

A public health and budget impact analysis (BIA) of influenza vaccination in the Austrian population

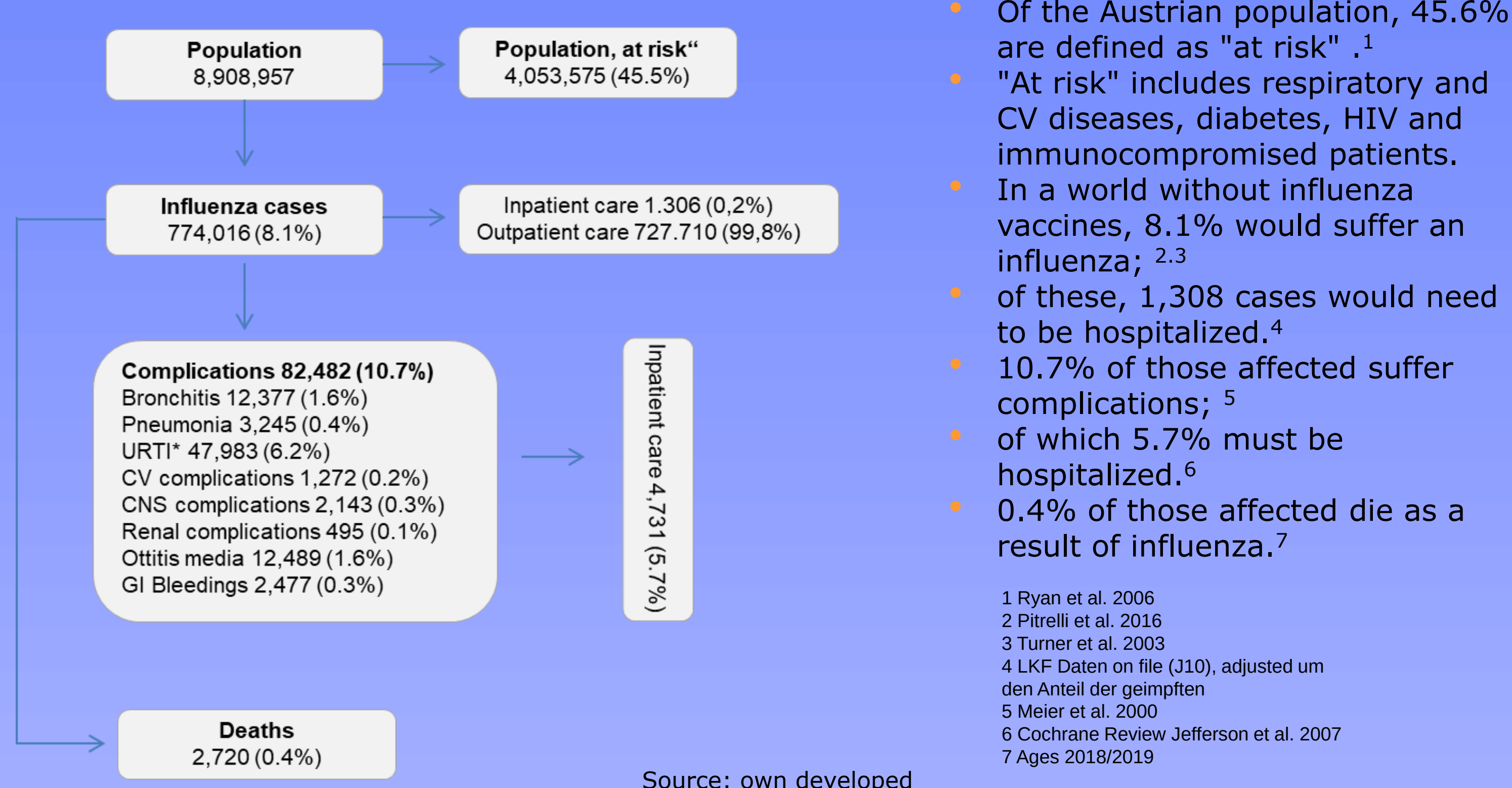
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Objectives

Influenza is associated with considerable morbidity and mortality and remains important for public-health surveillance and prevention efforts. Every year about 5-10% of adults and up to 15% of children develop influenza; more than 700,000 cases in Austria. The virus causes significant follow-up costs. The vaccine is recommended for all persons >6 months, elderly, chronically ill, people at-risk and healthcare-professionals. The aim of the BIA is to quantify the monetary-impact due to the current situation of influenza vaccination, expressed as world with vaccination, compared to a world without vaccination.

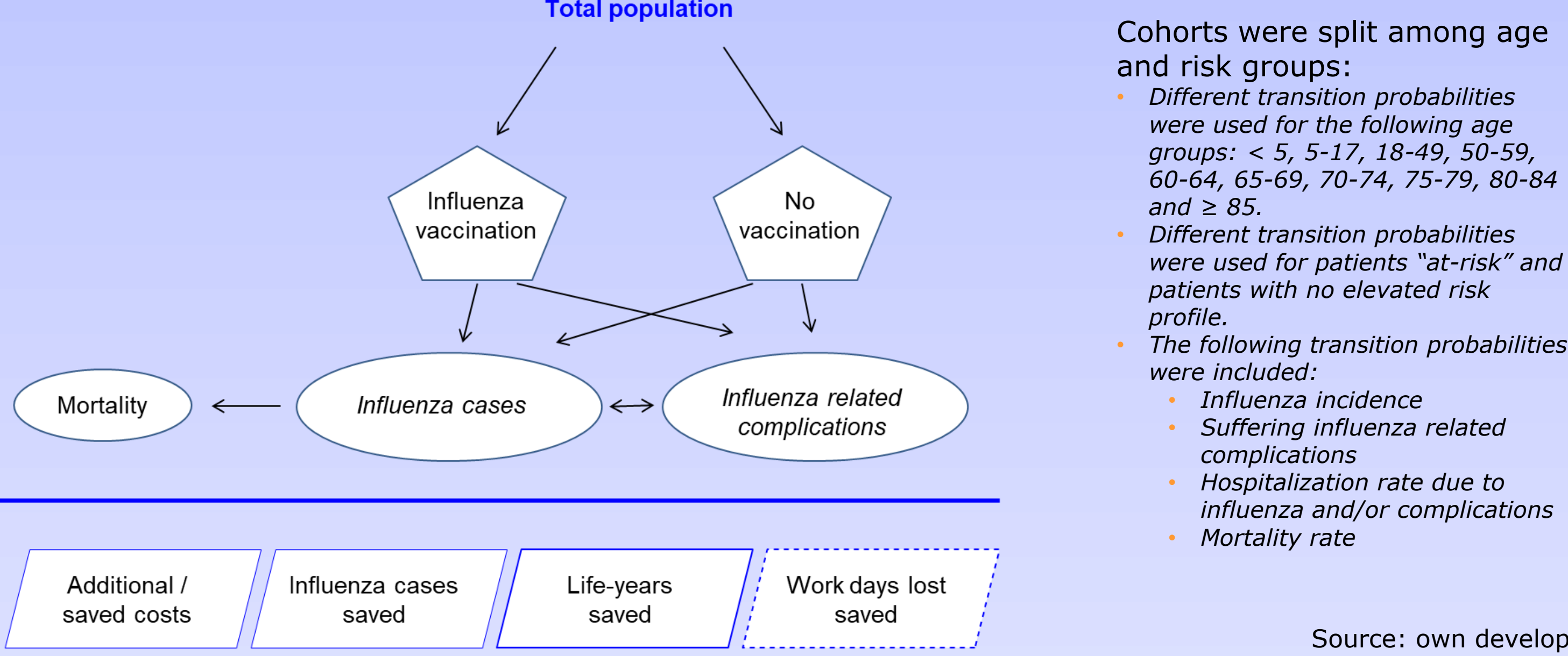
Figure 1: Patientflow WITHOUT influenza vaccine



Methods

A multi-cohort, population-based model (age and risk-groups) was developed over a 5-year time-horizon, which included the following states: hospitalized and outpatient influenza, complications (bronchitis, pneumonia, URTI, CV, CNS, renal, otitis-media, GI-bleeding) and mortality. In the world with vaccination, individuals received vaccination (9.2% 1st year to 14.4% 5th year) or no vaccination according to the current market-share. The model includes probabilities for virus A and B. Results showed which savings could be achieved from the health-care-systems perspective and from the societal perspective. Vaccination costs are based on the present pharmacy-selling-price, which is paid out-of-pocket.

Figure 2: Model Design



Epidemiological und clinical Data

Basically, the influenza vaccine is recommended for all persons from the age of 6 months, especially for the elderly, the chronically ill, groups of people with other risk factors and healthcare professionals. With the present vaccination rate (9.22% see table 1) 721,526 influenza cases were calculated.

Table 1: Influenza incidence in the unvaccinated population

Age groups	Influenza incidence
<5	19.21%
5-17	19.21%
18-49	6.55%
50-64	6.55%
≥65	6.17%

Source: Pitrelli et al. 2016

Figure 3: Influenza cases per age groups (vaccination rate of 9.22%)

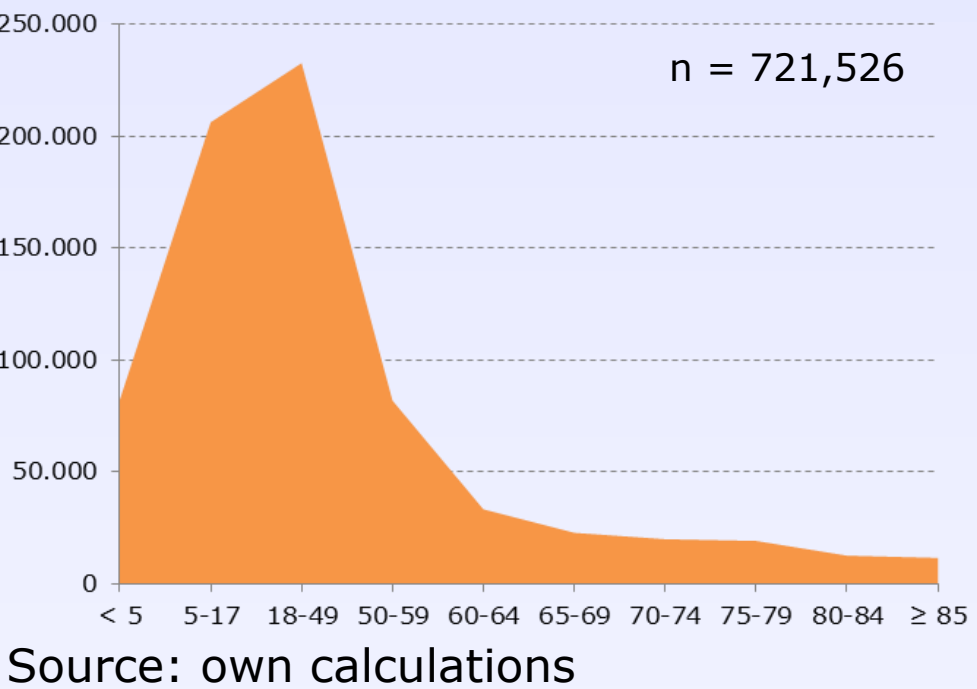


Figure 4: Percentage of population "at-risk"

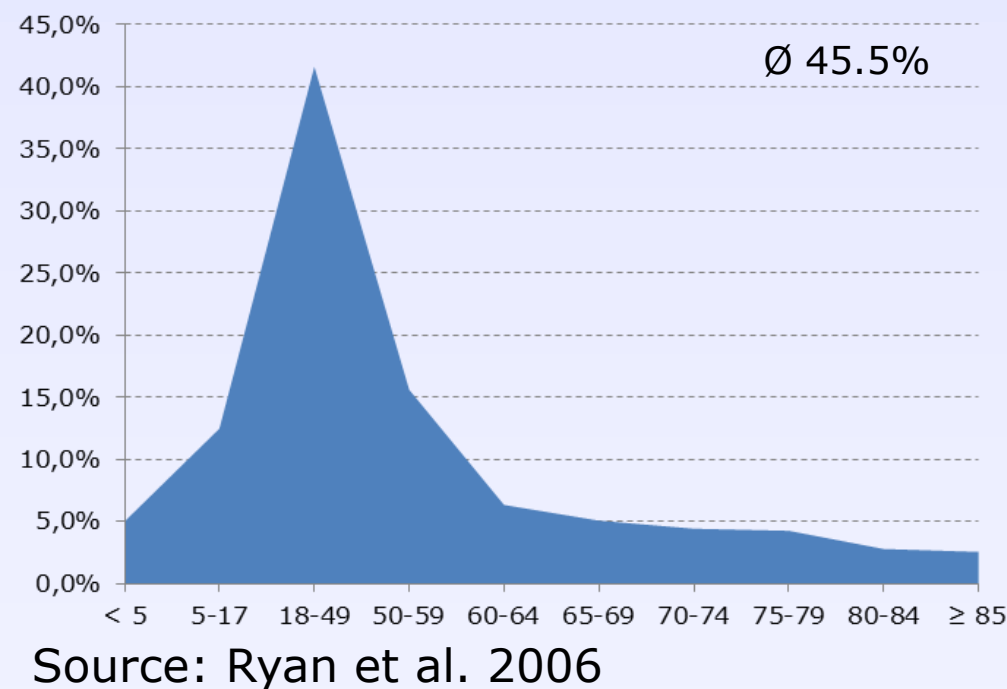
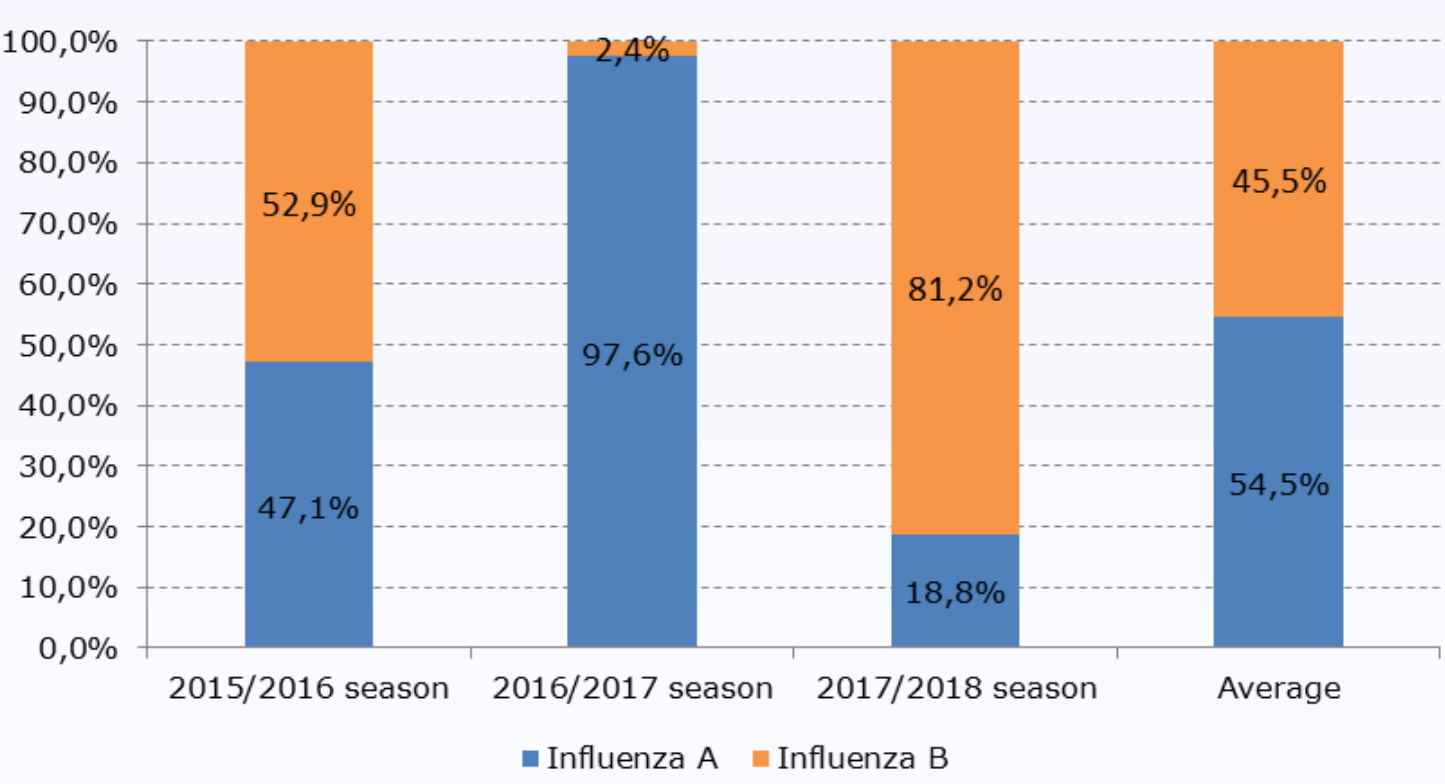


Table 2: Efficacy of influenza vaccination

Age groups	Influenza A virus	Influenza B virus
<5	59%	66%
5-17	59%	77%
18-49	61%	77%
50-59	61%	73%
60-64	61%	73%
≥65	58%	69%

Source: Pitrelli et al. 2016

Figure 5: Influenza type over 3 seasons



Immunization rate

The probability of receiving vaccination was set to 9.22% for the first year. The Influenza vaccination rate was calculated from the sales data of the past 3 years (2016-2018) and was projected as an average trend into the future (2019-2023).

Table 3: Vaccination rate over 5 years

Age groups	% of population	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)	Year 4 (2022)	Year 5 (2023)
<5	5.0%	10.1%	11.5%	12.9%	14.3%	15.7%
5-17	12.5%	10.1%	11.5%	12.9%	14.3%	15.7%
18-49	41.6%	4.1%	4.7%	5.3%	5.9%	6.4%
50-64	21.9%	10.1%	11.5%	12.9%	14.3%	15.7%
≥65	19.0%	18.4%	21.0%	23.6%	26.2%	28.7%
Total		9.22%	10.51%	11.80%	13.09%	14.38%

Source: own calculations

Direct costs

The BIA includes costs of inpatient and outpatient influenza treatment, including medication and the inpatient and outpatient treatment of the complications. Costs were presented from the payers perspective. The costs of influenza vaccination are borne by vaccinated people (24.80 €; pharmacy selling price).

Indirect costs

Indirect costs include sick leave and leave to care for sick children (care leave for children <12 years). In case of illness of children a 1 day leave is considered. Indirect costs are calculated on the basis of the employment rate by age group (share of the working-age population). The duration of work loss is calculated based on ICD-10 for the influenza and associated complications.

Results

Based on the current vaccination coverage annual savings of 40.9 million € (1st year) to 65.6 million € (5th year) [total: 274.6 million € over 5 years] could be achieved. Direct costs contributed between 3.3 million € (1st year) to 7.3 million € (5th year) [total: 28.3 million €] to total saving. The society is relieved due to a vaccination strategy. The savings in indirect costs range from 37.5 million € (1st year) to 58.4 million € (5th year) [total: 246.3 million €]. The costs of the vaccination are borne by the patients, who make private payments of 1.6 million € (1st year) to 2.4 million € (5th year) [total: 10.1 million €].

Figure 5: Total budget-impact

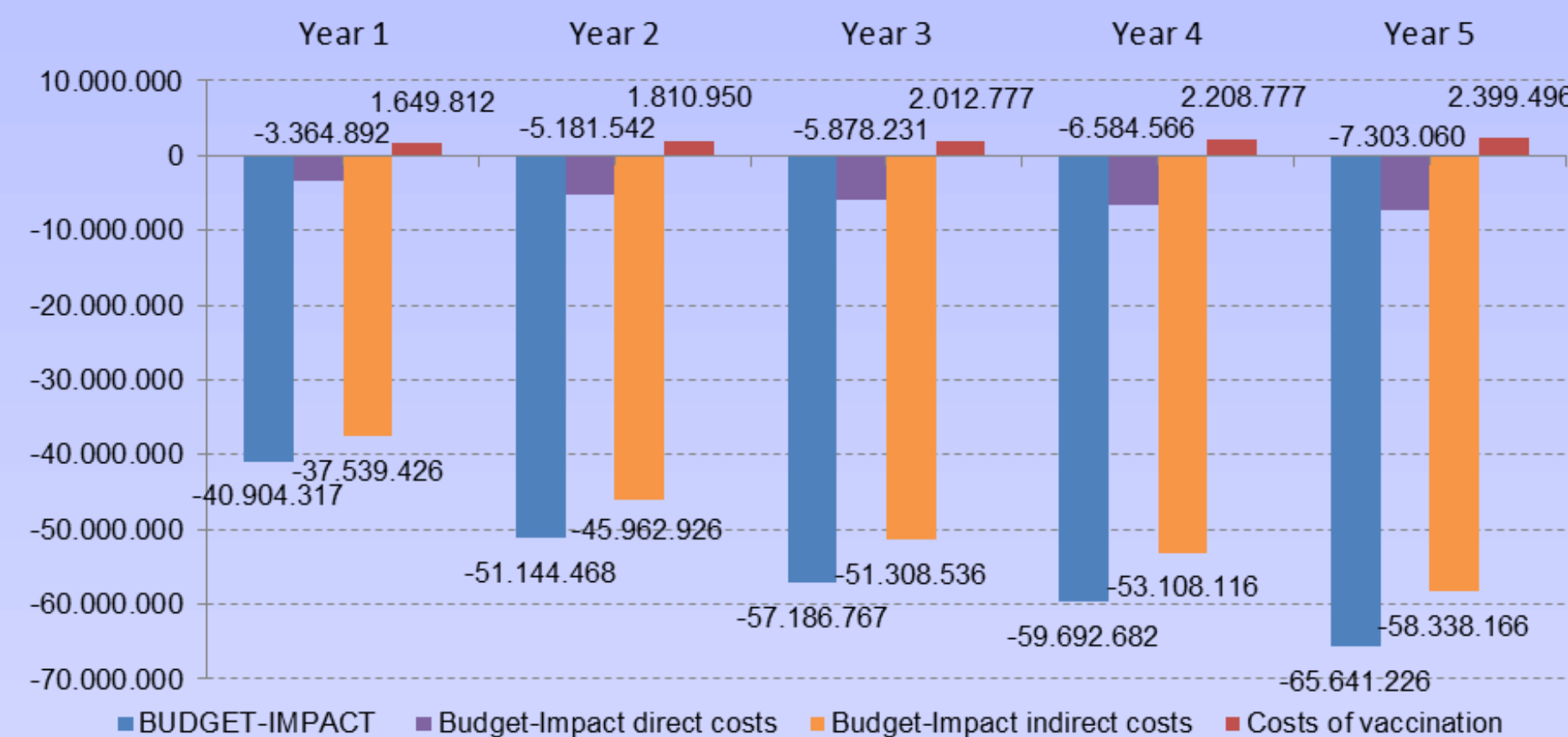


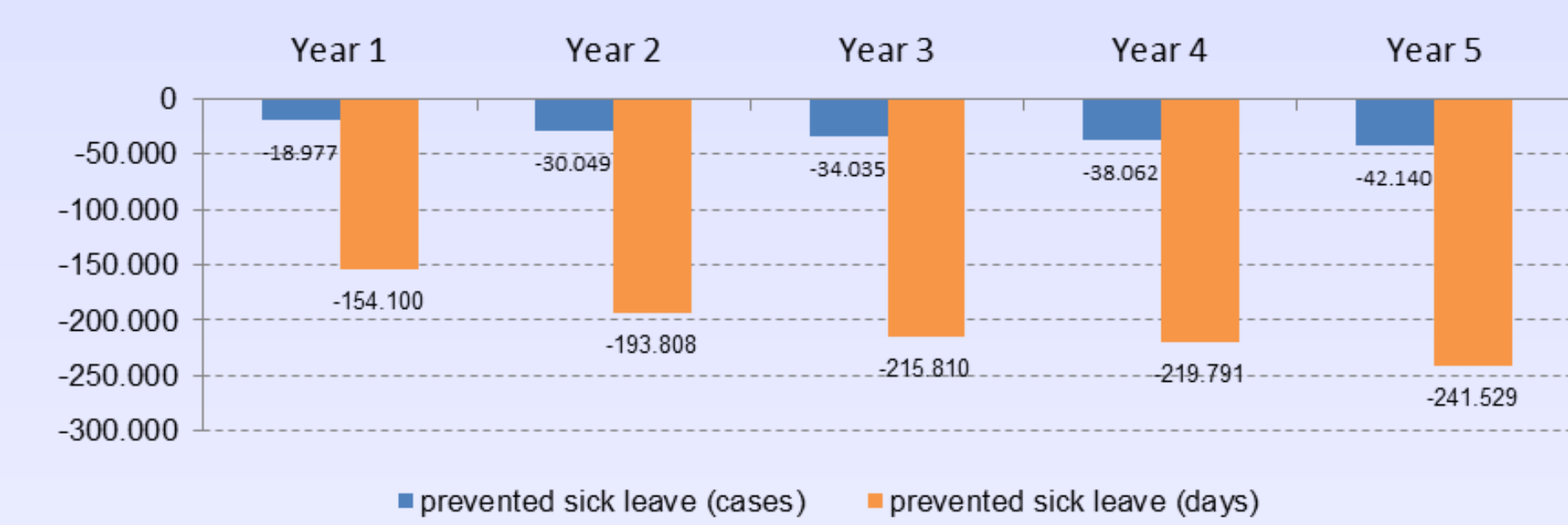
Table 4: Prevented cases due to influenza vaccination

Prevented cases	Year 1	Year 2	Year 3	Year 4	Year 5
Influenza cases	-52,490	-83,114	-94,139	-105,277	-116,559
Complications	-5,539	-9,237	-10,469	-11,712	-12,973
Deaths	-184	-292	-331	-370	-410
Hospital admissions	-409	-648	-734	-821	-909

Multiplier effects:

- 1 € invested in the influenza vaccine relieves the society by 27.23 €
- 1 € invested in the influenza vaccine saves 2.81 € within the health care system

Figure 6: Prevented work absenteeism



Source: own calculations

Sensitivity Analysis

Table 4: Sensitivity analysis

Vaccination coverage	Budget-Impact (in 1,000 €)	Influenza cases	Sick leave (cases)
20%	-233,148	-377,272	-136,398
30%	-678,271	-1,131,815	-409,194
40%	-900,833	-1,509,086	-545,592
50%	-1,123,395	-1,886,358	-681,990
60%	-1,332,708	-2,177,619	-787,292
70%	-1,541,958	-2,468,468	-892,445
80%	-1,751,208	-2,759,317	-997,598

Source: own calculations

The sensitivity analysis shows the results as a consequence of a varied vaccination coverage. With a vaccination coverage of 20%, the total budget impact or social savings increases from 274.6 million € over five years to 455.7 million €; a vaccination coverage of 50% results in a further increase to 1,123.4 million €. Influenza cases are reduced compared to the current situation (451,578 prevented cases over 5 years) to 754,543 prevented cases (20%) or 1,886,358 prevented cases (50%).

Conclusion

1 € private invested in the influenza vaccine relieves the society with 27.23 € and saves 2.81 € in health-care-system.

References

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Additional literature with the author