Acceptance code: EPH36

Evaluation of the Impact of Herpes Zoster Vaccination in 18 to 49 Years Old German Patients with Immunosuppression on Public Health Measures

The model shows that vaccination with the adjuvanted recombinant zoster vaccine has the potential to significantly reduce the number of herpes zoster cases and related complications among immunocompromised persons aged 18 to 49 years in Germany

Digital poster
Supplementary data
SCAN ME

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Background

Herpes zoster (HZ) is characterized by neuropathic pain and dermatomal vesicular rash that often appears on the trunk along a thoracic dermatome or on the face. The most common complication is post-herpetic neuralgia (PHN, long-lasting nerve pain).[1]

The risk of HZ increases with ageing and in people with weakened immune system due to illness and/or therapy (immunocompromised (IC) status).[2]

The adjuvanted recombinant zoster vaccine (RZV) was approved in the European Union in 2018 for the prevention of HZ and PHN in people aged 50 and older and since 2021 for people aged 18 and older who are at increased risk of HZ.[3]

Current STIKO recommendations:[4] Standard vaccination: ≥ 60 years of age (yoa); Indication vaccination: 50 to 59 yoa with underlying conditions. In contrast, ACIP recommends the vaccination with RZV for IC individuals aged 19 years or older.[5]

Objective

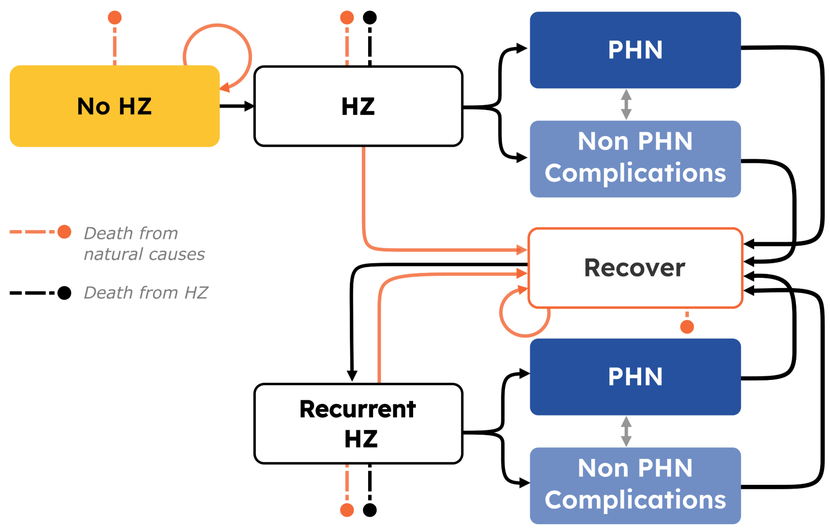
Evaluate the public health impact of RZV in German IC populations aged 18 to 49 years for the prevention of HZ and its complications considering three selected IC conditions:

- **Hematopoietic stem-cell transplant (HSCT)**
- **Renal transplant**
- **Human immunodeficiency virus (HIV)**

Methods

- The existing Markov model "ZOster ecoNomic Analysis" was adapted for German IC populations (ZONA IC).[6]
- Uncertainty of parameters was assessed through Deterministic sensitivity analysis (DSA) (see supplementary data via QR code).
- For each population, in a base case scenario, a hypothetical non-vaccinated cohort was compared to a fully vaccinated cohort and the number of HZ and PHN cases were computed over a 30-year time horizon.

Markov structure of the ZONA IC model

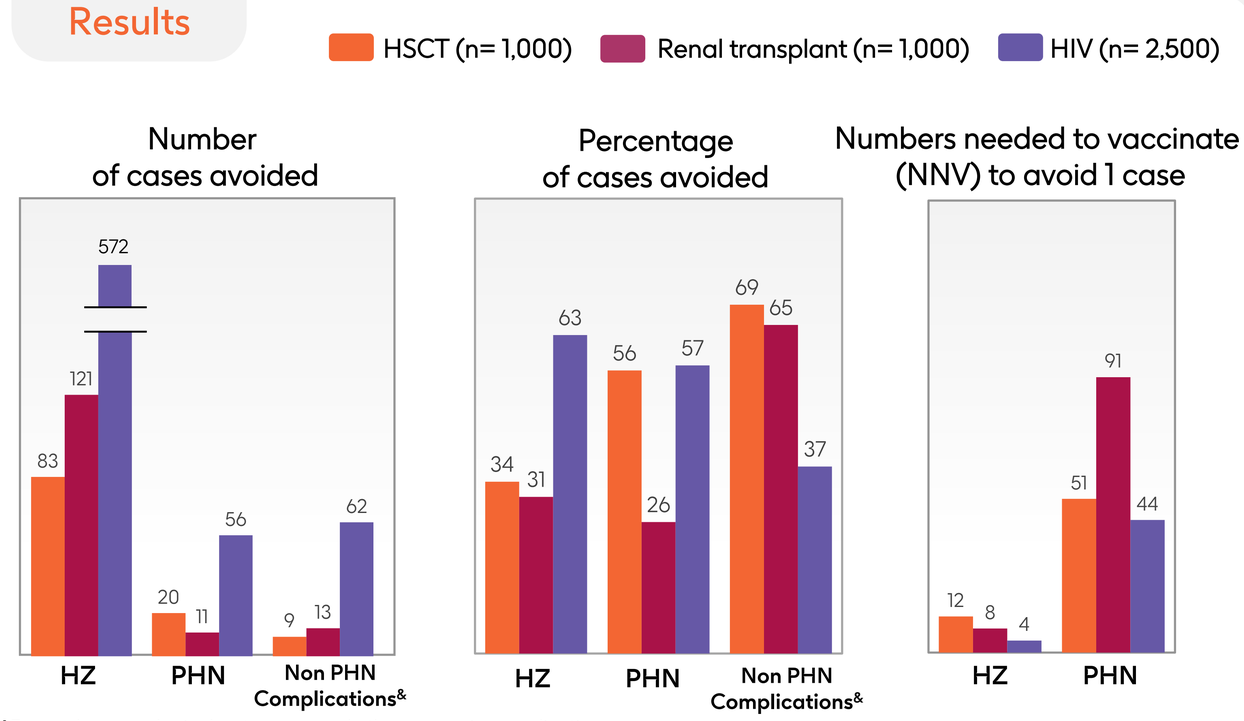


Inputs

	Healthy	HSCT	Renal transplant	HIV
Time horizon (years)	30			
Cohort size	Analog IC-cohort	1,000	1,000	2,500
Population starting age (years)	After the end of the IC condition[#]	35		
IC status duration (years)	/	5	lifetime	
Coverage	/	1st dose: 100%, 2nd dose: 100%		
Primary 2-dose RZV efficacy against HZ	98.9%	72.5%	94.5%	98.6%
Primary 2-dose RZV efficacy against PHN	/	94.8%	97.0%	97.5%
Annual waning	1.5%	9.1%	5.2%	2.3%
Annual incidence of primary and recurrent HZ (per person-year, 18-49 yoa)*	0.0047[7]	0.0372[8]	0.0145[9]	0.0130[8]
Percentage of primary and recurrent HZ cases with PHN	9.37%[7]	15.61%[10]	8.39%[10]	8.33%[10]

*The incidence is assumed to increase by age in the healthy population: Range: 0.0047 - 0.0141 (per 100,000 person-years).
The model population starts in the IC cohort and switches to the healthy cohort after 5 years in HSCT. As RT and HIV are assumed to be lifelong, there is no change to the healthy cohort.

Results



&E.g. ocular, neurological, cutaneous and other non-pain complications

Conclusion

Vaccination with RZV can significantly reduce the HZ-related disease burden in individuals with HCST, renal transplant and HIV aged 18 to 49 years in Germany.

Future studies may include more conditions and therapies, more recent epidemiological data and account for costs averted.

Abbreviations

ACIP, Advisory Committee on Immunization Practices; **DSA**, Deterministic sensitivity analysis; **HIV**, Human immunodeficiency virus; **HSCT**, Hematopoietic stem cell transplant; **HZ**, Herpes zoster; **IC**, immunocompromised; **NNV**, Number needed to vaccinate; **PHN**, postherpetic neuralgia; **RZV**, adjuvanted recombinant zoster vaccine; **STIKO**, Ständige Impfkommission; **yoa**, years of age; **ZONA**, ZOster ecoNomic Analysis

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Acknowledgements

Business & Decision Life Sciences Medical Communication Service Center c/o GSK.

Conflicts of interest

Funding: GSK (Study-ID: VEO-000864).
Conflicts of interest: See Supplementary data (QR-code)

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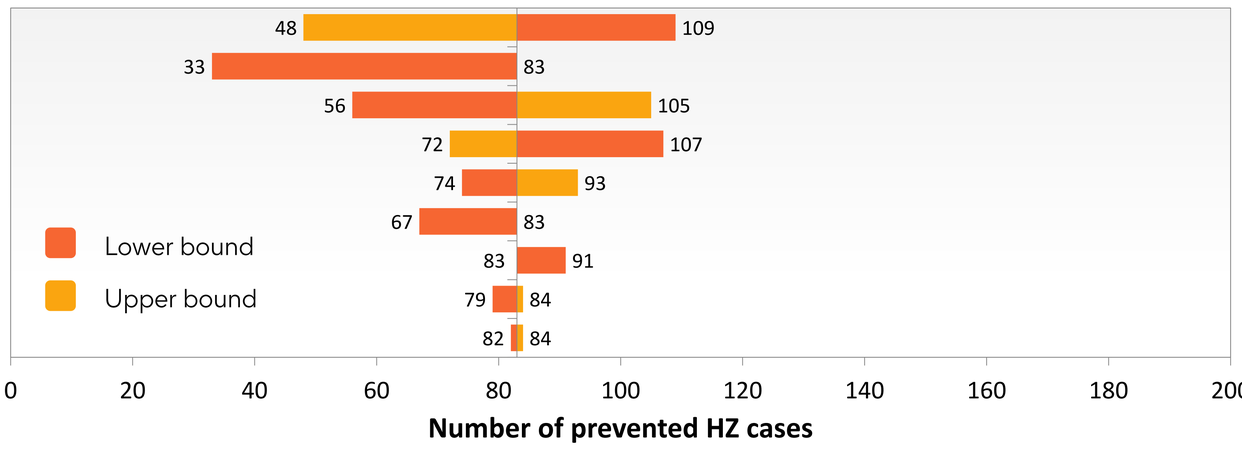
ZOster ecoNomic Analysis (ZONA) model: model structure and analysis framework

Model

- Multi-cohort Markov model
- **Population:** hypothetical cohort, adjustable cohort size
- **Age groups:** 18-49, 50-59, 60-64, 65-69, 70-79, 80 years and older
- **Risk stratification:** Population starts in IC status and returns to Healthy status after specific duration of IC status
- **Time horizon:** 30 years
- **Cycle length:** 1 year
- **Key endpoints:** Public health impact (PHI)
  - Reduction of HZ, PHN and other HZ-related complications
  - NNV to prevent one HZ- or PHN-case

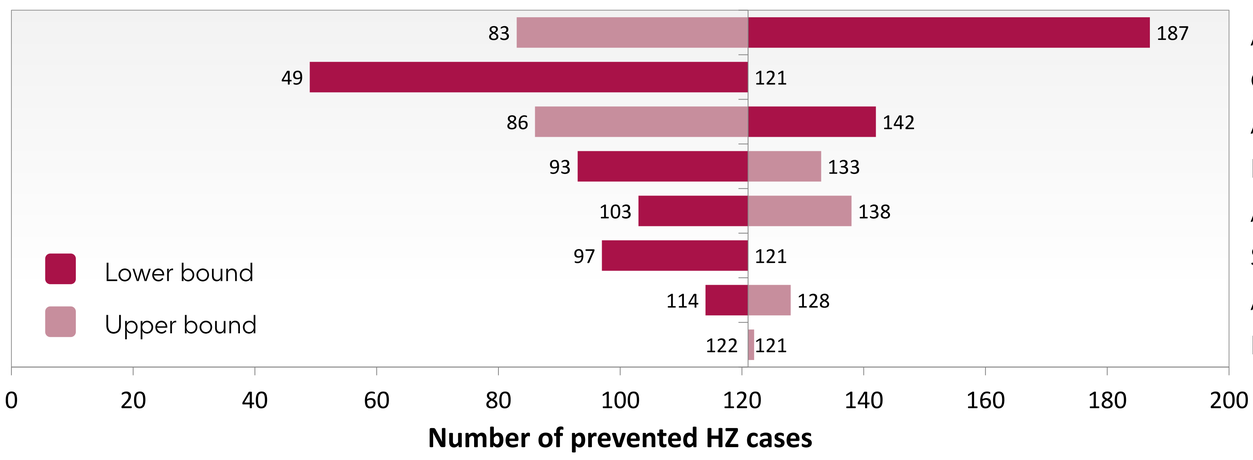
Results of the Deterministic Sensitivity Analysis (DSA) – Number of prevented cases

HSCT (Cohort size: 1,000)



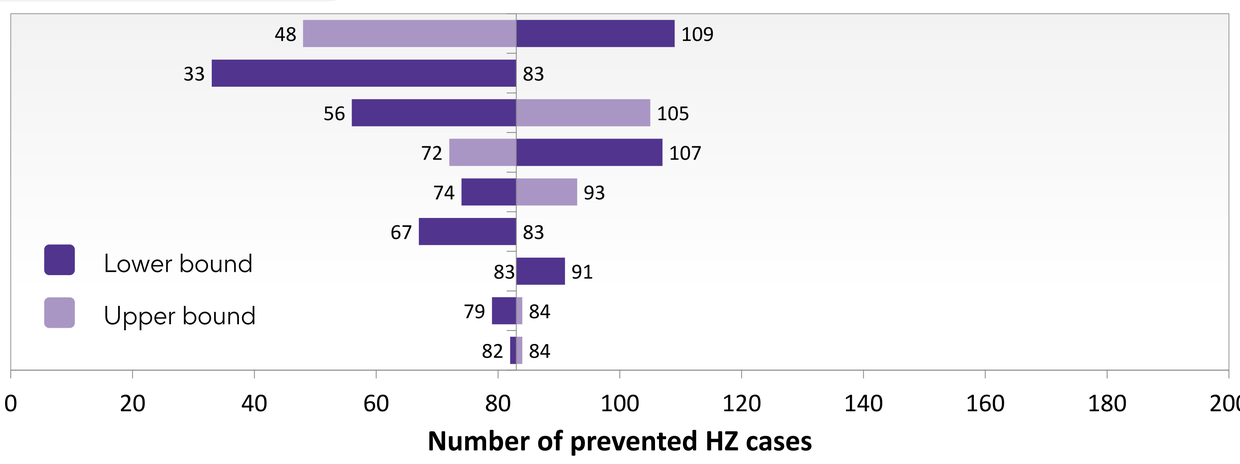
Annual waning of RZV (two-dose) HZ efficacy for years 1-4 and <70yoa
Coverage of first dose for RZV
Initial efficacy of RZV (two-dose) against HZ
Annual waning of RZV (two-dose) HZ efficacy for years 5+ and <70yoa
Annual incidence of initial HZ
Second-dose compliance for RZV
Duration of IC Condition
Annual incidence of recurrent HZ
Initial efficacy of RZV (one-dose) against HZ

Renal Transplant (Cohort size: 1,000)



Annual waning of RZV (two-dose) HZ efficacy for years 5+ and <70yoa
Coverage of first dose for RZV
Annual waning of RZV (two-dose) HZ efficacy for years 1-4 and <70yoa
Initial efficacy of RZV (two-dose) against HZ
Annual incidence of initial HZ
Second-dose compliance for RZV
Annual incidence of recurrent HZ
Initial efficacy of RZV (one-dose) against HZ

HIV (Cohort size: 2,500)



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Second-dose compliance for RZV
Duration of IC Condition
Annual incidence of recurrent HZ
Initial efficacy of RZV (one-dose) against HZ

Abbreviations

DSA, Deterministic sensitivty analysis; **HIV**, Human immunodeficiency virus; **HSCT**, Hematopoietic stem cell transplant; **HZ**, Herpes zoster; **IC**, immunocompromised; **NNV**, Number needed to vaccinate; **PHI,** public health impact; **PHN**, postherpetic neuralgia; **RZV**, adjuvanted recombinant zoster vaccine; **yoa**, years of age; **ZONA**, ZOster ecoNomic Analysis

ISPOR Europe 2024 | 17–20 November 2024 | Barcelona, Spain

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Conflicts of interest

Martin Krammer, Desmond Curran, Marie Nishimwe, Laura Weber, Maria Waize, Johannes Hain, Sara Pedron and Maximilian Dichtl are GSK employees. Desmond Curran and Johannes Hain hold financial equities in GSK. Eva Wolf declares receiving fees from GSK for advisory services, she also declares having a contract with Janssen-Cilag and ViiV Healthcare. Eva Wolf also received consulting fees from Gilead Sciences and ViiV Healthcare, as well as payment or honoraria from Biogen, Gilead Sciences and ViiV Healthcare. Eva Wolf also declares support for attending meetings and/or traveling from ViiV Healthcare, Gilead Sciences and Janssen-Cilag, and she declares having participated in boards from Gilead Sciences, GSK and ViiV Healthcare. Dominik Bettenworth received consulting fees from AbbVie, Amgen, Arena, Atheneum, Bristol Myers Squibb Celltrion, Else Kröner-Fresenius-Stiftung, Galapagos, GSK, Impulze, Janssen Cilag, Lilly, MSD, Mylan, Pfizer, Pharmacosmos, Takeda, Tetrameros, Tillotts Pharma und UCB Biopharma; as well as payment or honoraria for lectures and presentations from AbbVie, Amgen, Art tempi, Atheneum, BNG Service GmbH, Bristol Myers Squibb, CED-Service GmbH, Celltrion, DGVS, Diaplan, Doctorflix, Falk Foundation, Ferring, Galapagos, Gastro Today Guidepoint, GSK, Janssen Cilag, Lilly, Medical Tribune, MedTriX, MSD, Onkowissen, Pharmacosmos, Pfizer, Roche, Sandoz, Takeda, Thieme, Tillotts Pharma, Viatris and Vifor Pharma. Dominik Bettenworth also received payments for attending advisory board meetings from AbbVie, Amgen, Atheneum, Bristol Myers Squibb Celltrion, Galapagos, GSK, Janssen Cilag, Lilly, Pfizer, Pharmacosmos and Takeda. Stefan Esser declares receiving grants or contracts, and support for traveling and/or attending meetings from Gilead, ViiV, MSD and Janssen. He also received consulting fees for participating in advisory boards from Gilead, GSK, Janssen, MSD and ViiV. Stefan Esser has a leadership or fiduciary role in the German AIDS Society (Landeskomission AIDS NRW). Clemens Wendtner received consulting fees, payment or honoraria for lectures and presentations, support for attending meetings and travel, and participating on Advisory Boards for/from GSK, Abbvie, Hoffmann-La Roche, Janssen and BeiGene. Christina Rieger participated in data safety monitoring boards or advisory boards organized by AbbVie, AstraZeneca, Basilea, BioNTech, Bristol Myers Squibb, GSK, Janssen Cilag GmbH, Pfizer Pharma International, Moderna, Merck Sharp & Dohme, Roche Pharma AG, Sanofi Pasteur AG and Shire, and she also declares receiving consulting fees from these companies. Christina Rieger declares receiving payment or honoraria for lectures, presentations, speaker bureaus, manuscript writing or educational events from Abbvie, AstraZeneca, Bristol Myers Squibb, Gilead Sciences, GSK, Janssen Cilag GmbH and Pfizer Pharma International, as well as support for attending meetings and/or travel from AbbVie and Janssen Cilag GmbH. Andreas Stallmach declares receiving grants for research activities from BmBF, Deutsche Forschungsgemeinschaft (DFG), Thüringer Aufbaubank, Innovationsfond des G.BA, AbbVie, Celltrion and Takeda., for presentations from AbbVie, Bristol Myers Squibb, Celltrion, CLS Behring, De Prom, Falk Foundation, Ferring, Janssen, Kompetenznetz Darmerkrankungen, med update, MSD, Recordati-Pharma, sobi rare strength and Takeda, and for consultancy from AbbVie, Amgen, Bristol Myers Squibb, Consal, Galapagos, Gilead, GSK, Janssen, Lilly, MSD, Repha GmbH, Roche, Pfizer, Pharmacosmos GmbH, Takeda, Tillots Pharma. Reinhard Voll and his institution have received grants or contracts from Pfizer and Novartis, and support for attending meetings and/or travel from AbbVie. Reinhard Voll declares receiving consulting fees from AstraZeneca, Boehringer-Ingelheim, GSK, Janssen, Neutrolis and Novartis; payment or honoraria for lectures, presentations, speaker bureaus, manuscript writing or educational events from AbbVie, AstraZeneca, Boehringer-Ingelheim, GSK, Janssen-Cilag, Novartis and Pfizer, payments for participating on a Data Safety Monitoring Board or Advisory board from AstraZeneca, Boehringer-Ingelheim, GSK, Janssen-Cilag, as well as owning stock options from Neutrolis. Reinhard Voll is a medical advisor to the German Lupus Patient Association. The authors declare no other financial and non-financial relationships and activities.

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