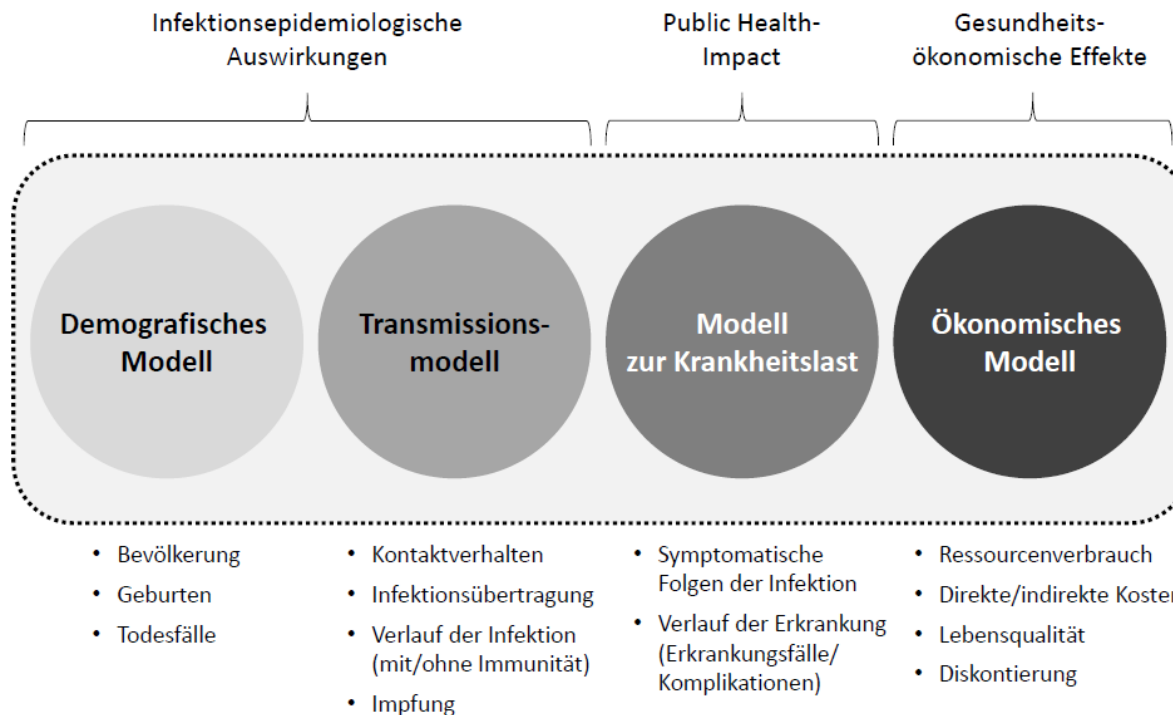
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# I. Darstellung künftiger Effekte mittels Modellierungen

- Gesundheitsökonomische Evaluationen von Impfungen basieren in der Regel auf Modellen
- Fokus liegt nicht ausschließlich auf Gesundheitsökonomie

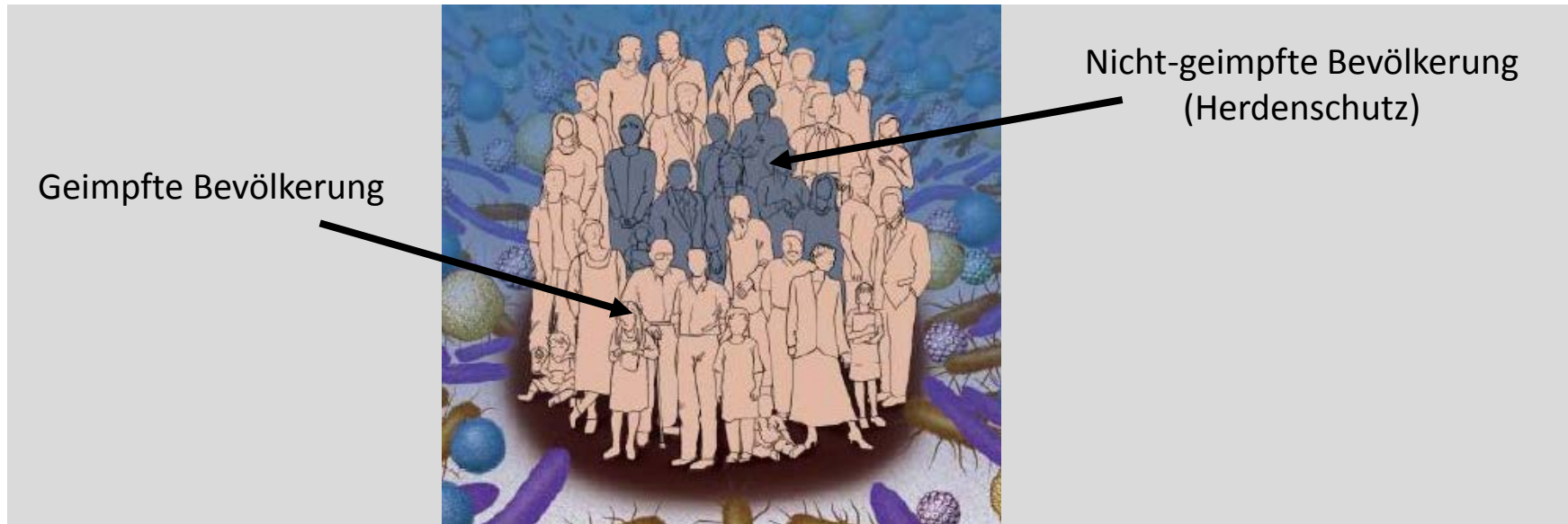


(Damm & Ultsch 2015)

# I. Darstellung künftiger Effekte mittels Modellierungen

Vorteile von Modellen:

- Berechnung der **langfristigen** epidemiologischen Auswirkungen einer Impfung
- Berechnung von **Auswirkungen auf Bevölkerungsebene** (direkte und indirekte Effekte)



## II. Identifikation der effizientesten Impfstrategie

- Mit Modellen können unterschiedliche Impfstrategien evaluiert werden
- Die Ausgestaltung einer Impfstrategie hat Auswirkungen auf das Kosten-Nutzen-Verhältnis
  - Alters-/Risikogruppe
  - Geschlecht
  - Anzahl der Impfdosen
  - Impfzeitpunkt
  - Setting



# II. Identifikation der effizientesten Impfstrategie



Ultsch et al. BMC Health Services Research 2013, 13:59  
<http://www.biomedcentral.com/1472-6963/13/59>



RESEARCH ARTICLE

Open Access

## Health economic evaluation of vaccination strategies for the prevention of herpes zoster and postherpetic neuralgia in Germany

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### Abstract

**Background:** Herpes zoster (HZ) is a self-limiting painful skin rash affecting mostly individuals from 50 years of age. The main complication is postherpetic neuralgia (PHN), a long-lasting pain after rash has resolved. A HZ-vaccine has recently been licensed in Europe for individuals older than 50 years. To support an informed decision-making for a potential vaccination recommendation, we conducted a health economic evaluation to identify the most cost-effective vaccination strategy.

**Methods:** We developed a static Markov-cohort model, which compared a vaccine-scenario with no vaccination. The cohort entering the model was 50 years of age, vaccinated at age 60, and stayed over life-time in the model. Transition probabilities were based on HZ/PHN-epidemiology and demographic data from Germany, as well as vaccine efficacy (VE) data from clinical trials. Costs for vaccination and HZ/PHN-treatment (in Euros; 2010), as well as outcomes were discounted equally with 3% p.a. We accounted results from both, payer and societal perspective. We calculated benefit-cost-ratio (BCR), number-needed-to-vaccinate (NNV), and incremental cost-effectiveness ratios (ICERs) for costs per HZ-case avoided, per PHN-case avoided, and per quality-adjusted life-year (QALY) gained. Different target age-groups were compared to identify the most cost-effective vaccination strategy. Base-case-analysis as well as structural, descriptive-, and probabilistic-sensitivity-analyses (DSA, PSA) were performed.

**Results:** When vaccinating 20% of a cohort of 1 million 50 year old individuals at the age of 60 years, approximately 20,000 HZ-cases will be avoided over life-time. The NNV to avoid one HZ (PHN)-case was 10 (144). However, with a BCR of 0.34 this vaccination-strategy did not save costs. The base-case-analysis yielded an ICER of 1,419 (20,809) Euros per avoided HZ (PHN)-case and 28,146 Euros per QALY gained. Vaccination at the age of 60 was identified in most (sensitivity) analyses to be the most cost-effective vaccination strategy. In DSA, vaccine price and VE were shown to be the most critical input-data.

**Conclusions:** According to our evaluation, HZ-vaccination is expected to avoid HZ/PHN-cases and gain QALYs to higher costs. However, the vaccine price had the highest impact on the ICERs. Among different scenarios, targeting individuals aged 60 years seems to represent the most cost-effective vaccination-strategy.

**Keywords:** Herpes zoster, Postherpetic neuralgia, Vaccine, Cost-effectiveness, QALY, Markov

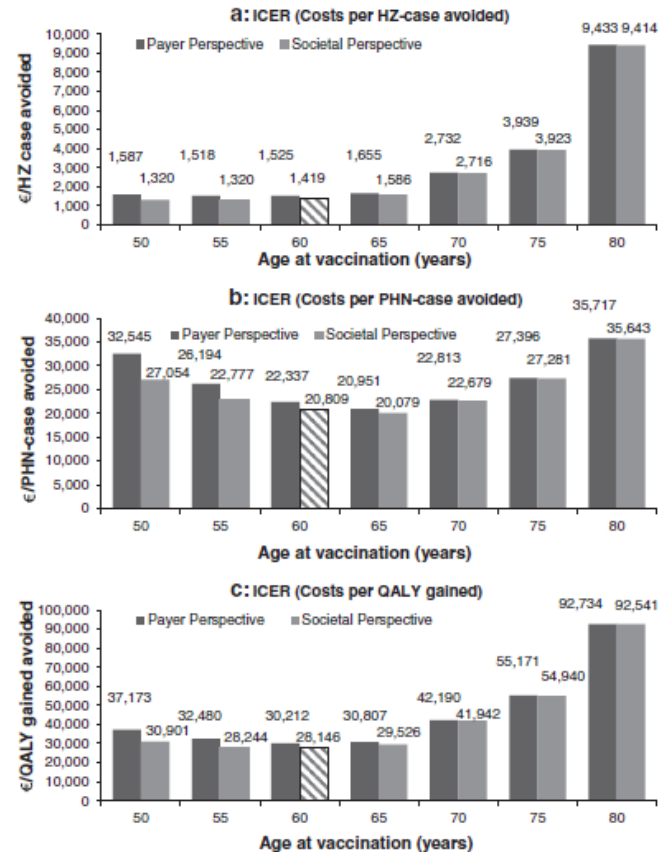


Figure 3 Base-case-analyses and variation of age and perspective - ICERs by outcome and age. ICER, incremental cost-effectiveness ratio; HZ, herpes zoster; PHN, postherpetic neuralgia; QALY, quality adjusted life-year. NOTE: Hatched bars represent base-case analyses.

(Ultsch et al. 2013)

### III. Identifikation kritischer Inputparameter

Im Rahmen von Unsicherheits-/Szenario-Analysen werden verschiedene Einflussfaktoren im Modell analysiert

- Epidemiologische Daten
    - z. B. Häufigkeit und Schwere von Komplikationen
  - Impfstoffcharakteristika
    - z. B. Schutzdauer
  - Gesundheitsökonomische Daten
    - z. B. Impfstoffpreis (Schwellenwertpreis?)
- Evtl. Ableitung von dringendem Forschungsbedarf



### III. Identifikation kritischer Inputparameter

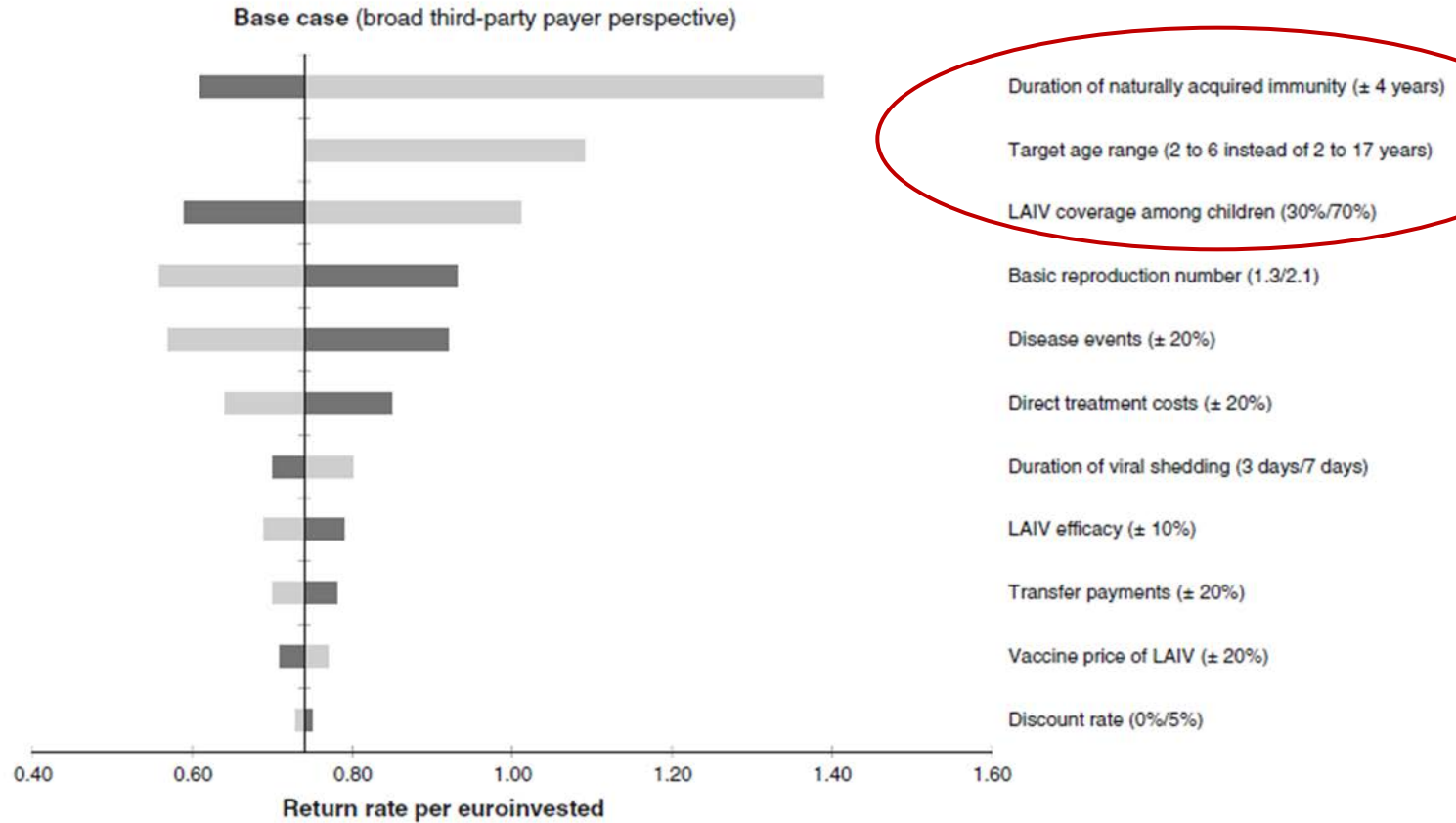


Fig. 2 Results of one-way sensitivity analyses on key model parameters (the *dark bars* represent the upper limits whereas the *light bars* indicate the lower limits). LAIV live attenuated influenza vaccine

(Damm et al. 2014)

# IV. Budget-Impact-Analyse

## Vorausberechnung der Budgetauswirkungen einer Impfpflicht

- GKV-Perspektive
- Eher kurzer/mittlerer Zeithorizont
- „Welche Budgetauswirkungen hat eine Impfpflicht in den nächsten 1, 2, ... und x Jahren?“

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VALUE IN HEALTH

### Budget Impact and Cost-Effectiveness of Including a Pentavalent Rotavirus Vaccine in the New Zealand Childhood Immunization Schedule

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**ABSTRACT**

**Objectives:** To estimate: 1) rotavirus disease burden in New Zealand children aged under 5 years, and 2) health benefits, budget impact, and cost-effectiveness of incorporating a pentavalent rotavirus vaccine (PRV) into the national immunization schedule.

**Methods:** A static equilibrium model was developed to evaluate health benefits and budget impact of vaccinating five successive birth cohorts with PRV at \$50 per dose and 85% coverage (three doses). Cost-effectiveness was estimated from the societal perspective in year 5 of the program, with future health benefits discounted at 3.5% per annum.

**Results:** By the age of 5 years, one in five children will have sought medical advice for rotavirus gastroenteritis and one in 43 will have been hospitalized. In 2009, we estimate 1506 hospitalizations (476 per 100,000; 95% confidence interval 451, 502), 3086 Emergency Department (ED) presentations not requiring hospitalization, plus 10,120 cases of rotavirus gastroenteritis managed solely in primary care. The annual societal cost is \$7.07 million, including 41% from hospitalization and 25% from caregiver income loss. Health benefits will increase and the cost of illness will decline by 78% in year 5 as successive birth cohorts are immunized. In the fifth year, 1191 hospitalizations, 2442 ED treated cases, 9762 primary care consultations, and 0.8 deaths will be averted. It requires six vaccinated children to avoid one primary care consultation, 49 to avert one hospitalization, and 73,357 to prevent one death. The incremental cost is \$2.99 million and the break-even price per vaccine dose is \$32.39 at 2006 prices. The cost is \$2,509 to avert one hospitalization and \$305 to prevent one case seeking health-care assistance. The cost per life-year gained in year 5 is \$143,097 and the cost per quality-adjusted life-year (QALY) gained is \$46,092 (US\$26,774). The cost per QALY is sensitive to incidence rates, vaccine price and efficacy, loss of quality of life by the child, case fatality, and caregiver income loss.

**Conclusions:** From a societal perspective, addition of PRV to the New Zealand childhood immunization schedule would confer important clinical gains at a modest cost per QALY gained.

**Keywords:** cost-effectiveness, gastroenteritis, immunization, rotavirus, vaccine.

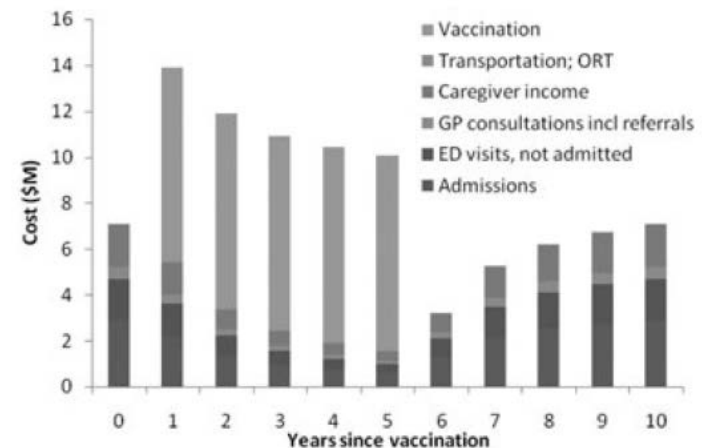


Figure 2 Projected annual costs to New Zealand over 10 years, if a pentavalent rotavirus vaccine were to be included in the national childhood immunization schedule for 5 years (undiscounted). ED, Emergency Department; GP, general practitioner; ORT, oral rehydration therapy.

(Milne & Grimwood 2009)



## V. Abwägung von Kosten und Nutzen

- Kosten-Nutzen-Verhältnis als eigenständiges Empfehlungskriterium
- Zu hohes Kosten-Nutzen-Verhältnis führt zur Nicht-Empfehlung?

- Alarmfunktion 

→ daraus entstehen weitere Handlungsoptionen

- Impfstoffpreisverhandlung
- Identifikation und/oder Gewichtung weiterer Aspekte/Kriterien  
(z. B. Wahrnehmung der Zielerkrankung/Schwere der Krankheitslast in der Bevölkerung)  
→ Empfehlung trotz ungünstigen Kosten-Nutzen-Verhältnisses