

BURDEN OF VACCINE PREVENTABLE DISEASES IN MISSOURI

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Columbia, MO, *July 20, 2017*



Annual economic burden of vaccine-preventable diseases, by pathogen, 2015
Ozawa et al, 2016

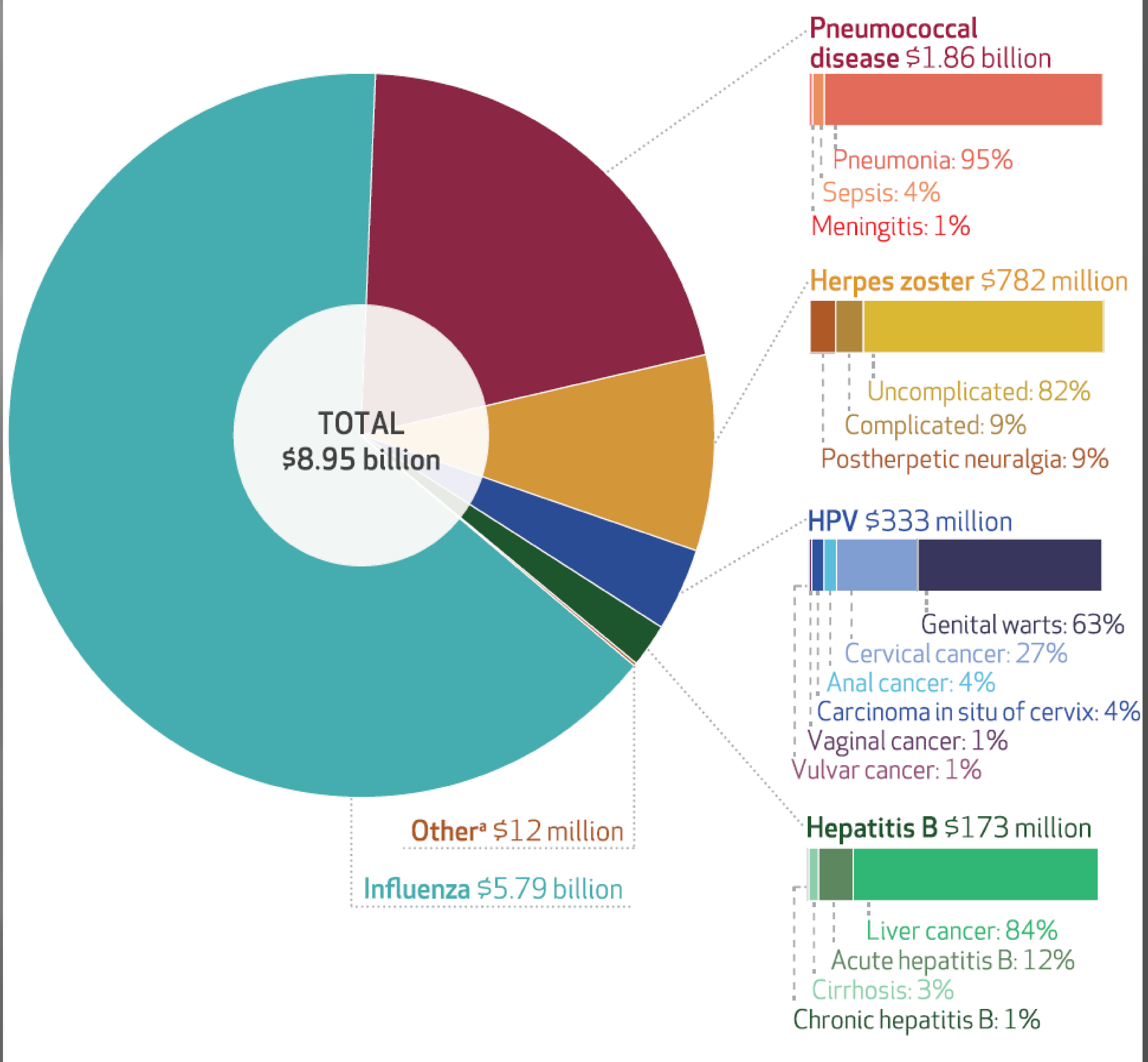
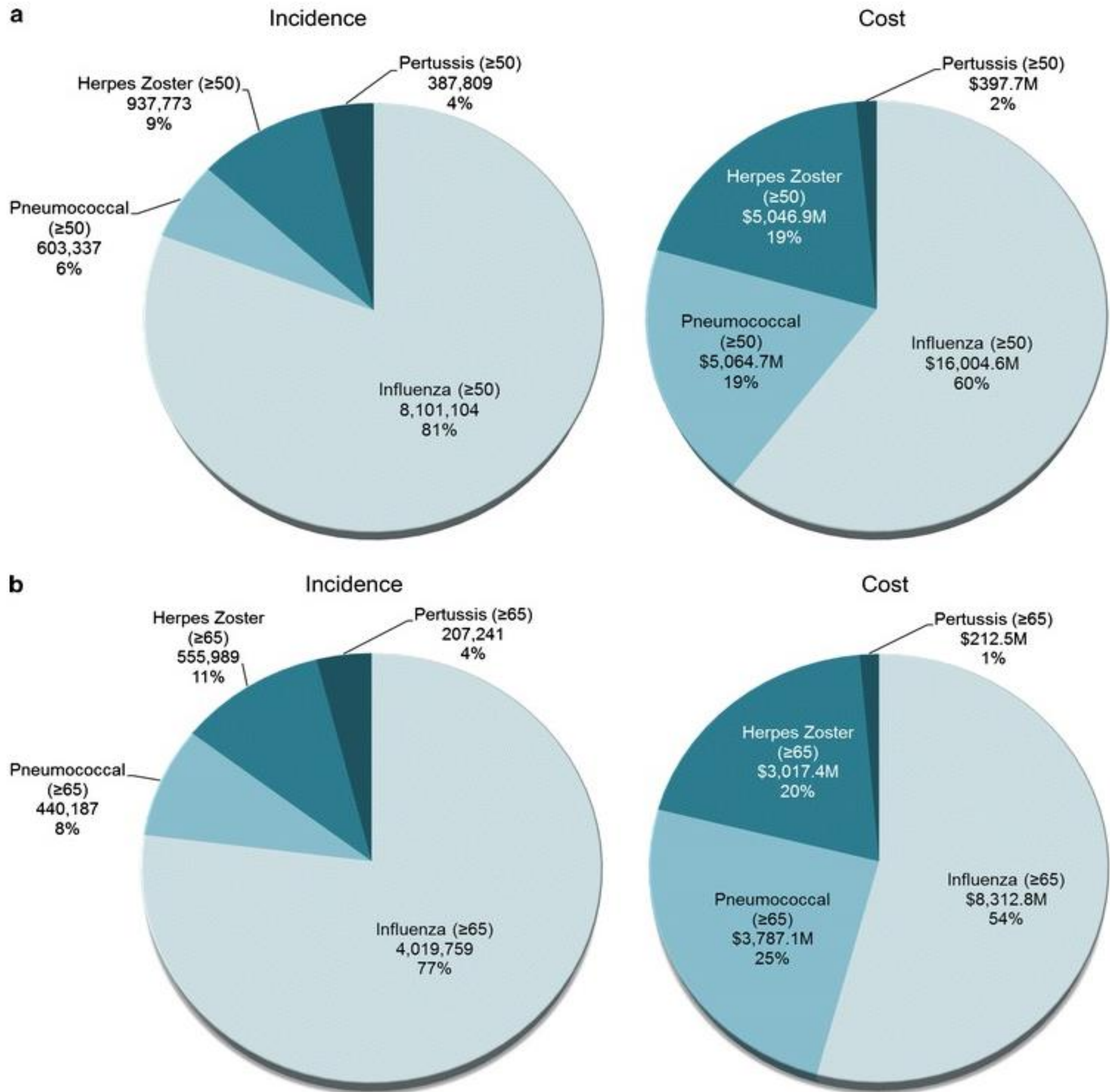
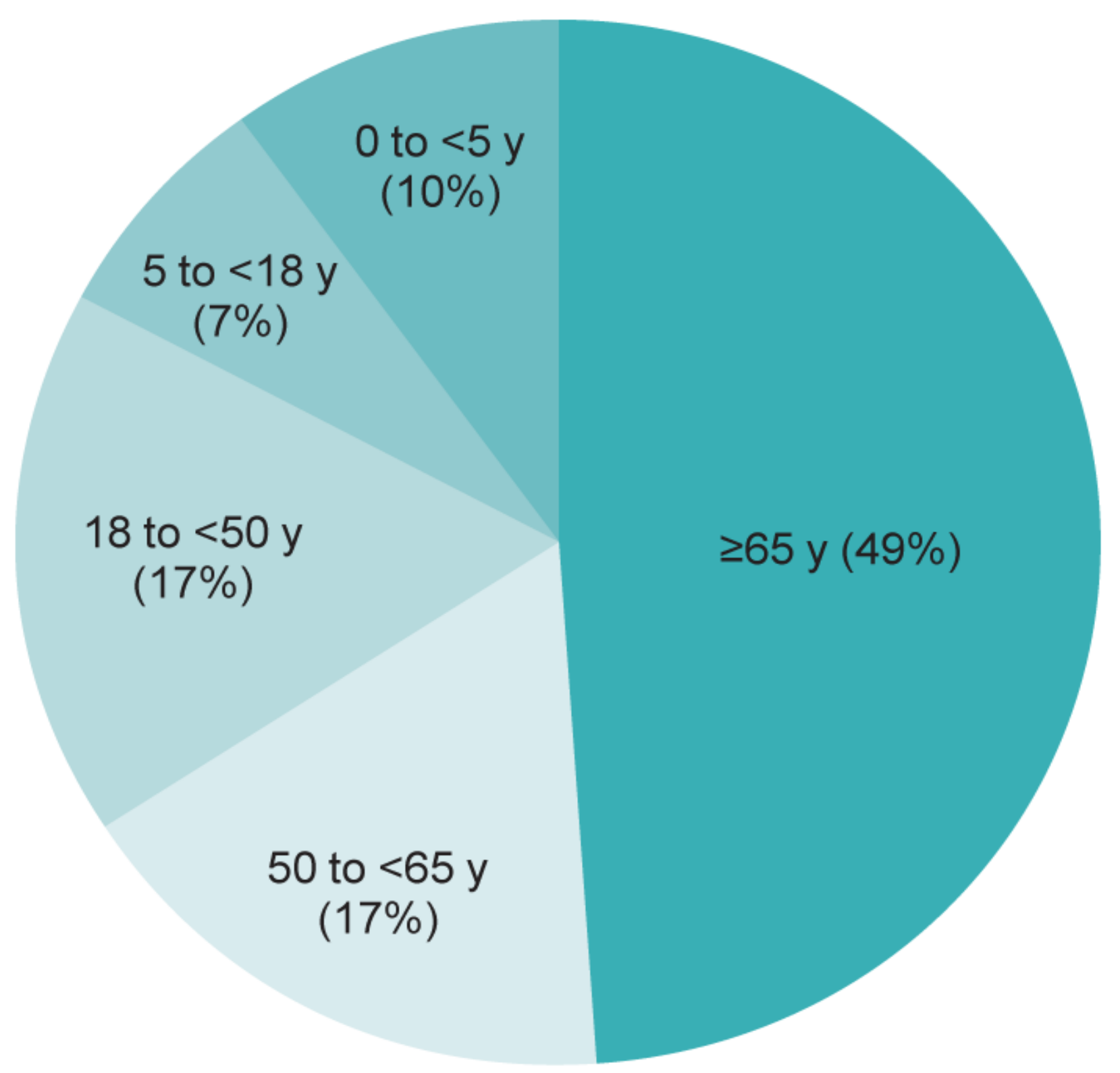
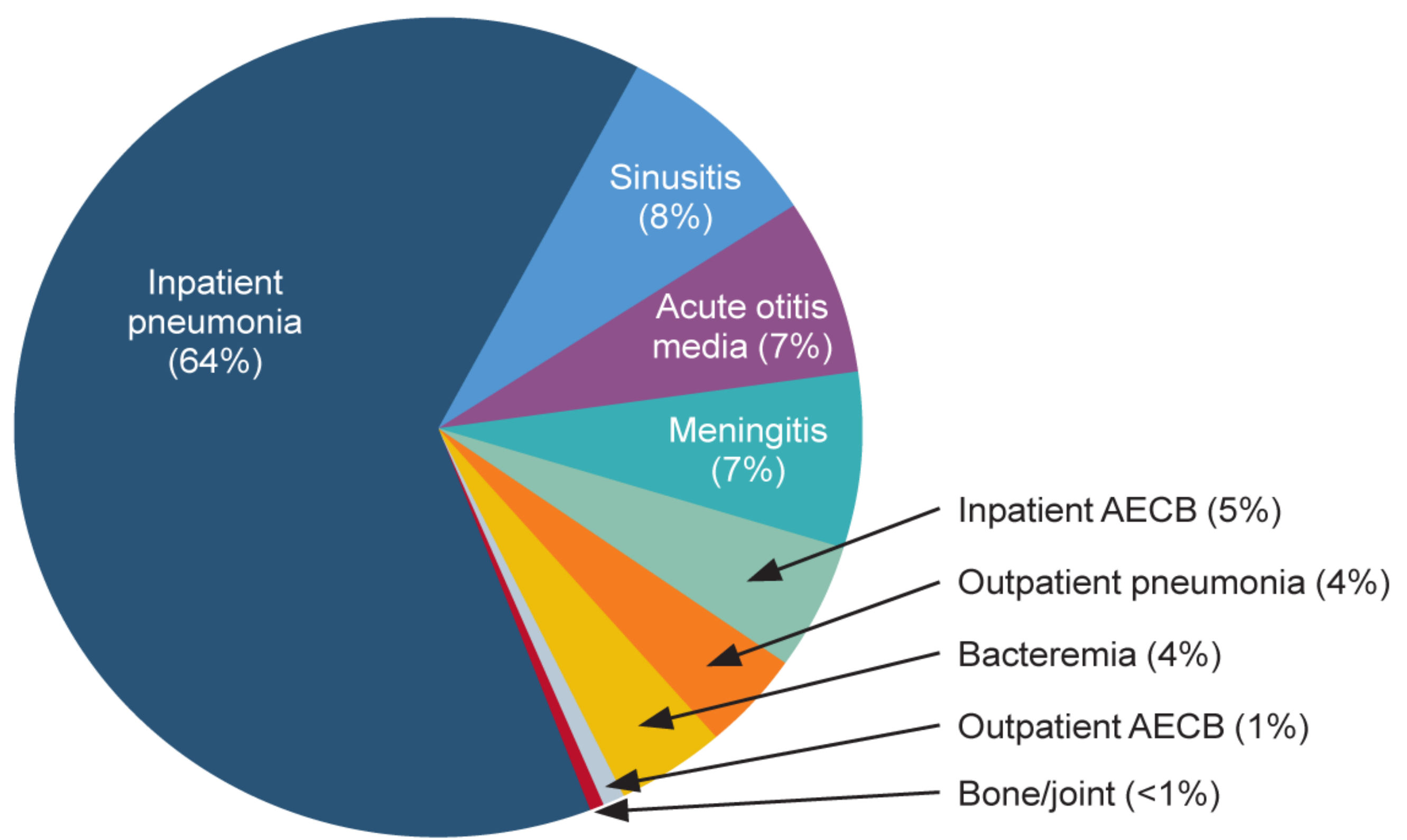


Fig. 1

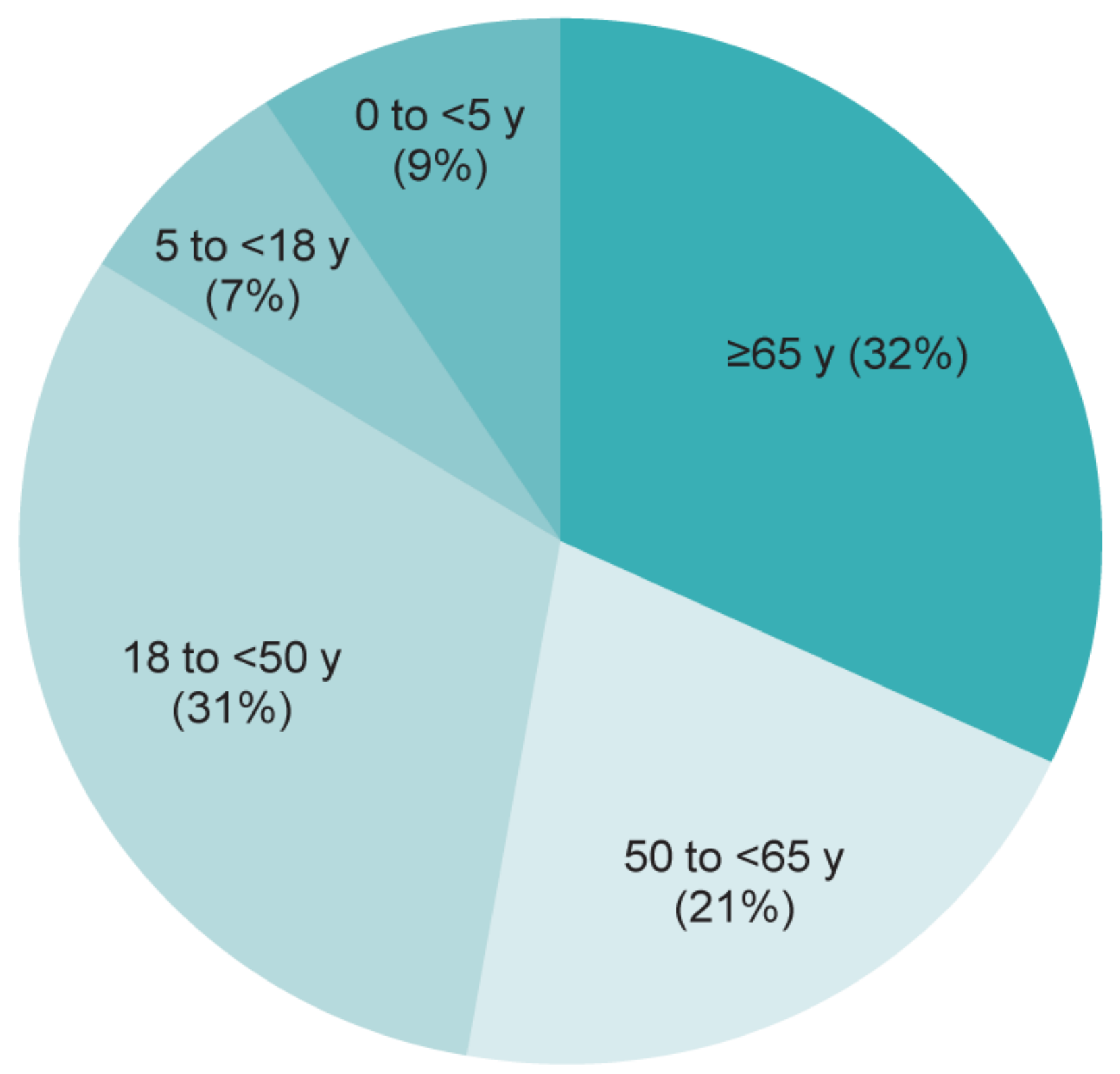
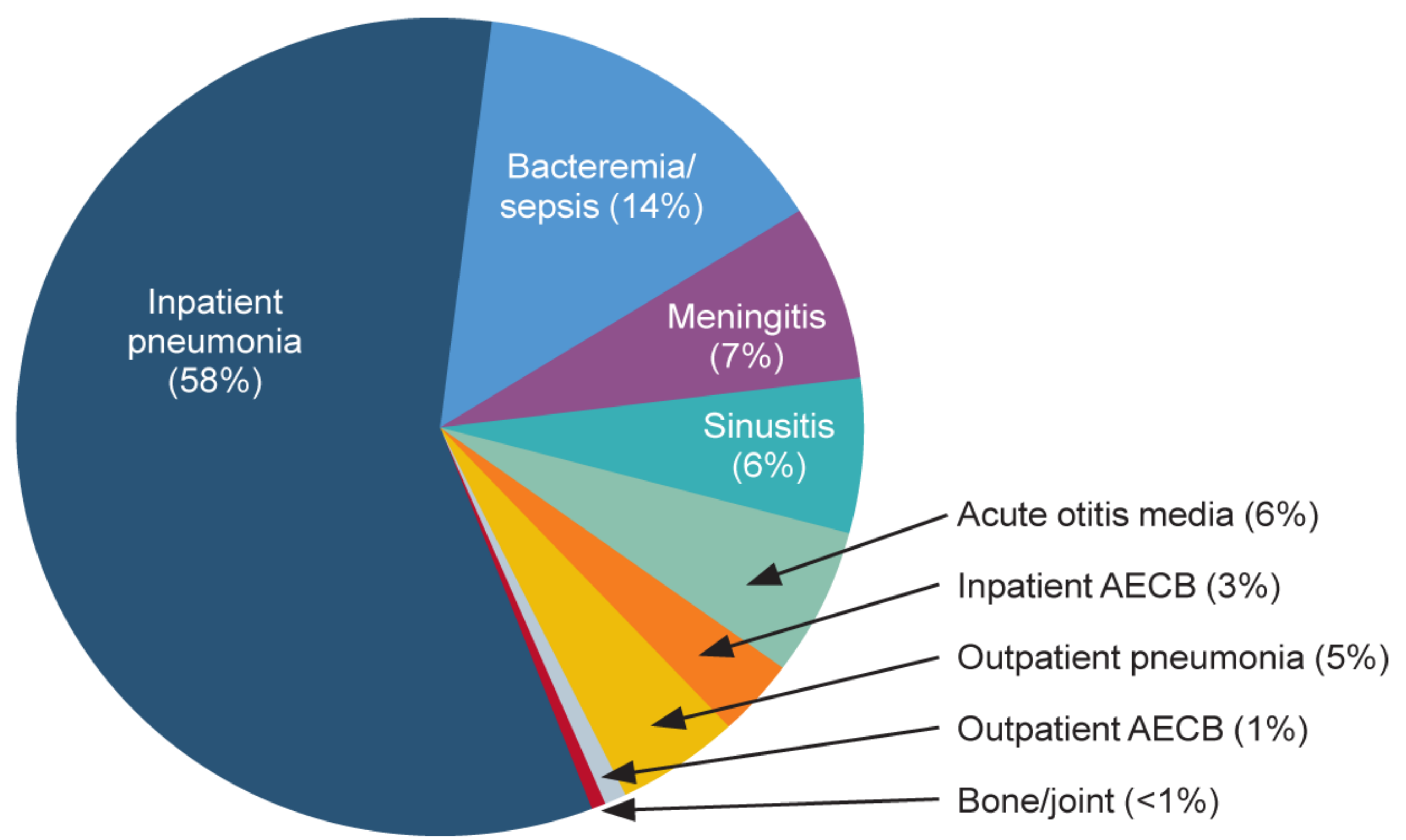
Estimated Human and Economic Burden of Four Major Adult Vaccine-Preventable Diseases in the United States, 2013
J Prim Prev, 2015

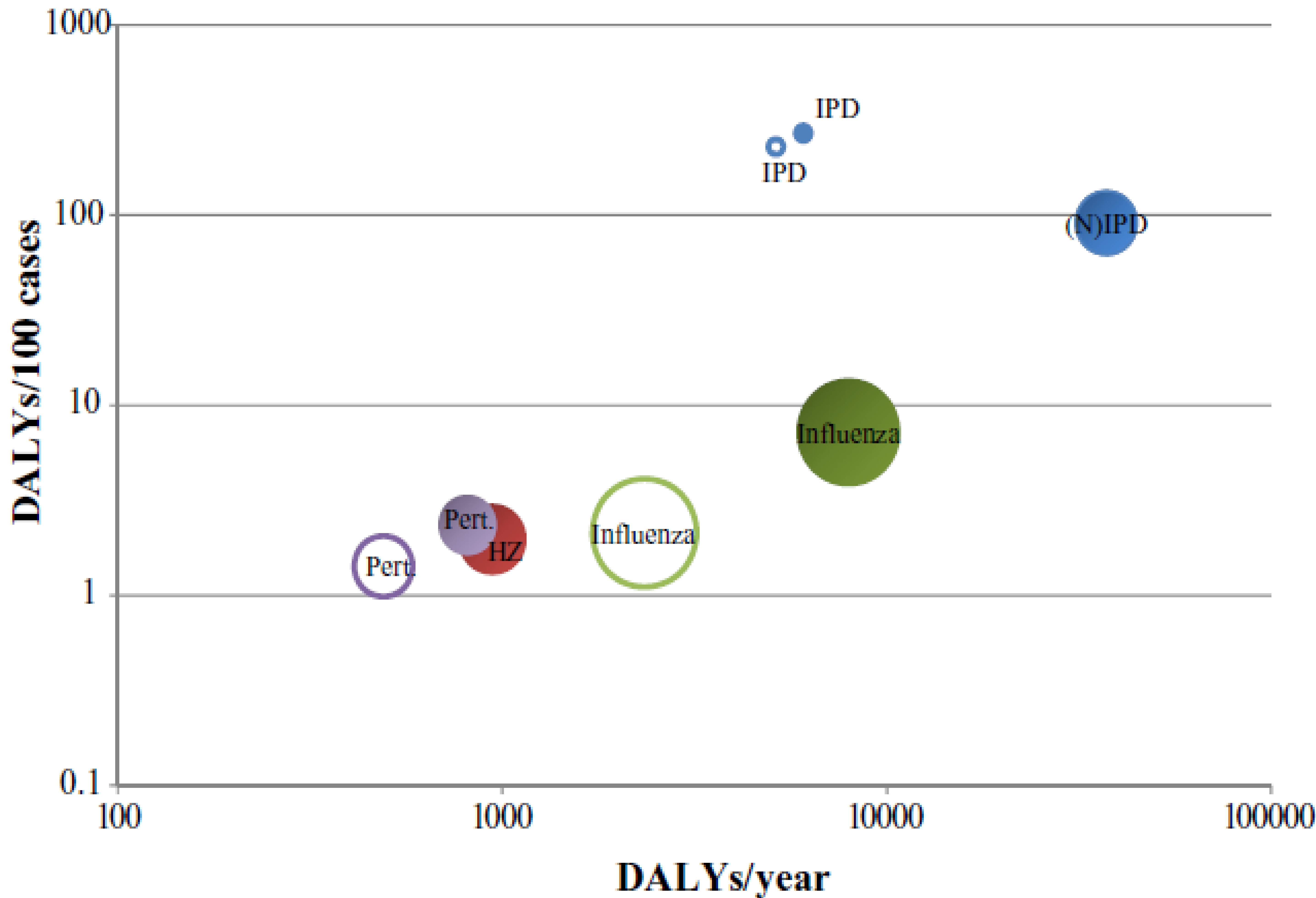


Costs Without Productivity and Work Loss: \$3.7 Billion



Costs With Productivity and Work Loss: \$7.7 Billion

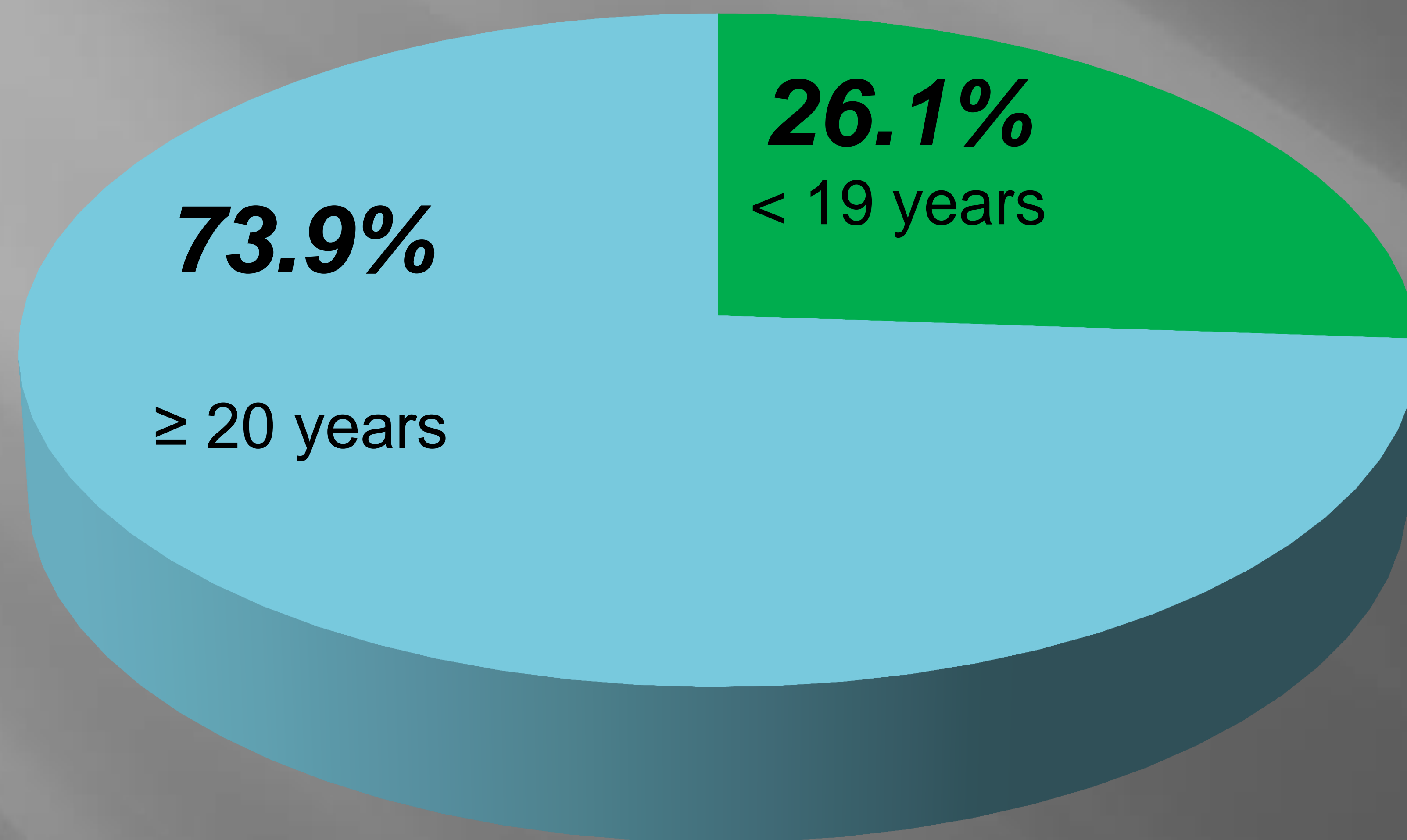




Ranking of the four VPD diseases in older adults by estimated burden at population level and individual level in the period 2010–2013, Netherlands. *Vaccine*, 2016

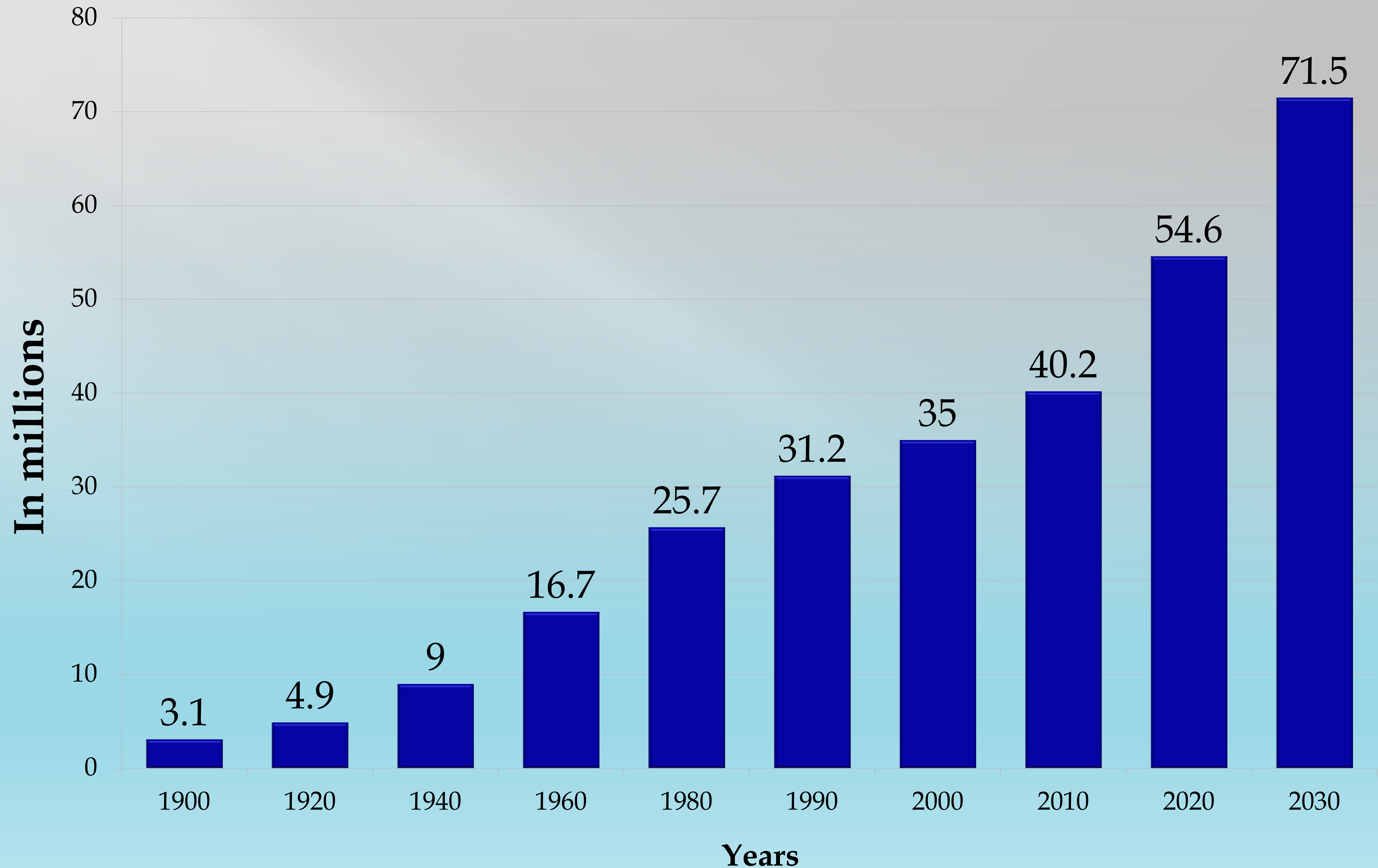


VPD Mortality by Age, Canada, 2010–2012



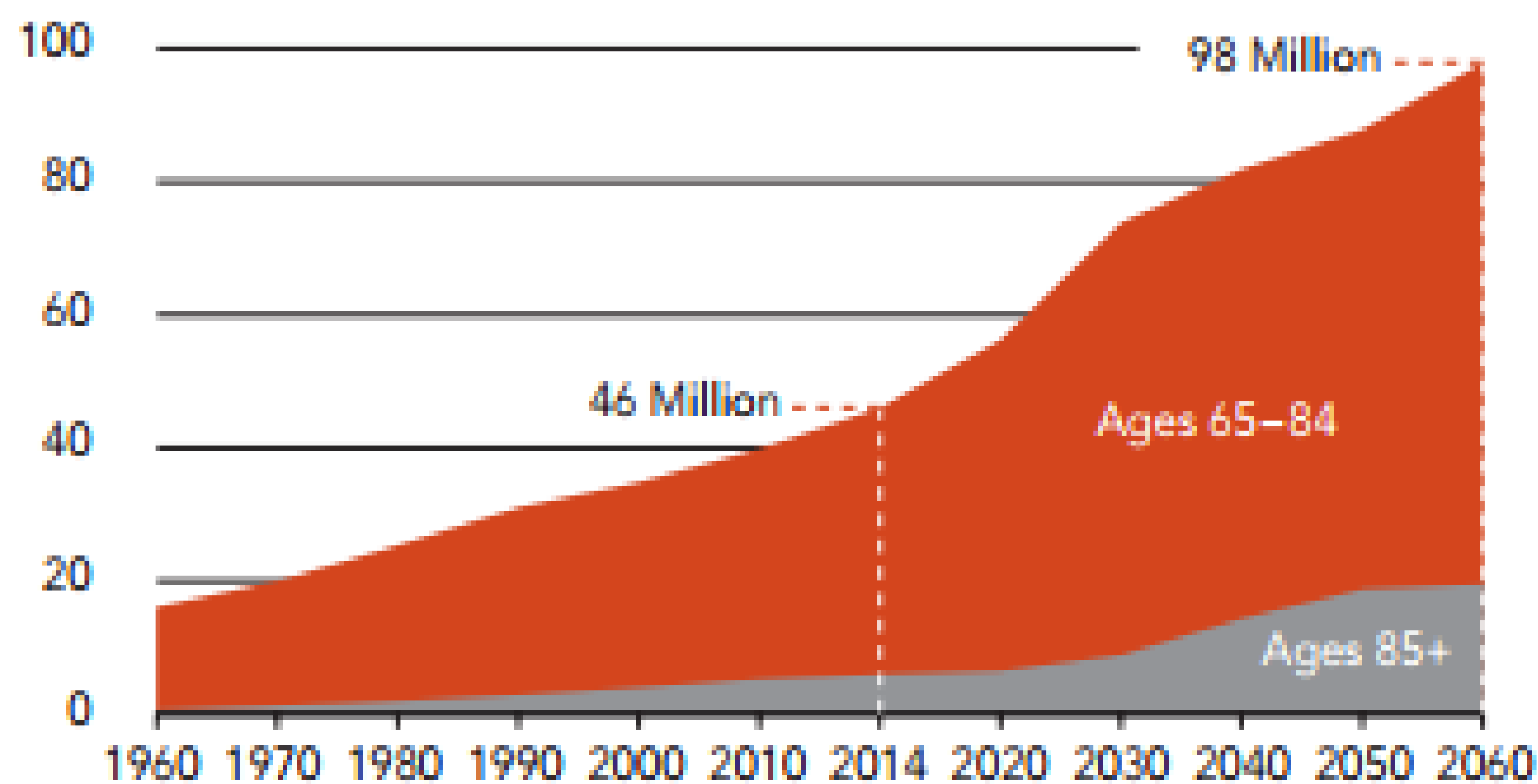
- Largest proportion of deaths across all ages include IPD (58.2%), HI (16.3%) and IMD (15.3%)
- Adults ≥ 60 years 2.6 times more likely to die from VPDs compared to adults 20-59 years old

Projected Number of Persons ≥ 65 Years of Age in the US, 1900-2030



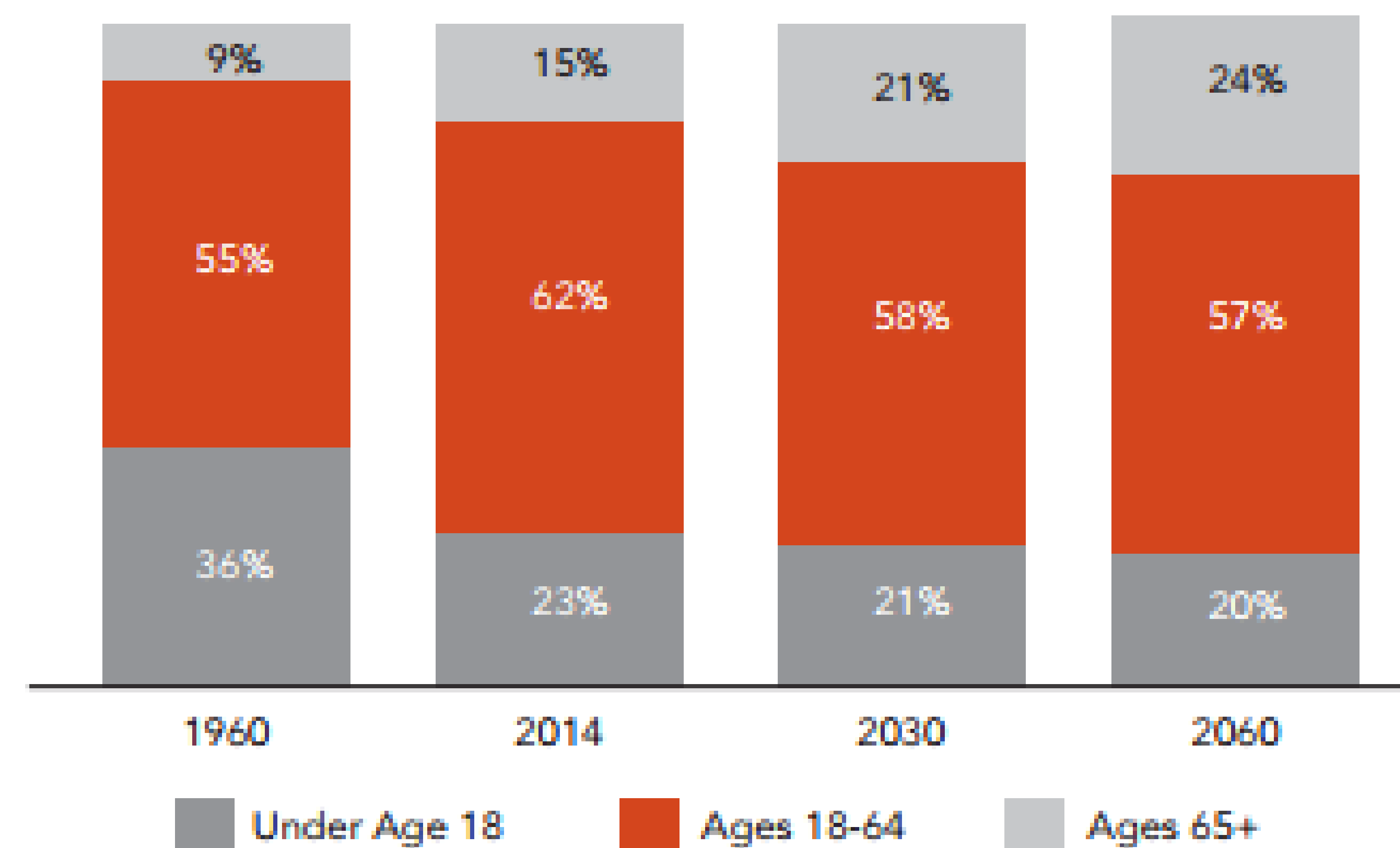
The Number of Americans Ages 65 and Older Will More Than Double by 2060.

U.S. Population Ages 65 and Older, 1960 to 2060 (Millions)



By 2060, Nearly One-Quarter of Americans Will Be Ages 65 and Older.

Percent of U.S. Population in Selected Age Groups, 1960 to 2060



Projected Number of Persons \geq 65 Years of Age, Missouri, 2000-2030



Cost-Effectiveness of 4 Pillars Practice Transformation Program to Improve Vaccination of Adults ≥ 65 years

J Am Geriatr Soc, 2017

Strategy	Cost	Incremental Cost	Effectiveness (QALYs Lost)	Incremental Effectiveness (QALYs)	Incremental Cost Effective Ratio, \$
No Program	2,083.53	-	-0.1016	-	-
Program	2,107.45	23.93	-0.0985	0.0031	7,635

*QALY= quality-adjusted life year



Surveillance of Vaccination Coverage Among Adult Populations — United States, 2015

MMWR, May 2017

- ▣ Prevalence of illness attributable to VPDs is greater among adults than among children
- ▣ Prevalence of VPDs among older persons is especially high
- ▣ Racial/ethnic disparities persisted for routinely recommended adult vaccines
- ▣ National Health Interview Survey (**NHIS**) is a continuous, cross-sectional national household survey of the noninstitutionalized U.S. civilian population
- ▣ In-person interviews are conducted throughout the year in a probability sample of households, and NHIS data are compiled and released annually



Surveillance of Vaccination Coverage Among Adult Populations — United States, 2015

MMWR, May 2017

- ▣ Adult vaccination coverage remains low for most routinely recommended vaccines and below *Healthy People 2020* targets
- ▣ Modest gains occurred in vaccination coverage for **influenza** (adults aged ≥ 19 years), **pneumococcal** (adults aged 19–64 years with increased risk), **Tdap**, **herpes zoster** (adults aged ≥ 60 years and ≥ 65 years), and **hepatitis B** (HCP aged ≥ 19 years)
- ▣ The 30% *Healthy People 2020* target for herpes zoster vaccination was met
- ▣ Although having health insurance and a usual place for health care were associated with higher vaccination coverage, these factors alone were not associated with optimal adult vaccination coverage

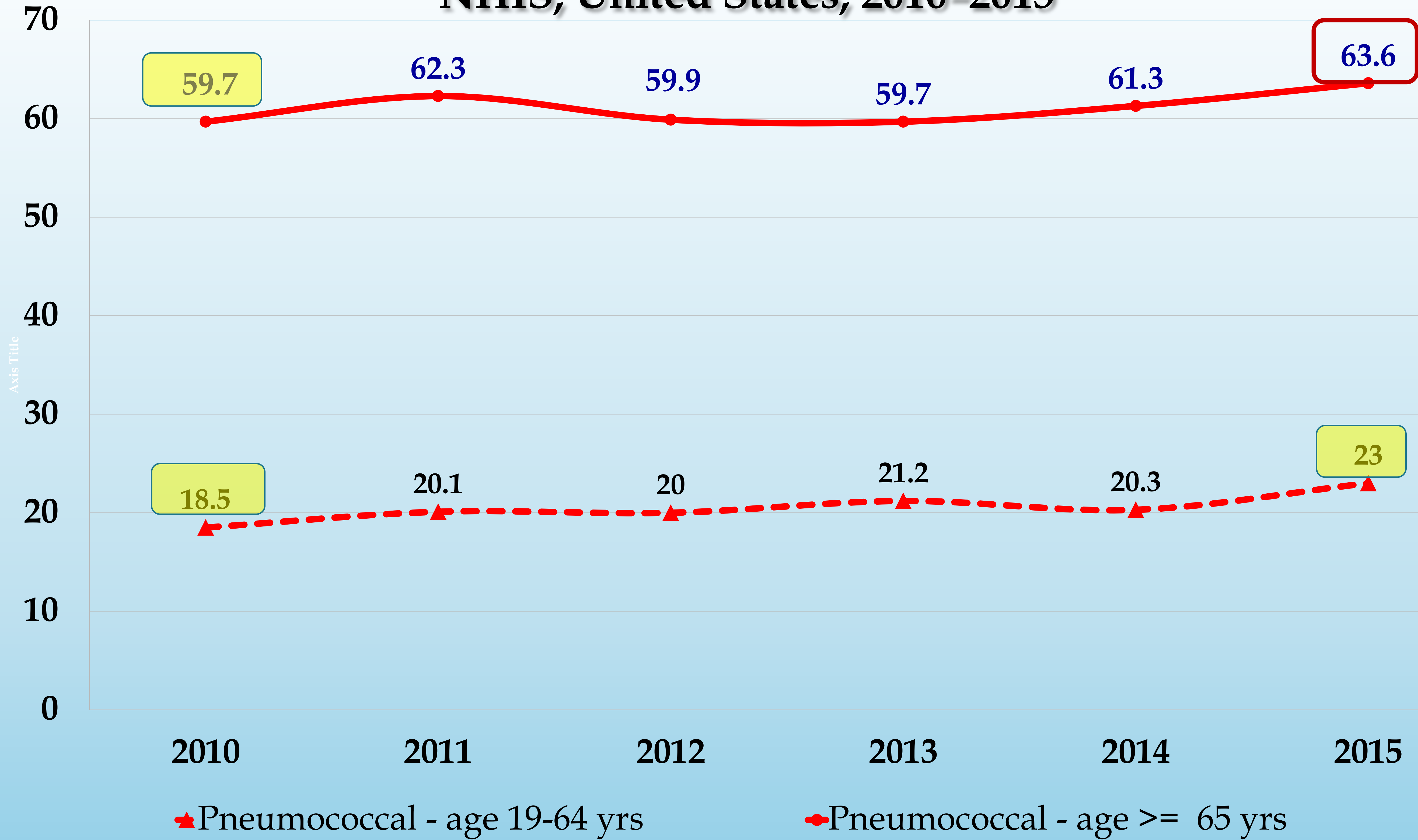


Healthy People 2020 Goals

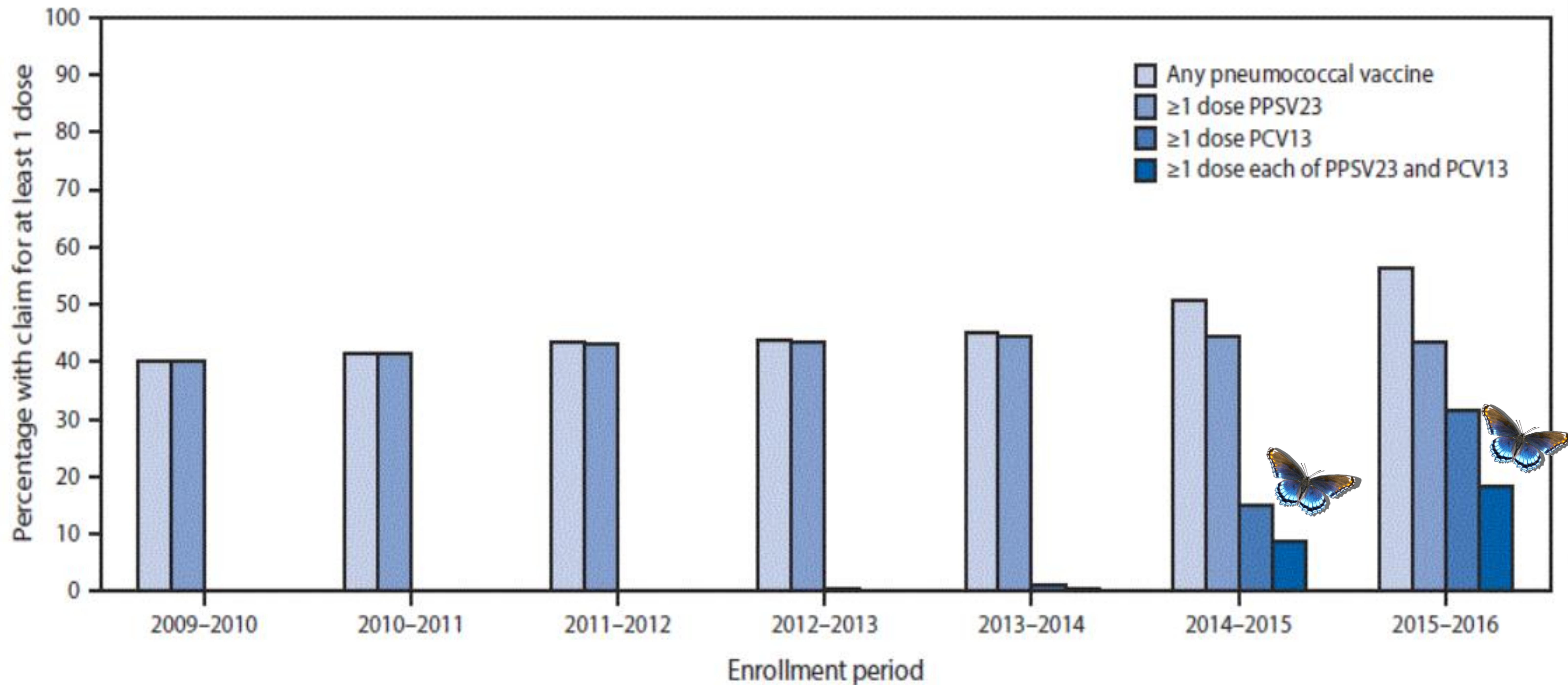
Vaccine and Target Group	Healthy People 2020 Goals
INFLUENZA VACCINE	
Noninstitutionalized Adults 18 to 64 years old	80%
Noninstitutionalized High Risk Adults 18 to 64 years old	90%
Noninstitutionalized Adults 65 years and older	90%
Institutionalized Adults 18 years and older	90%
Healthcare Personnel	90%
Pregnant women	80%
PNEUMOCOCCAL VACCINE	
Adults 65 years and older	90%
High Risk Adults under 65 years	60%
Institutionalized Adults	90%
ZOSTER VACCINE	
Adults 60 years and older	30%
HEPATITIS B VACCINE	
Healthcare Personnel	90%



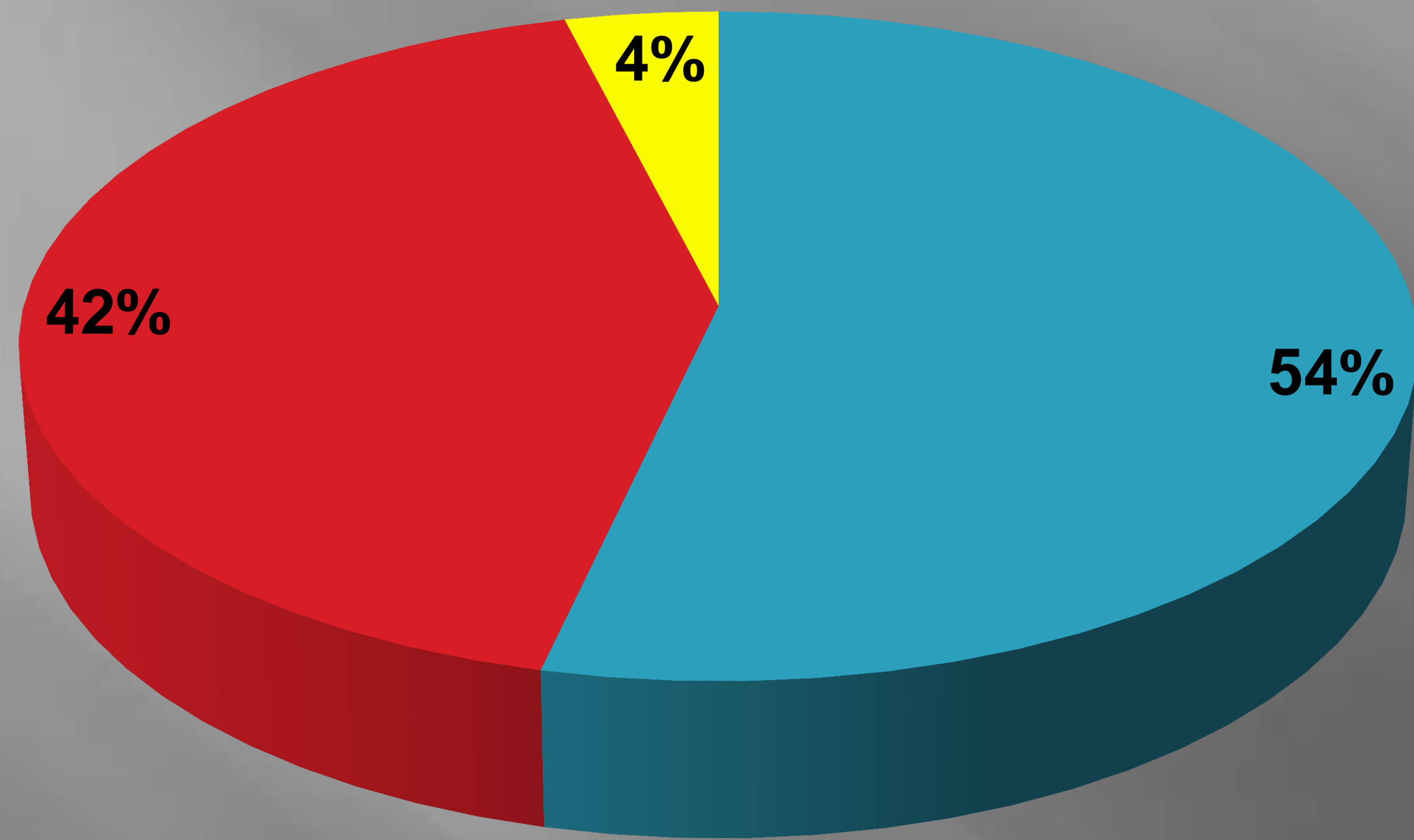
Estimated proportion of adults aged ≥ 19 years who received pneumococcal vaccines, by age and increased risk status – NHIS, United States, 2010–2015



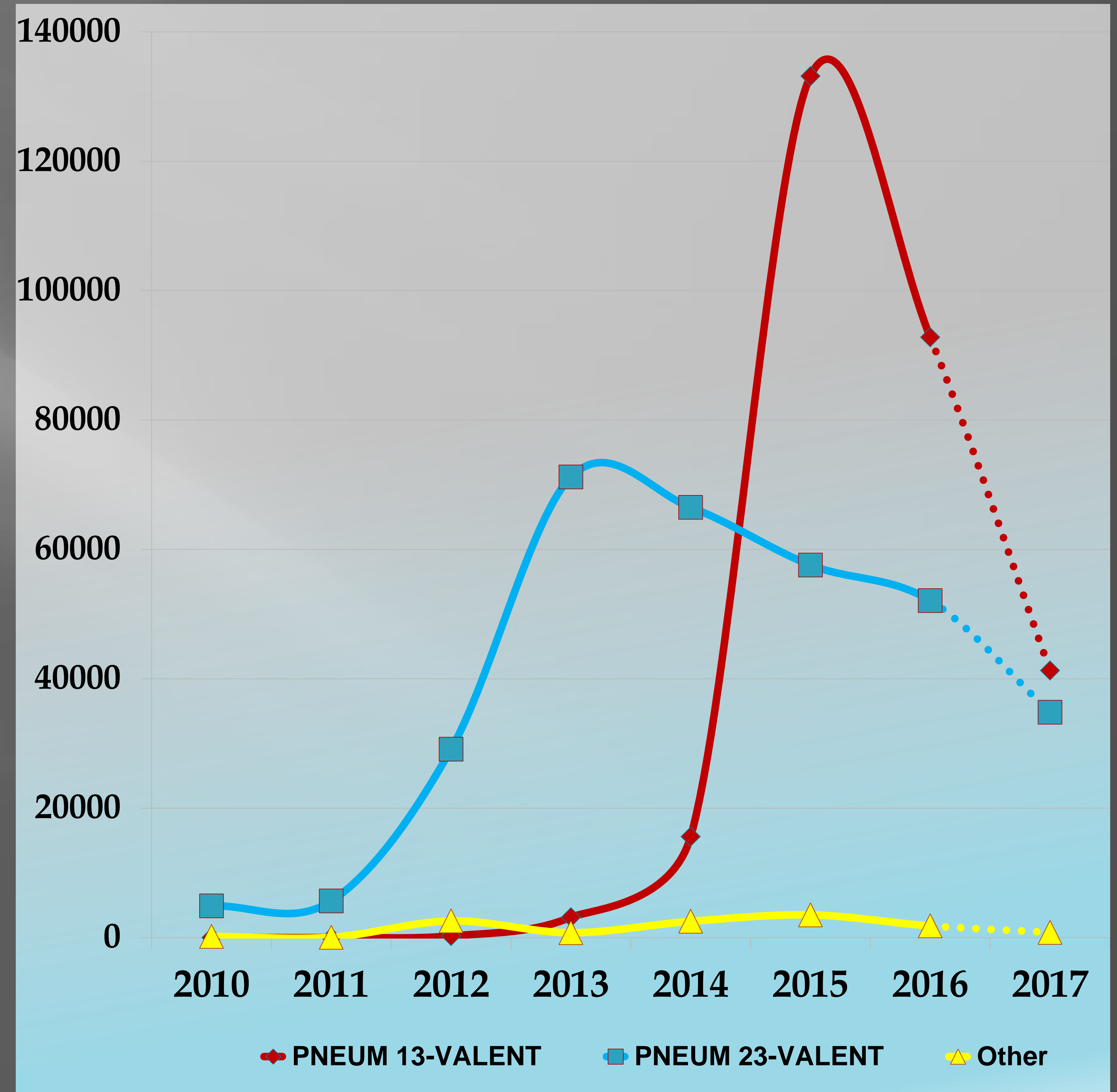
Percentage of Medicare beneficiaries aged ≥ 65 years with claims submitted for pneumococcal vaccination, USA, 2009–2016



Type of Pneumococcal Vaccine, *ShowMeVax*, Missouri, 2017



- PNEUM 23-VALENT
- PNEUM 13-VALENT
- Other

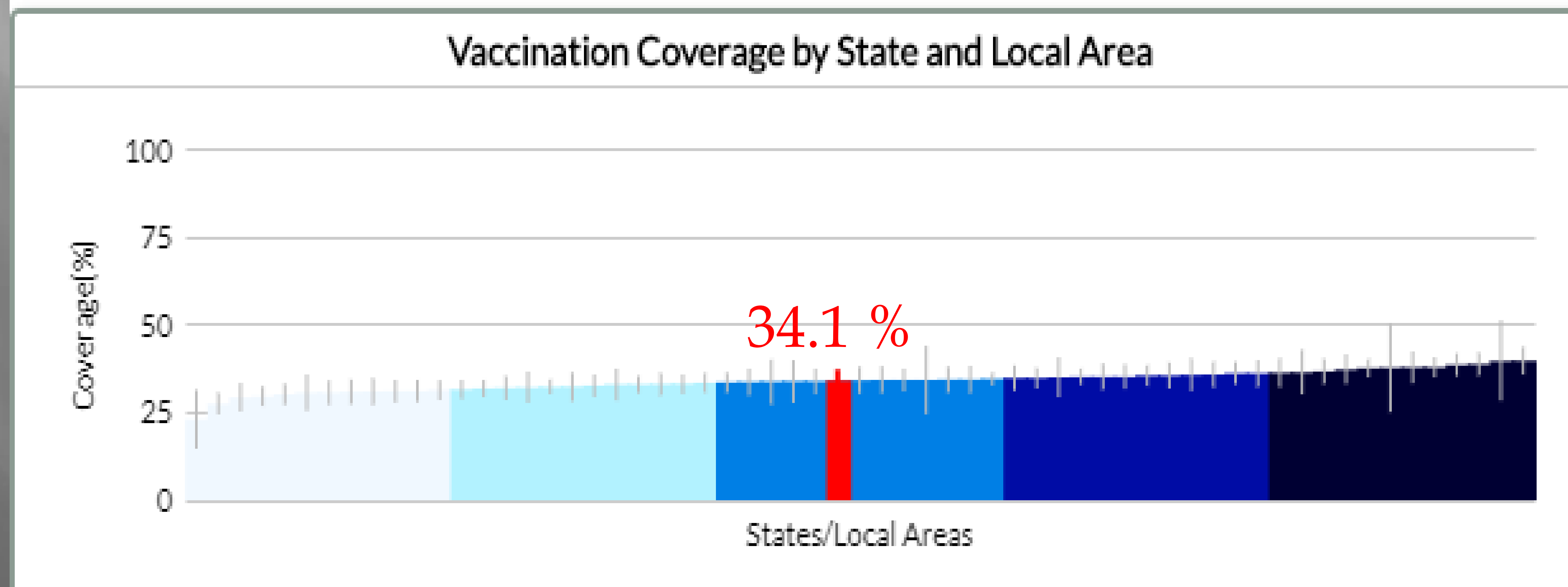
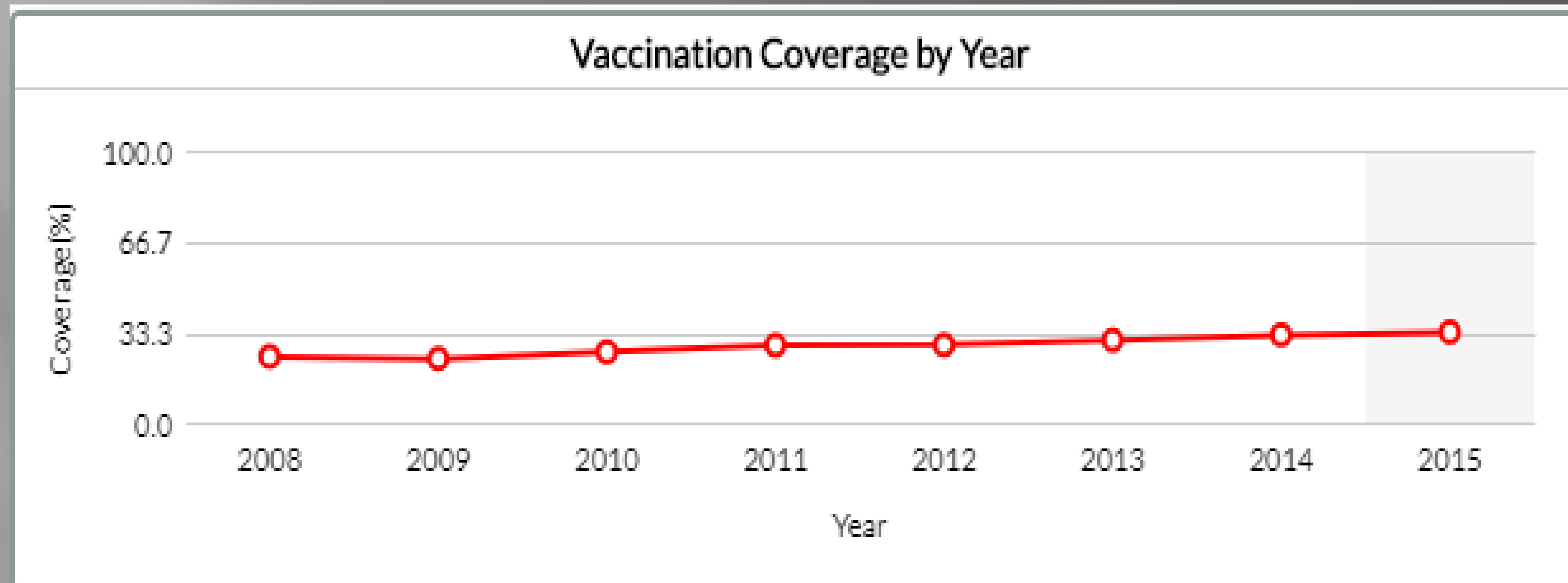


Pneumococcal vaccination coverage among adults 18–64 years at increased risk and ≥65 years, Missouri, BRFSS, 2015

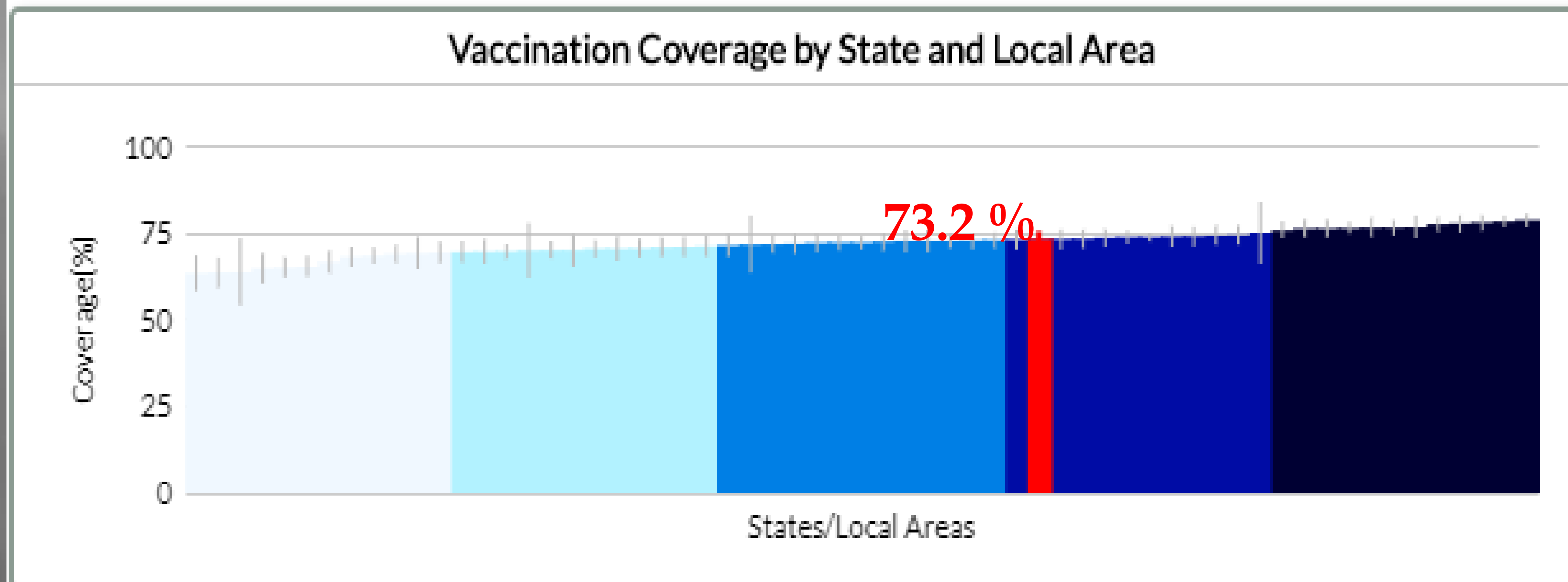
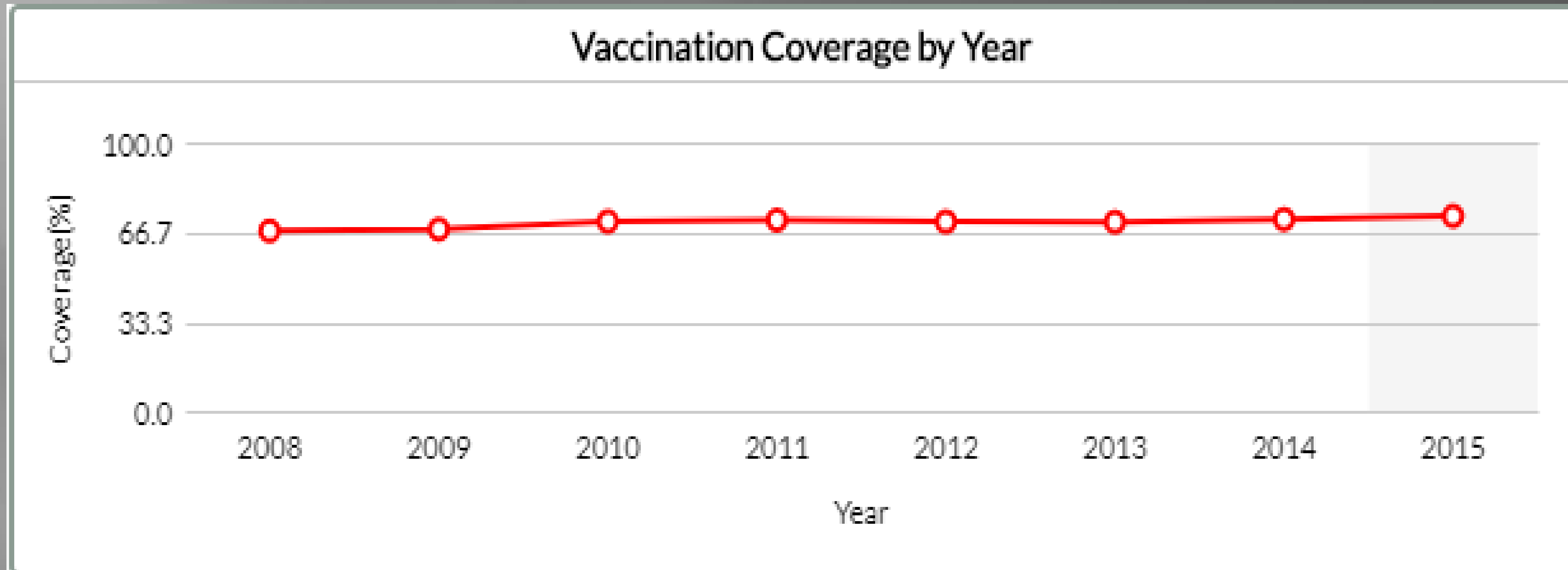
Vaccinations/Groups	State/Region/U.S.	n	%	CI	Progress Toward Healthy People 2020 (red line)
▼ Pneumococcal Vaccination					
▼ Age					
18-64 years at increased risk	Missouri	1,654	34.1	±3.2	0 100
≥65 years	Missouri	2,503	73.2	±2.3	0 100
▼ Race/ethnicity					
18-64 yrs at increased risk, white only, non-Hispanic	Missouri	1,313	33.1	±3.5	0 100
18-64 yrs at increased risk, black only, non-Hispanic	Missouri	188	36.0	±9.2	0 100
18-64 yrs at increased risk, Hispanic	Missouri	37	NR	NR	0 100
18-64 yrs at increased risk, other or multiple races	Missouri	95	44.0	±13.5	0 100
≥65 yrs, white only, non-Hispanic	Missouri	2,220	74.2	±2.4	0 100
≥65 yrs, black only, non-Hispanic	Missouri	167	65.2	±10.2	0 100
≥65 yrs, Hispanic	Missouri	14	NR	NR	0 100
≥65 yrs, other or multiple races, non-Hispanic	Missouri	78	49.1	±15.3	0 100



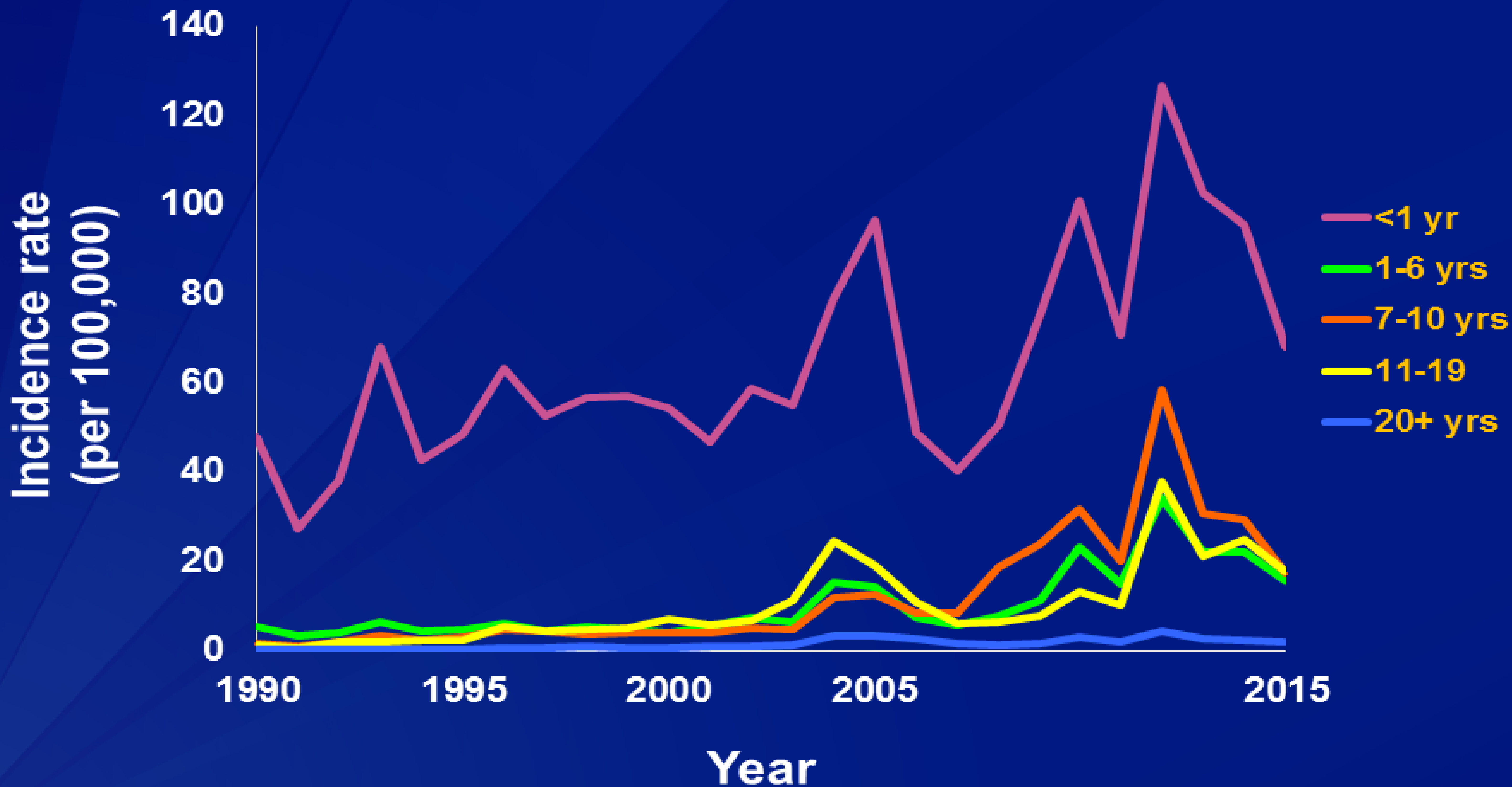
Pneumococcal vaccination coverage among adults 18–64 years at increased risk, BRFSS, Missouri, 2015



Pneumococcal Vaccination Coverage Trend, Adults ≥ 65 years, BRFSS, Missouri, 2015

















Reported pertussis incidence by age group: 1990-2015



Number of usual secondary transmissions

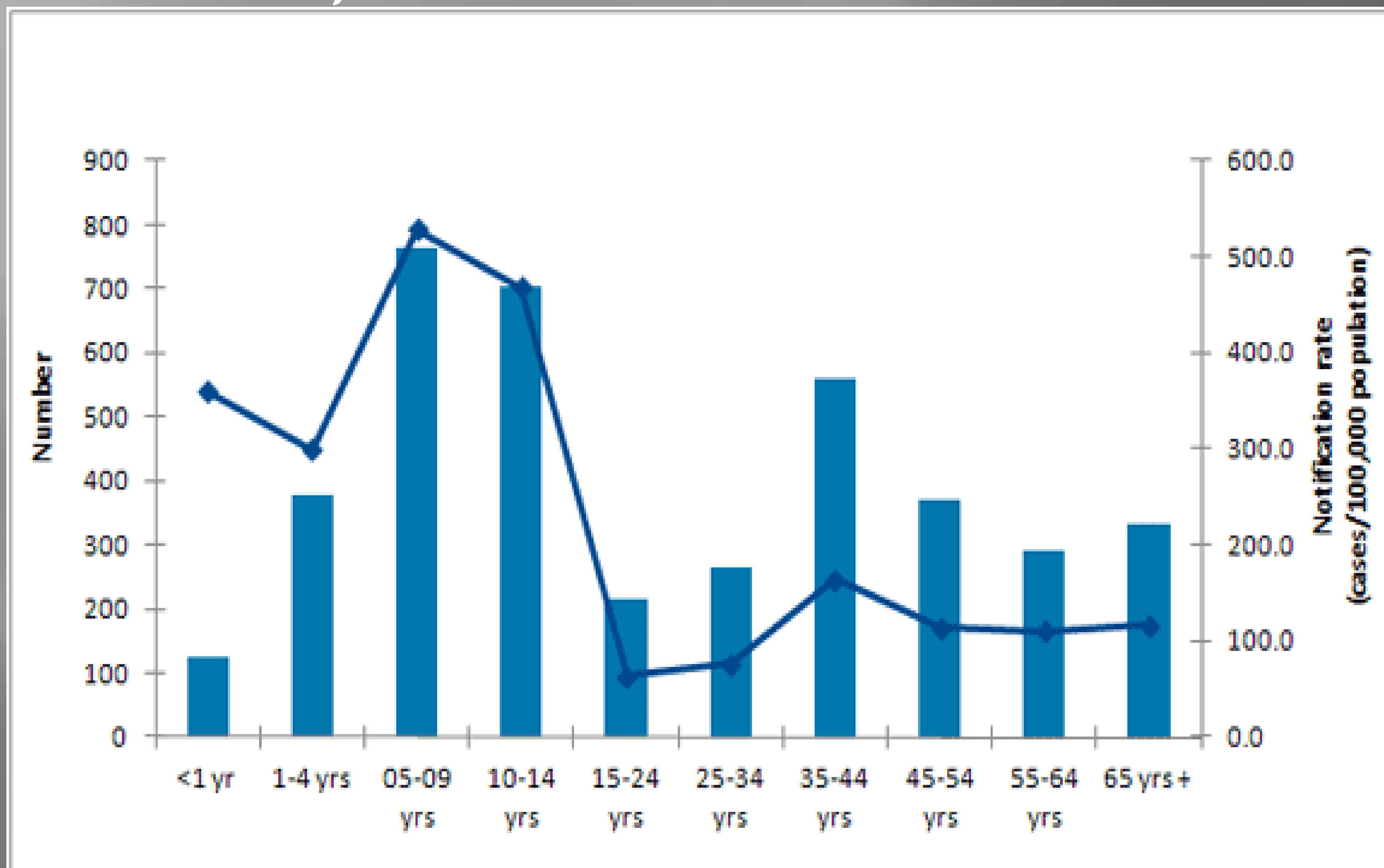
ONE CASE OF =

LEADS TO HOW MANY OTHER CASES

Measles			12 to 18
Pertussis			12 to 17
Diphtheria			6 to 7
Rubella			6 to 7
Polio			5 to 7
Smallpox			5 to 7
Mumps			4 to 7

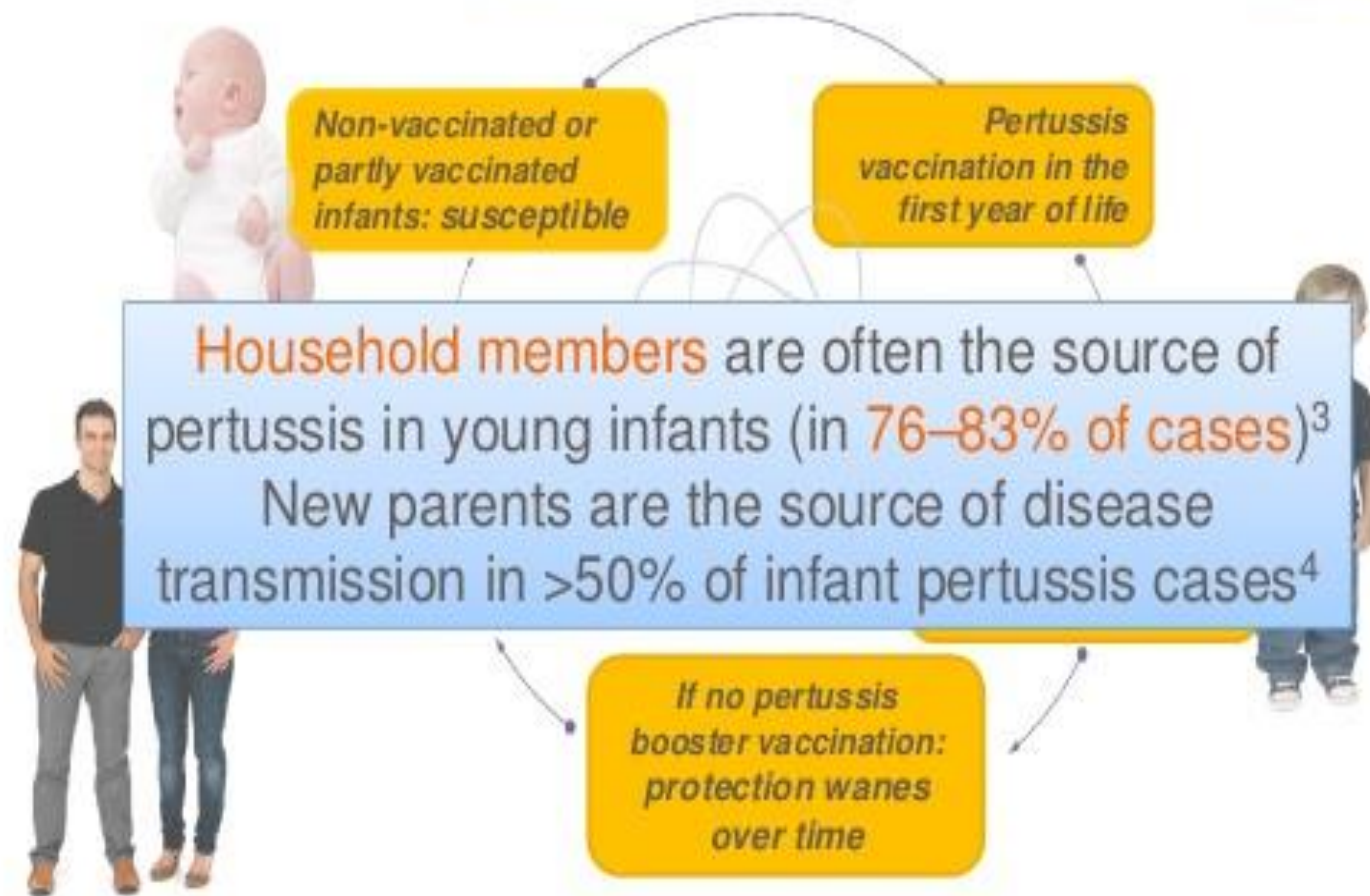
Pertussis

Pertussis Epidemic in Western Australia, 2011-2012



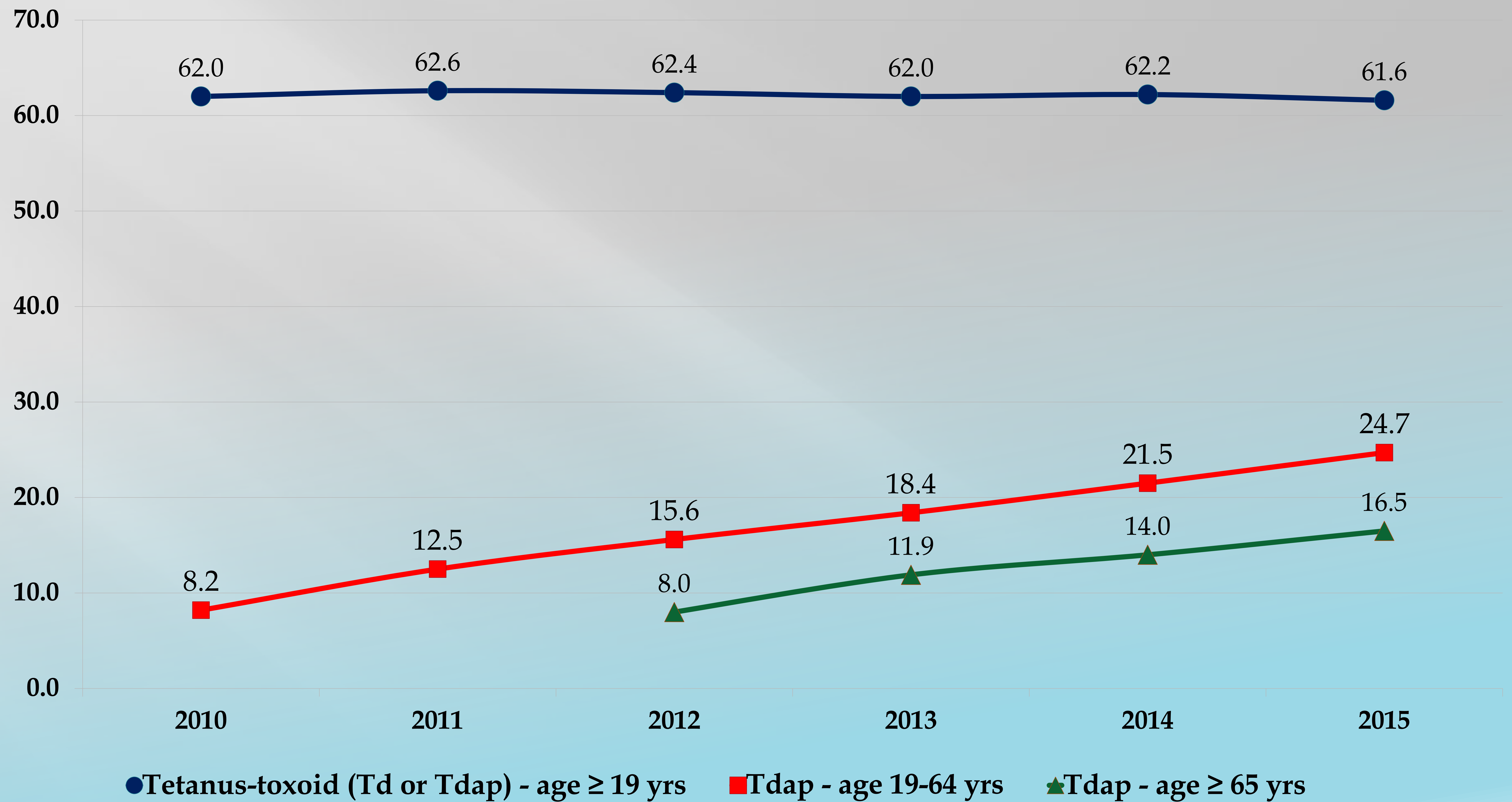
- In USA, of \approx 33,000 cases in 2014 and 21,000 cases in 2015, 22.4% of cases were those age \geq 20 years

Transmission cycle of pertussis between adults and infants^{1,2}



1. Wirsing von König CH, et al. *Lancet* 2002; 360: 744–50. 2. Finger et al. In: Barron S, ed. *Barron's Medical Microbiology* 1996; 3. Wendelboe et al. *Pediatr Infect Dis J* 2007; 26: 293–9; 4. Gerbie, Tan. *Obstet Gynecol* 2009; 113: 399–401

Estimated proportion of adults ≥ 19 years who receive a Tetanus-containing vaccine (Td or Tdap) and those who received Tdap, by age - NHIS, USA

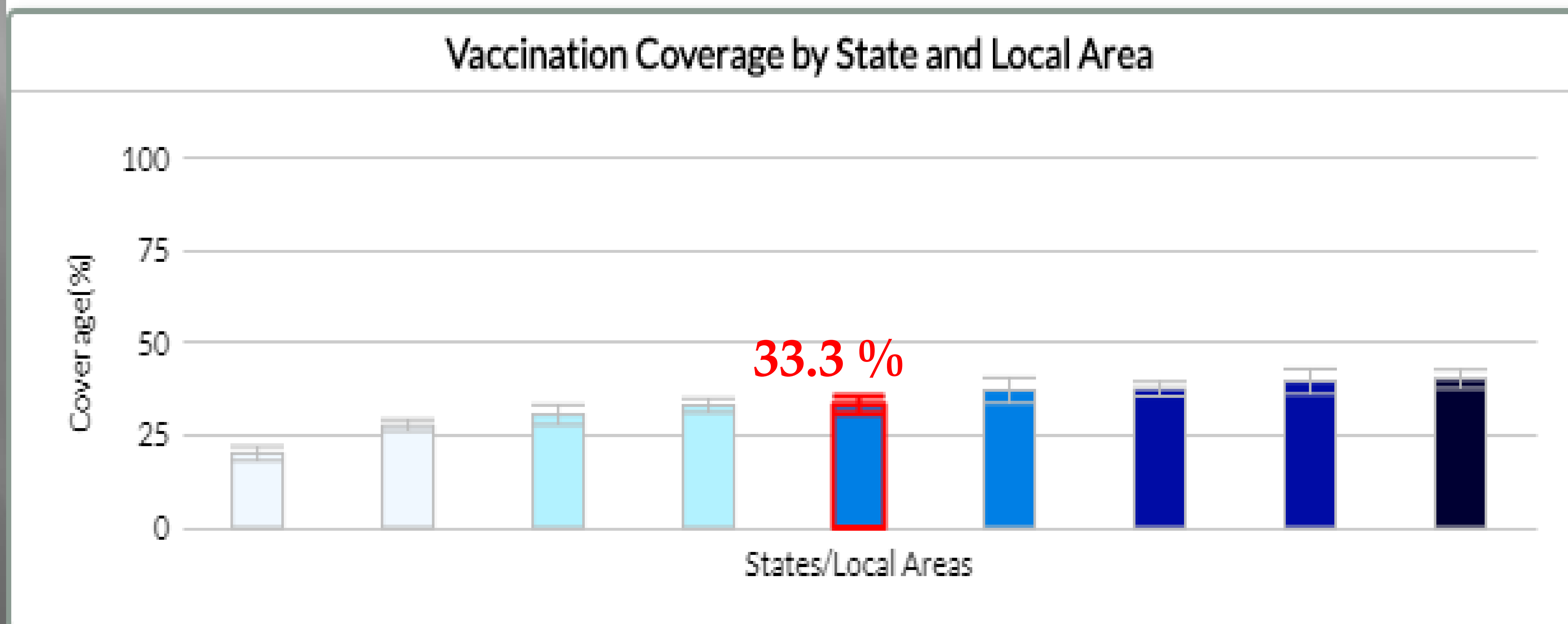
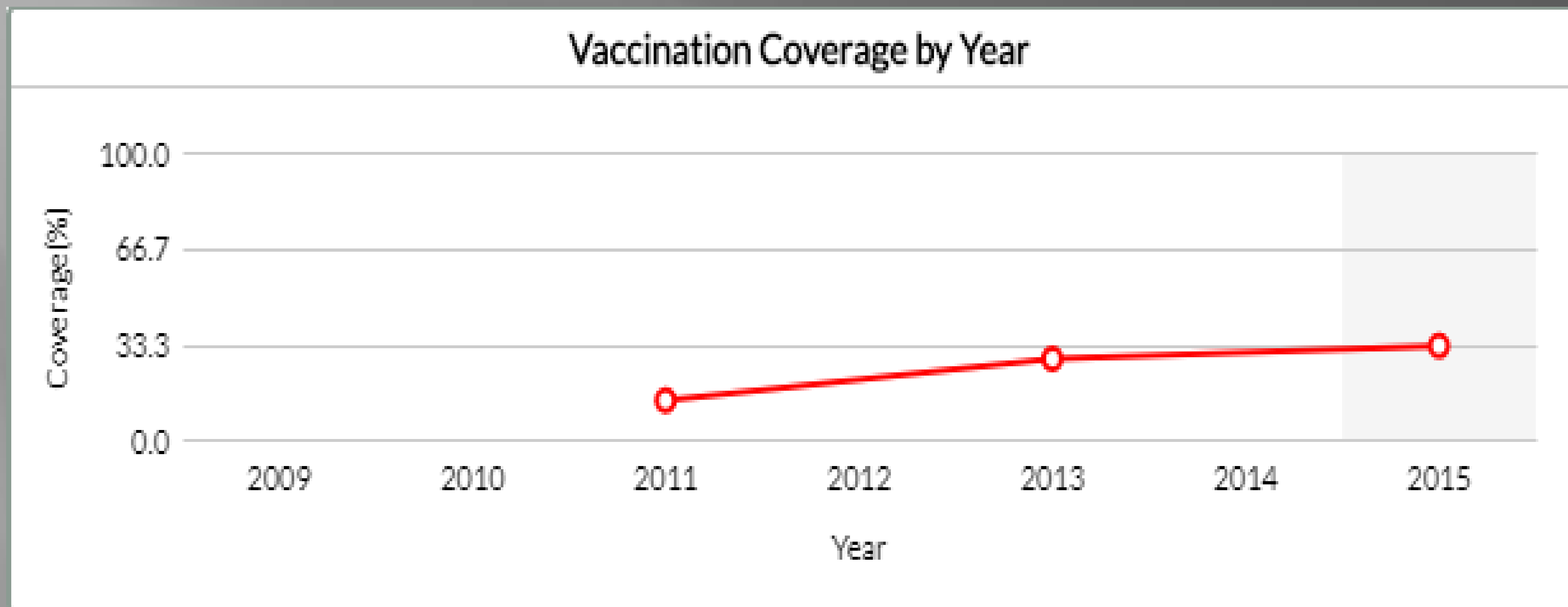


Tdap vaccination coverage among adults ≥ 18 years, Missouri, BRFSS, 2015

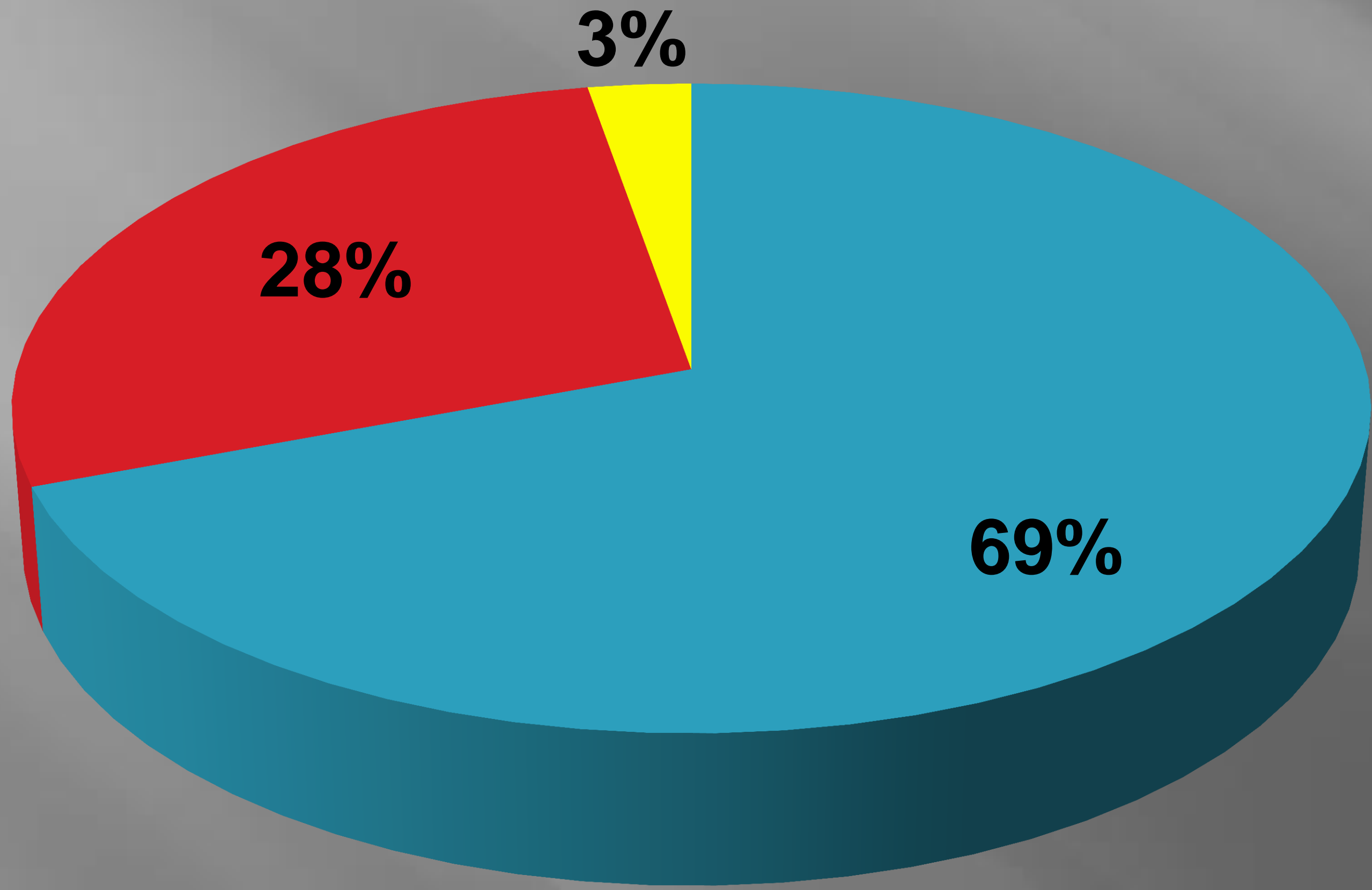
Vaccinations/Groups	State/Region/U.S.	n	%	CI	Progress Toward Healthy People 2020 (red line)
▼ Tdap Vaccination					
▼ Age					
≥ 18 years	Missouri	3,869	33.3	± 2.3	0 100
18-64 years	Missouri	2,257	38.5	± 2.9	0 100
≥ 65 years	Missouri	1,612	16.5	± 2.2	0 100
▼ Race/ethnicity					
≥ 18 years, white, non-Hispanic	Missouri	3,270	33.4	± 2.4	0 100
≥ 18 years, black, non-Hispanic	Missouri	360	30.0	± 7.2	0 100
≥ 18 years, Hispanic	Missouri	52	41.2	± 22.4	0 100
≥ 18 years, other or multiple races, non-Hispanic	Missouri	143	30.5	± 10.4	0 100



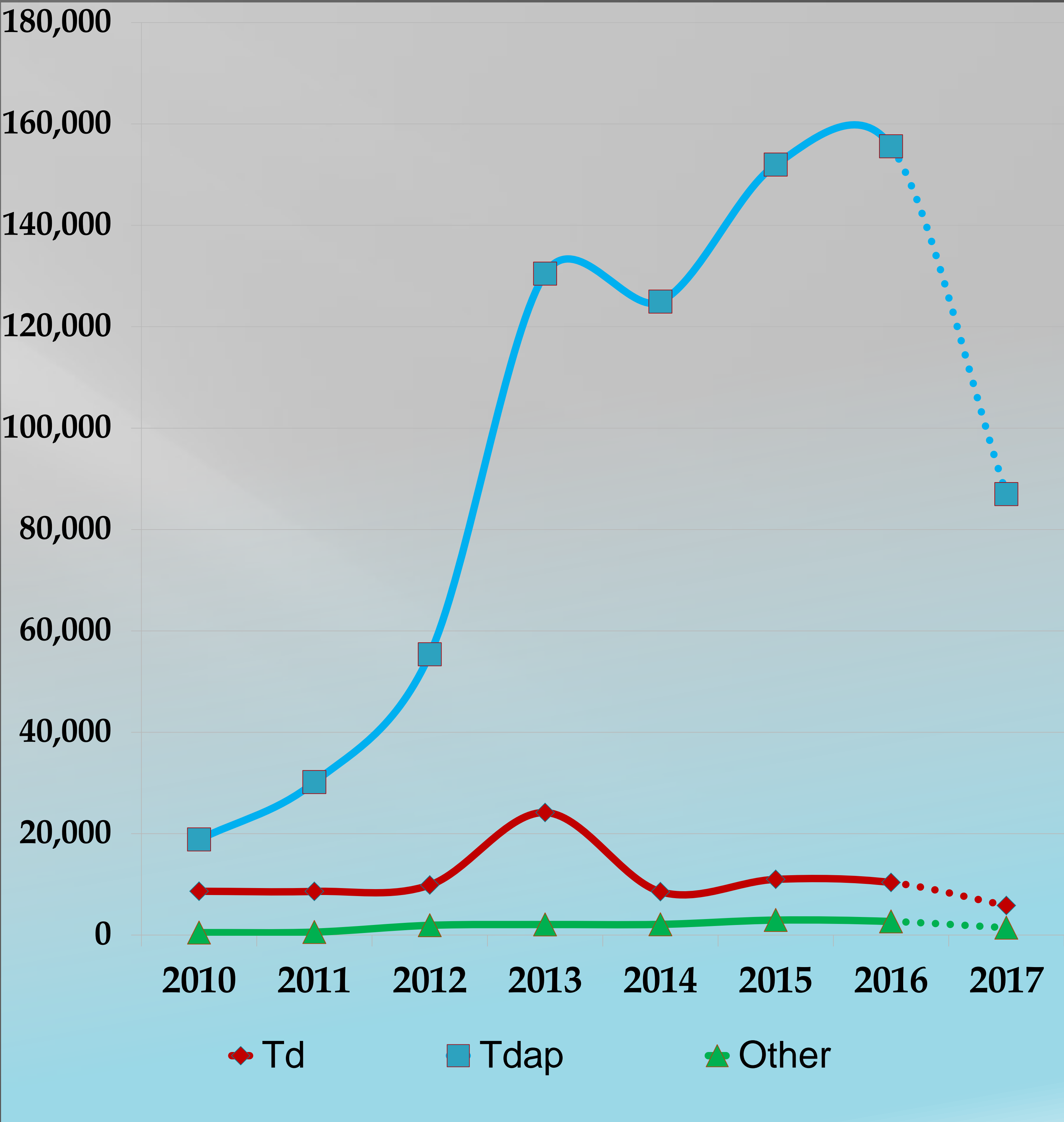
Tdap Vaccination Coverage Trend, Adults ≥ 18 years, BRFSS, 2015, Missouri



Type of Tetanus/Pertussis Vaccine, *ShowMeVax*, Missouri, 2017



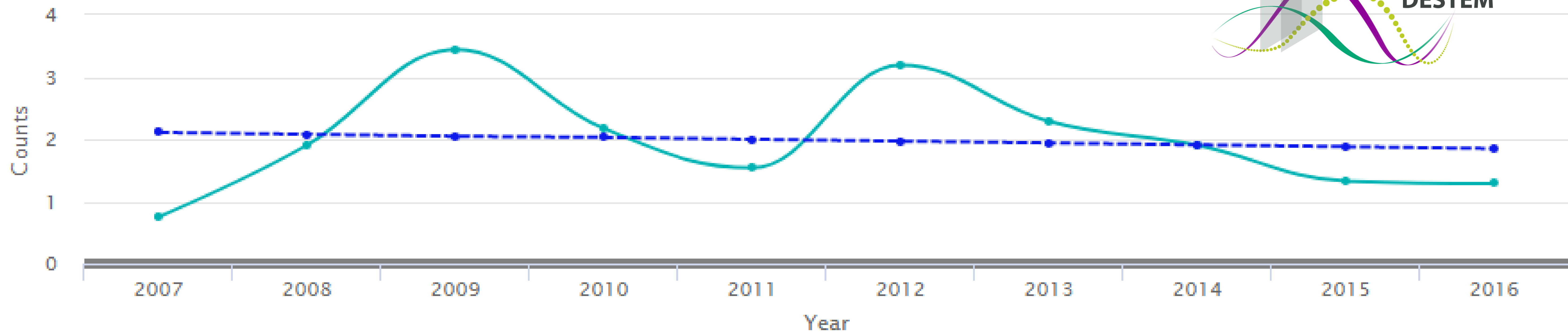
■ Tdap ■ Td ■ Other



◆ Td ■ Tdap ▲ Other



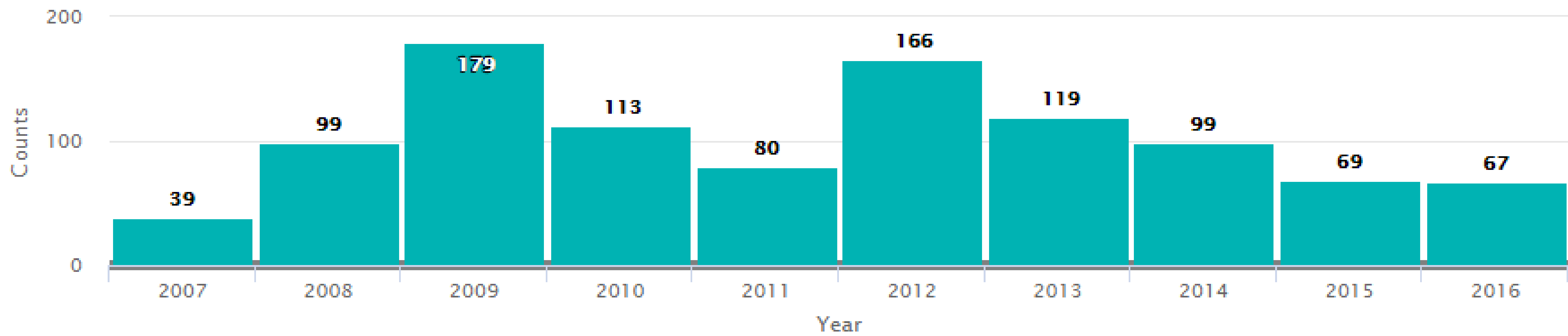
Pertussis Trend, ages 19 years and older



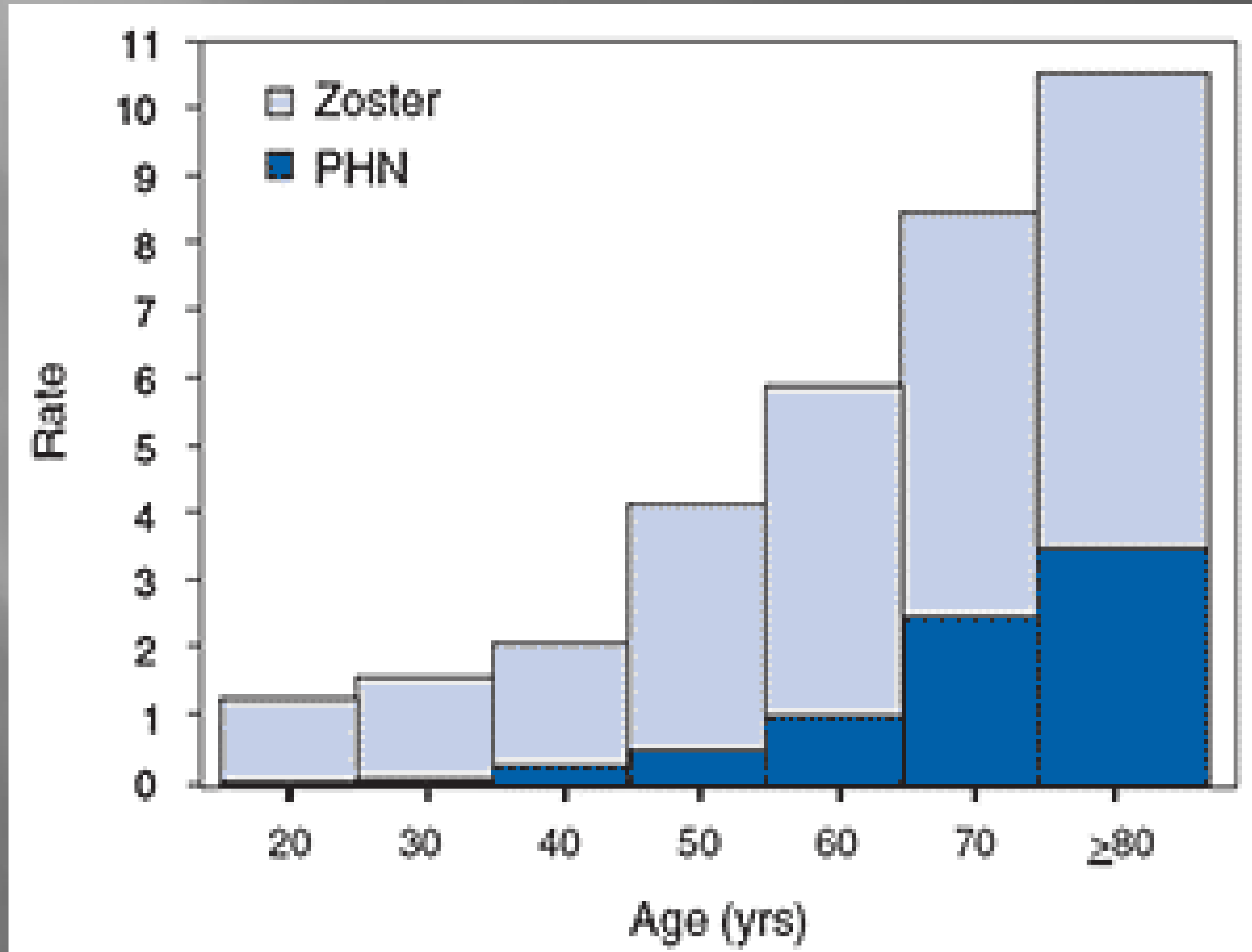
—●— Disease Counts - - -●- - - Insignificant Trend

Highcharts.com

Pertussis Cases, ages 19 years and older



Shingles and Postherpetic Neuralgia Rates per 1,000 person-years by Age, United States

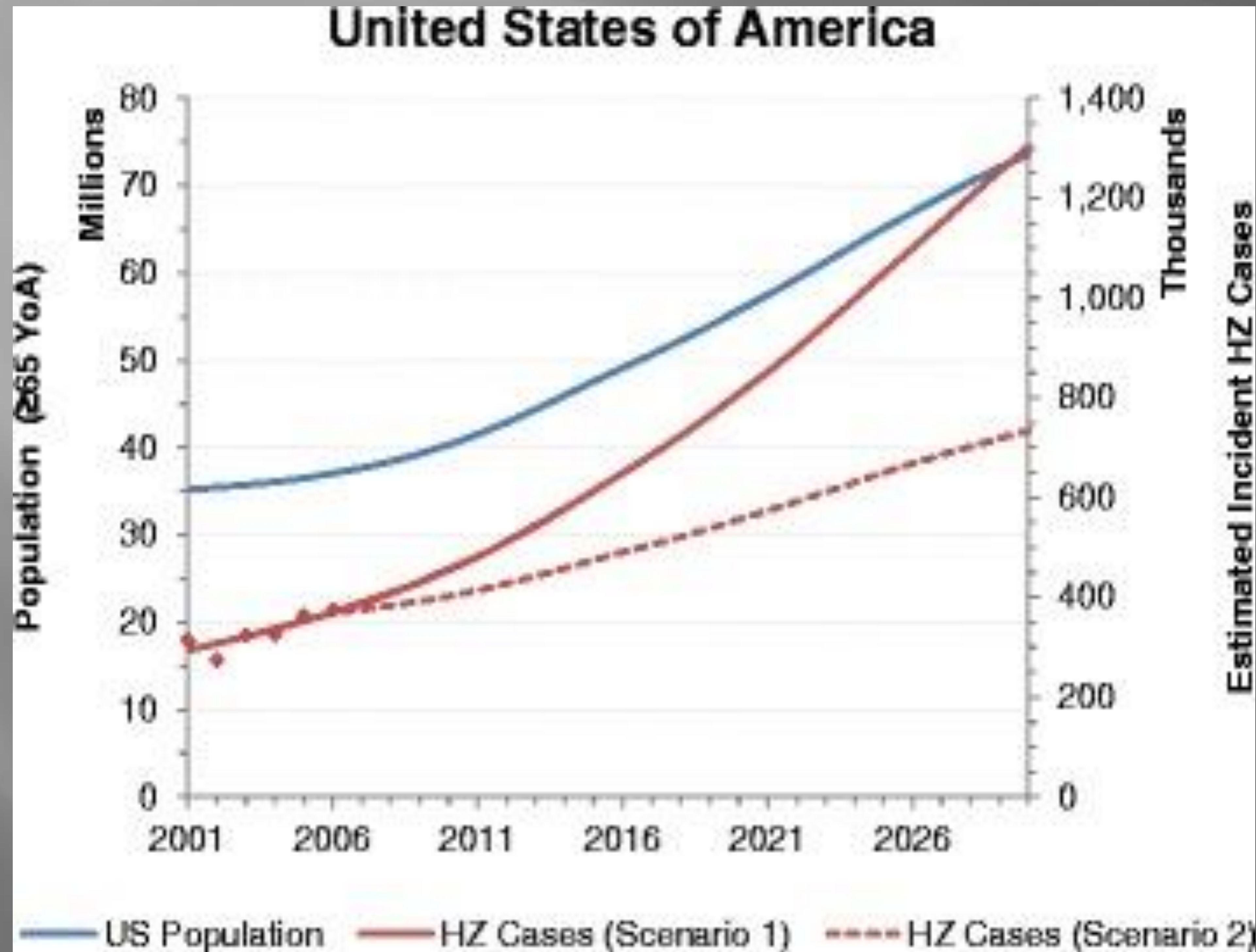


Annual incidence rates of herpes zoster among an immunocompetent population, USA

Johnson et al. BMC Infectious Diseases (2015)



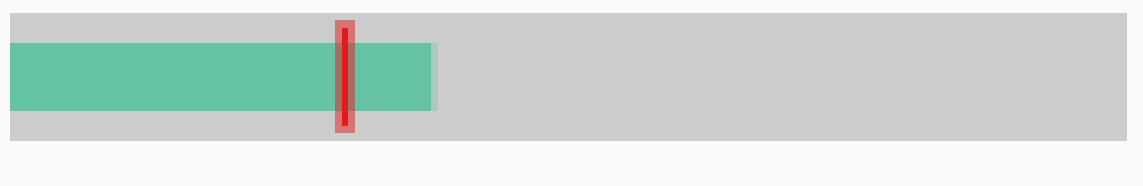
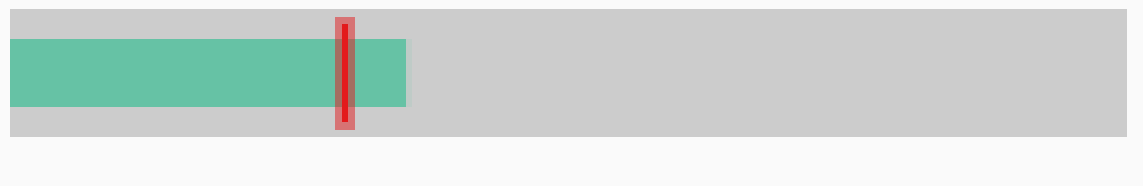



- ▣ Overall annual incidence across all ages = **4.47** per 1000 person-years
- ▣ Increase with age from 0.86 for ≤ 19 years old to 12.78 for ≥ 80 years old
- ▣ Women compared to men have higher incidence (5.25 vs. 3.66) across all age groups
- ▣ When adjusted for age and gender using 2010 US Census data, the annual IR was **4.63** per 1000 person-years

Estimates of Herpes Zoster Incident cases in aged ≥ 65 years, up to 2030, USA *BMC Geriatr, 2017*



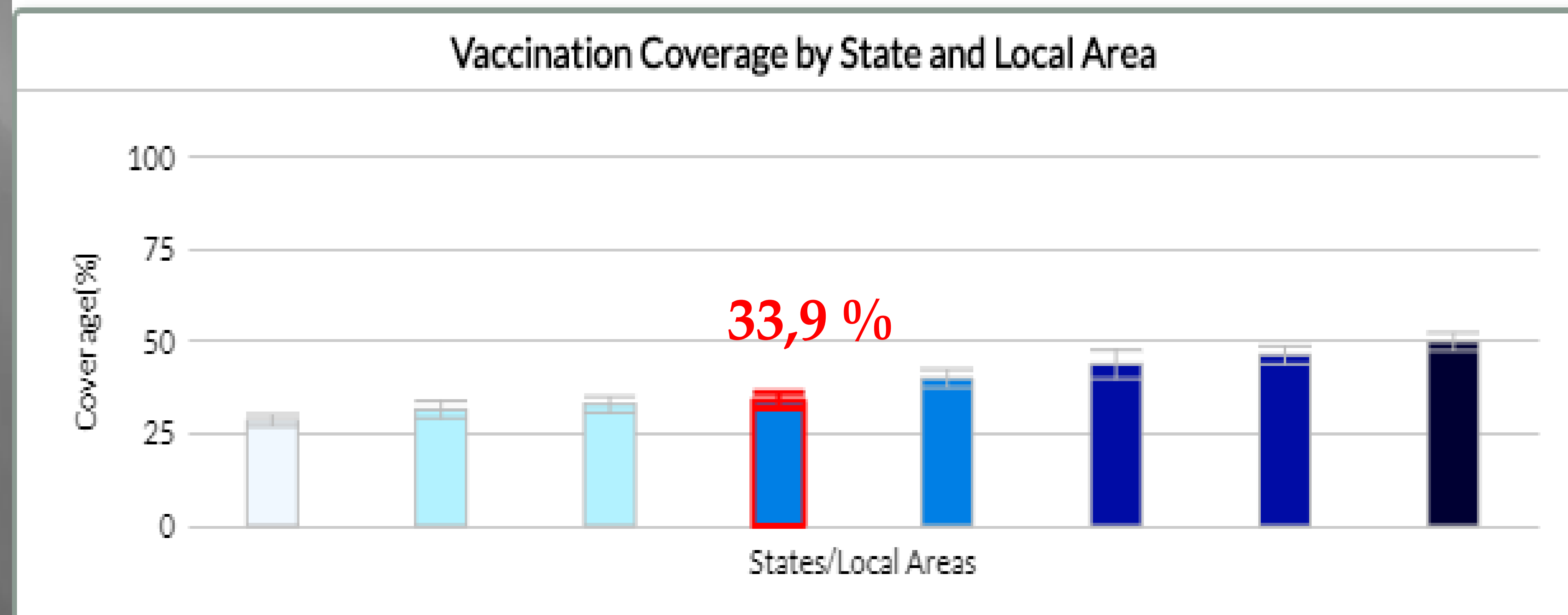
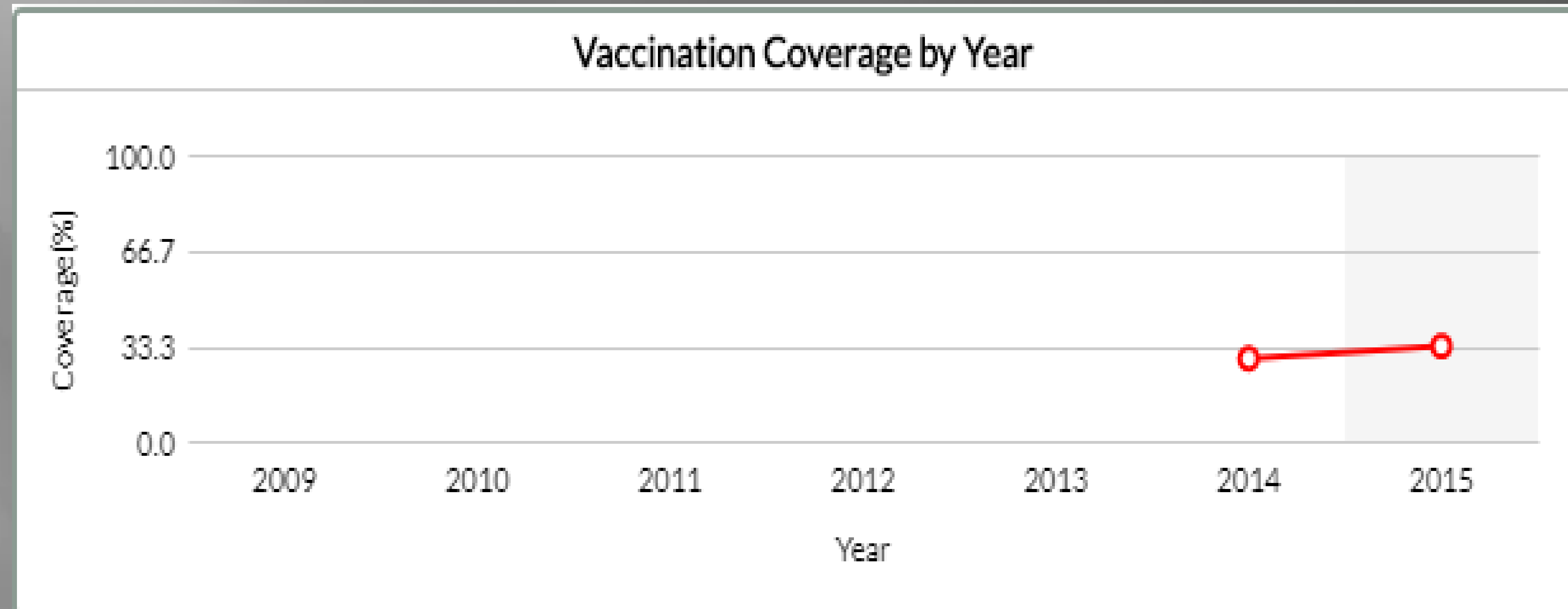
- Annual incident cases to increase by +343% (293,785 to 1,303,328) by 1st or 150% by 2^d scenario
- Estimated annual cost \approx 4.74 Billion US\$ in 2030

Shingles vaccination among adults ≥ 60 years, Missouri, BRFSS, 2015

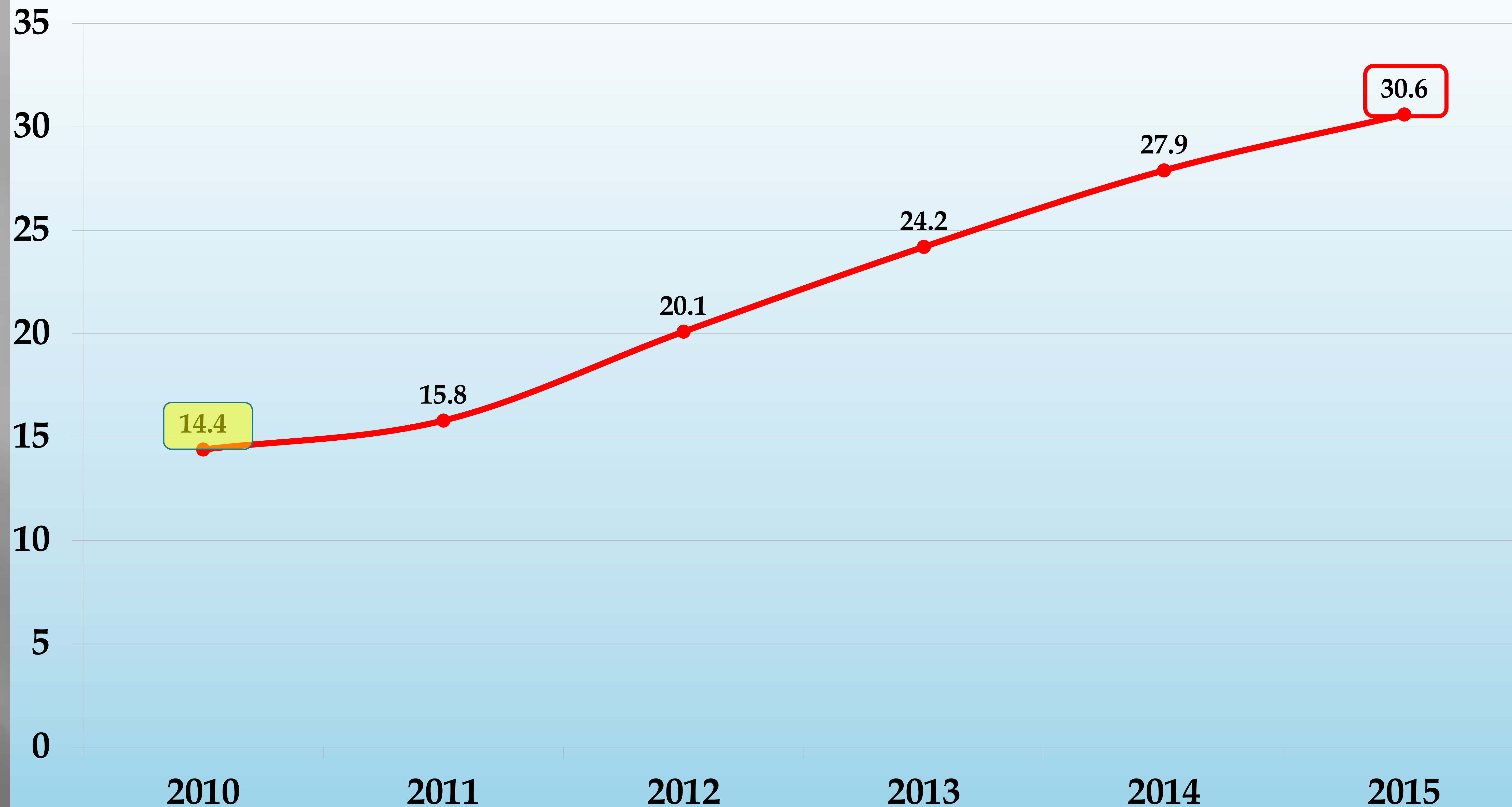
Vaccinations/Groups	State/Region/U.S.	n	%	CI	Progress Toward Healthy People 2020 (red line)
▼ Zoster (Shingles) Vaccination					
▼ Age					
≥ 60 years	Missouri	3,224	33.9	± 2.1	0  100
60-64 years	Missouri	722	24.5	± 4.0	0  100
≥ 65 years	Missouri	2,502	37.9	± 2.5	0  100
▼ Race/ethnicity					
≥ 60 years, white, non-Hispanic	Missouri	2,820	35.5	± 2.3	0  100
≥ 60 years, black, non-Hispanic	Missouri	239	20.1	± 6.8	0  100
≥ 60 years, Hispanic	Missouri	20	NR	NR	0  100
≥ 60 years, other or multiple races, non-Hispanic	Missouri	113	17.7	± 8.1	0  100



Shingles Vaccination Coverage Trend, Adults ≥ 60 years, BRFSS, 2015, Missouri



Estimated proportion of adults aged ≥ 60 years who received herpes zoster vaccine, – NHIS, United States, 2010–2015

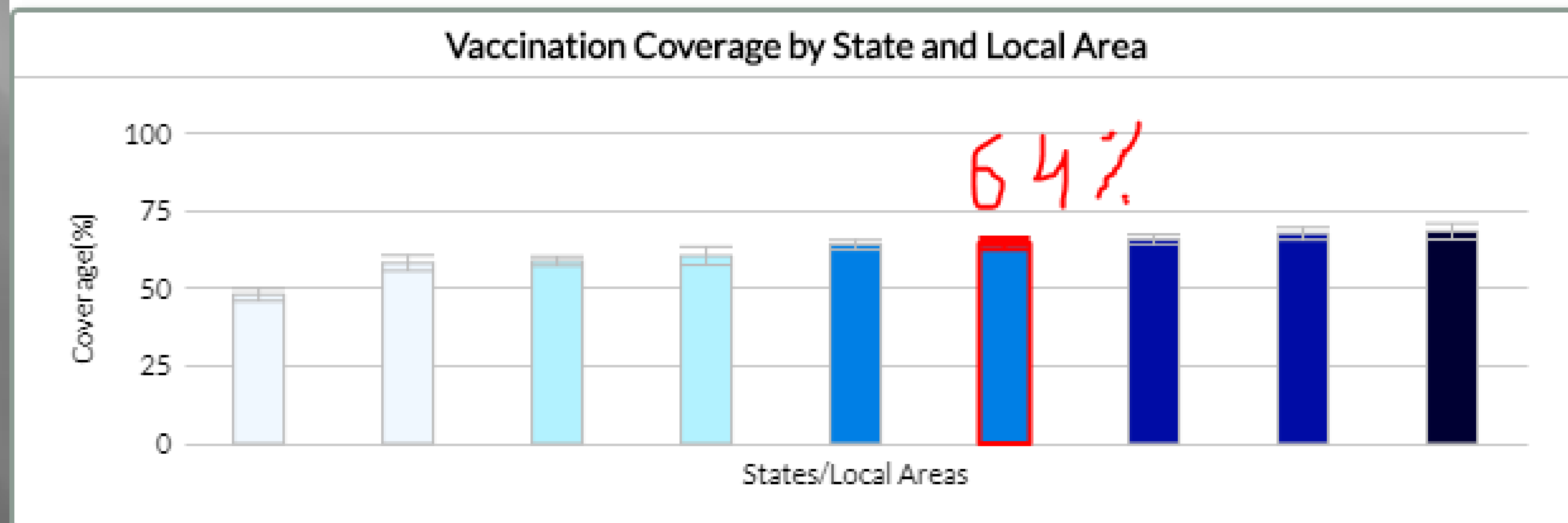
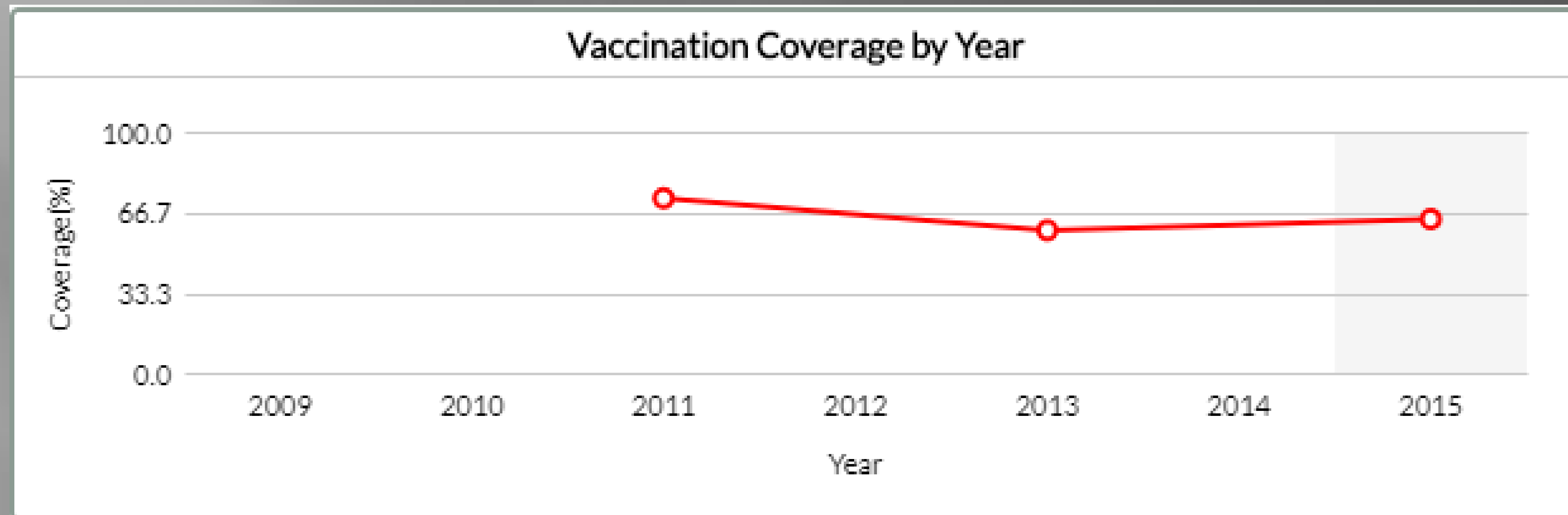


Tetanus (Td and Tdap) vaccination coverage among adults ≥ 18 years, Missouri, BRFSS, 2015

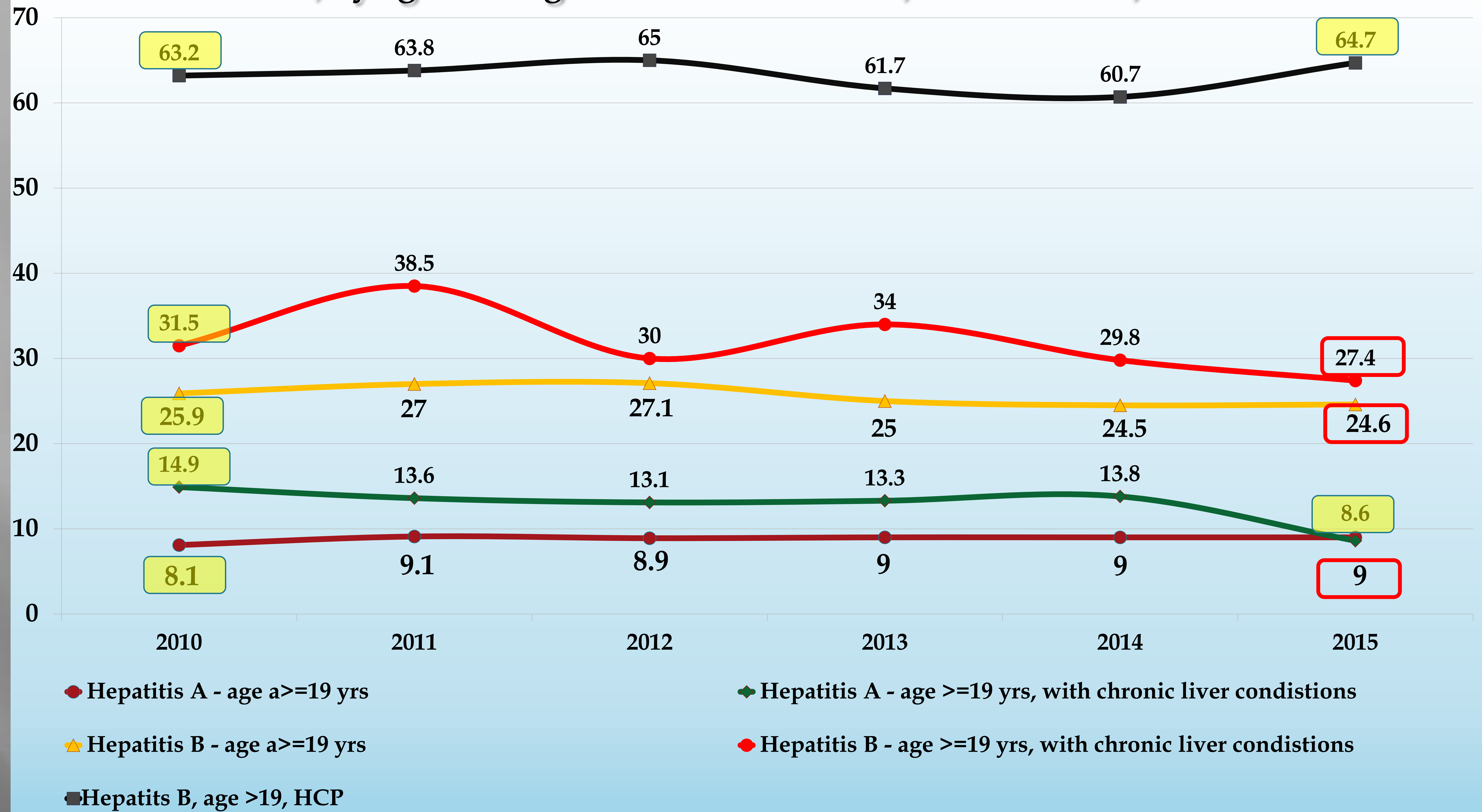
Vaccinations/Groups	State/Region/U.S.	n	%	CI	Progress Toward Healthy People 2020 (red line)
▼ Tetanus (Td or Tdap) Vaccination					
▼ Age					
≥ 18 years	Missouri	5,534	64.4	± 1.8	0 100
18-49 years	Missouri	1,579	70.0	± 3.0	0 100
50-64 years	Missouri	1,719	65.4	± 3.0	0 100
≥ 65 years	Missouri	2,236	51.5	± 2.7	0 100
▼ Race/ethnicity					
≥ 18 years, white only, non-Hispanic	Missouri	4,708	65.5	± 1.9	0 100
≥ 18 years, black only, non-Hispanic	Missouri	470	53.1	± 6.4	0 100
≥ 18 years, Hispanic	Missouri	80	72.3	± 13.3	0 100
≥ 18 years, other or multiple races, non-Hispanic	Missouri	220	65.8	± 8.7	0 100



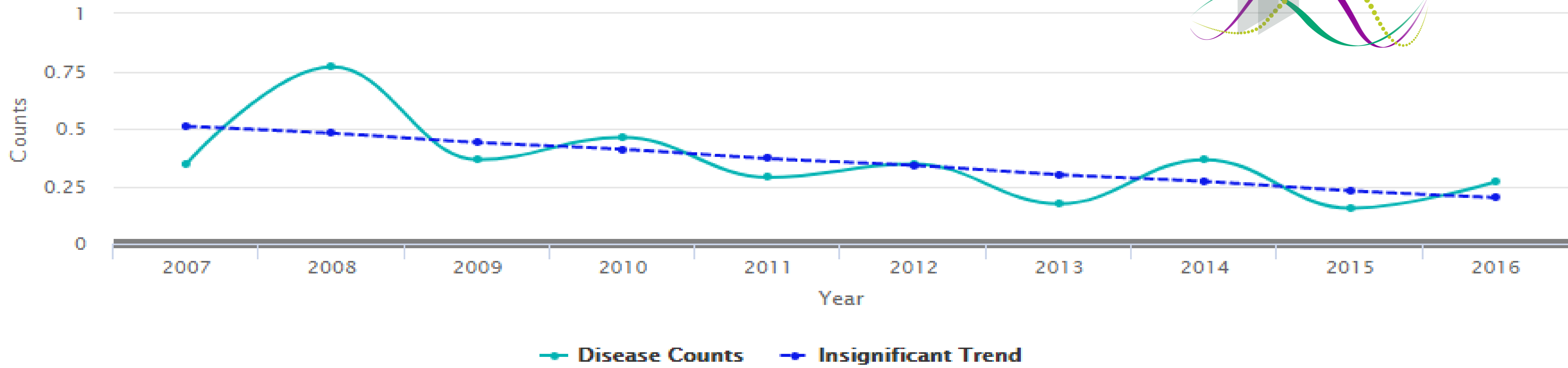
Tetanus Vaccination Coverage Trend, Adults ≥ 18 years, BRFSS, 2015, Missouri



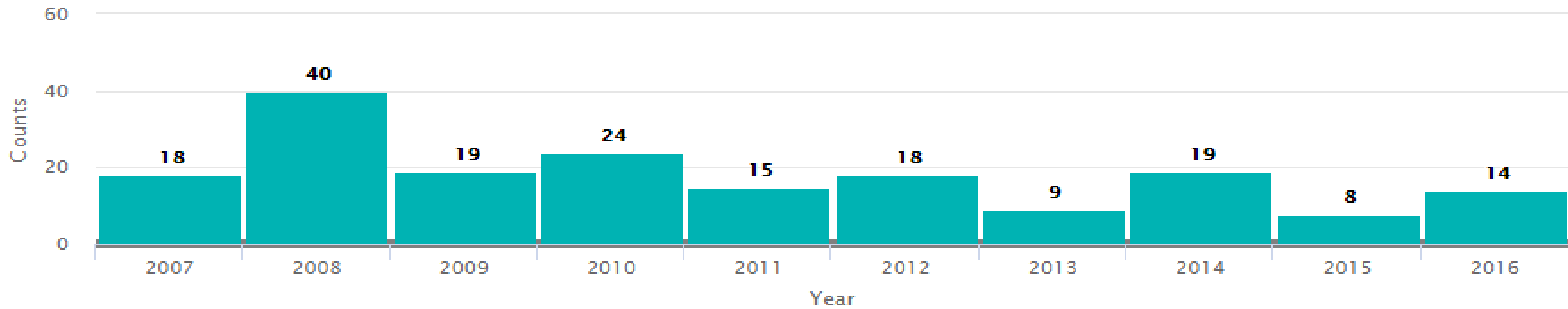
Estimated proportion of adults who received hepatitis A and hepatitis B vaccines, by age and high-risk status – NHIS, United States, 2010–2015



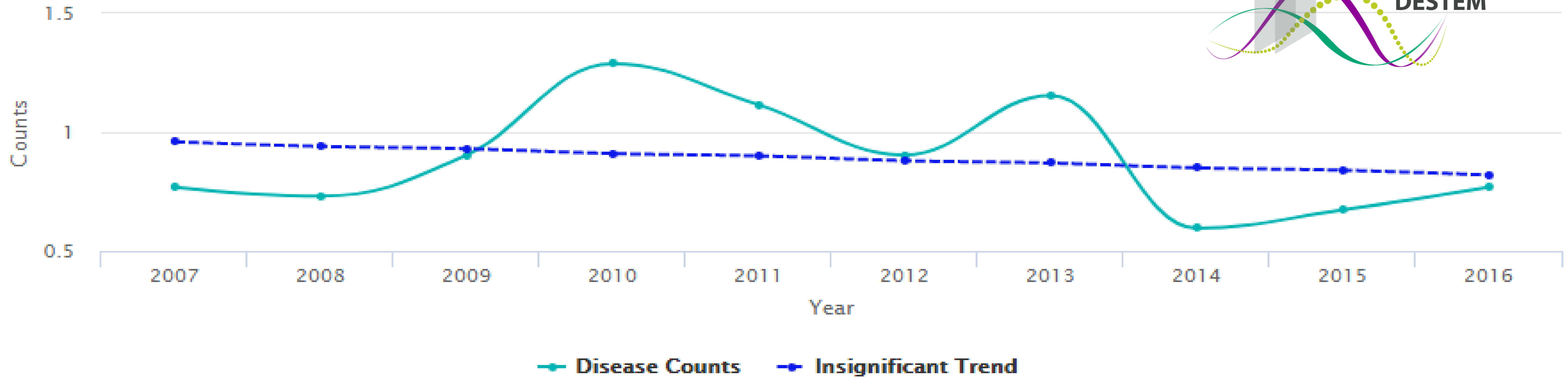
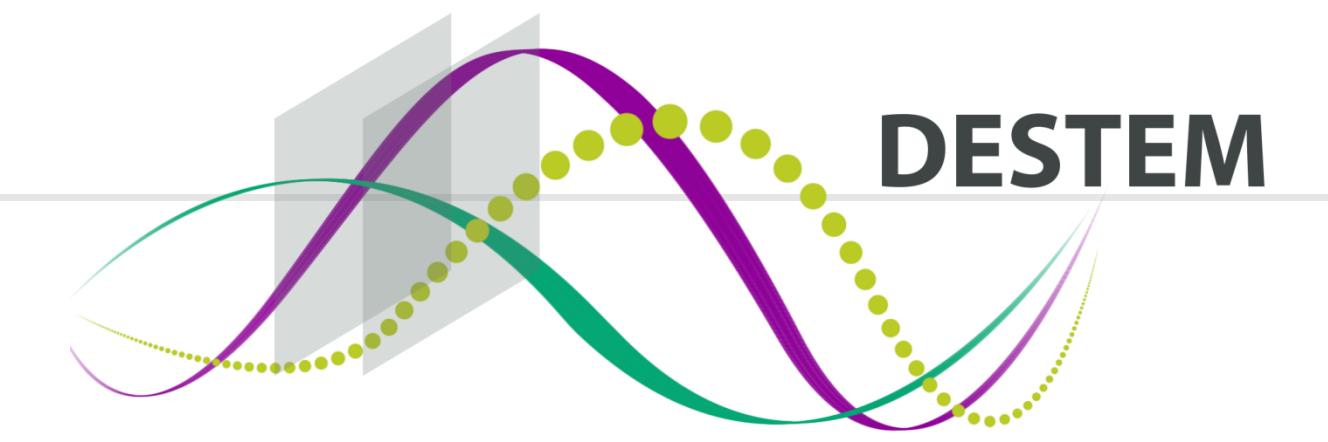
Hepatitis A Acute Trend, ages 19 years and older



Hepatitis A Acute Cases, ages 19 years and older

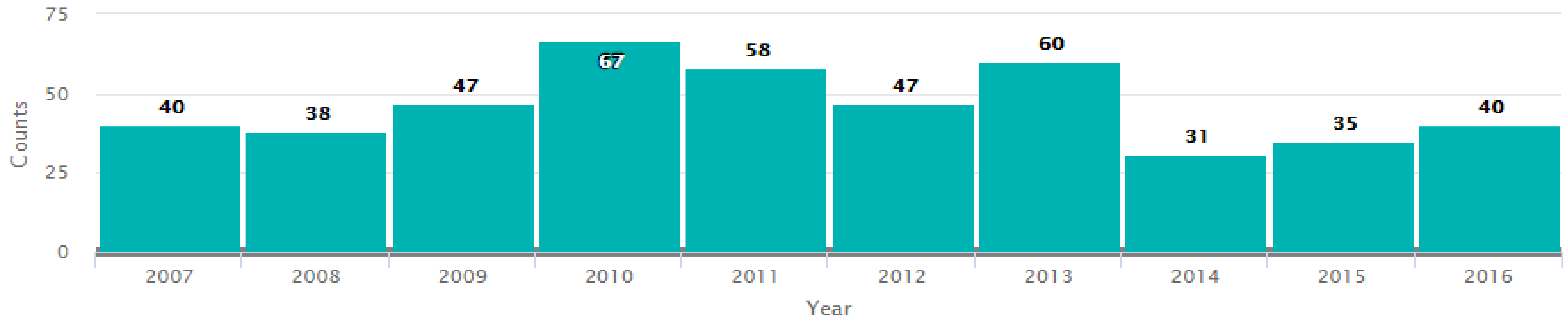


Hepatitis B Acute Trend, ages 19 years and older

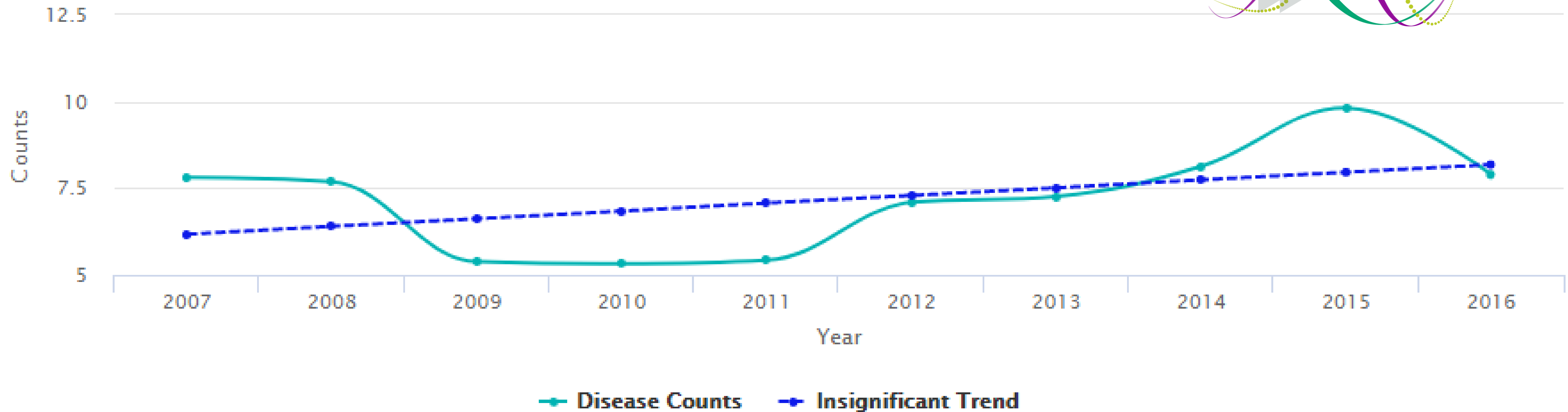


Highcharts.com

Hepatitis B Acute Cases, ages 19 years and older

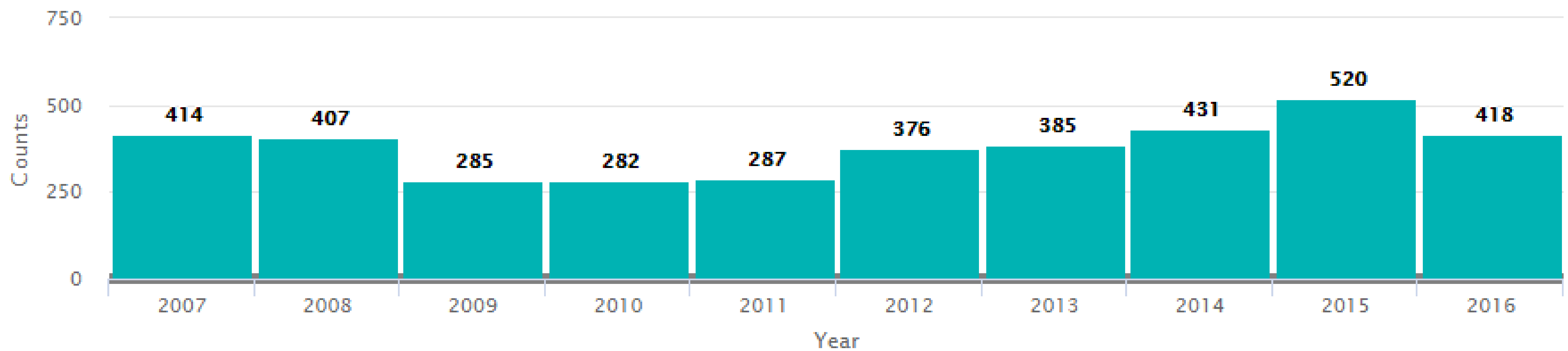


Hepatitis B Chronic Infection Trend 10-years

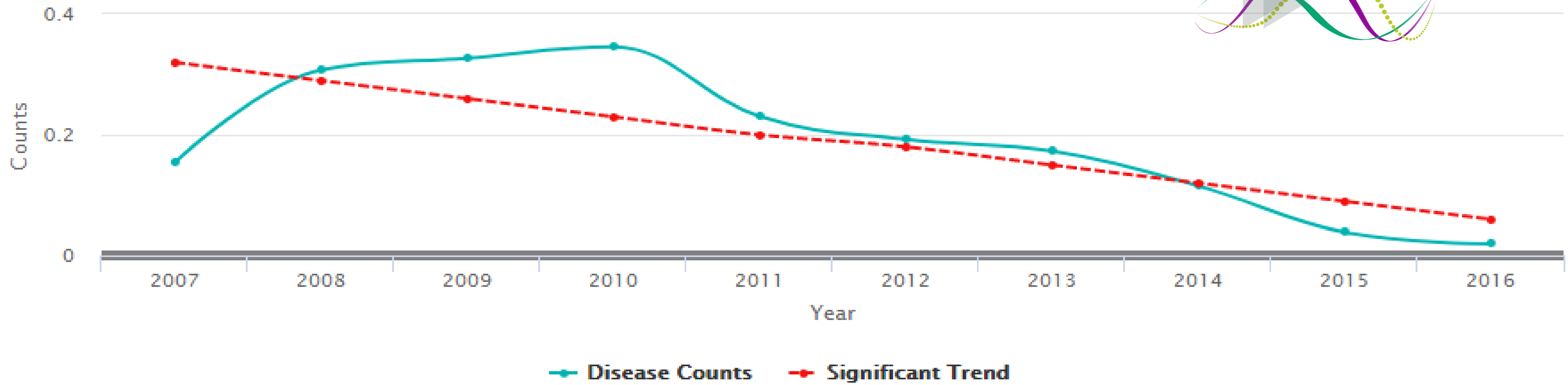


Highcharts.com

Hepatitis B Chronic Infection Cases 10-years

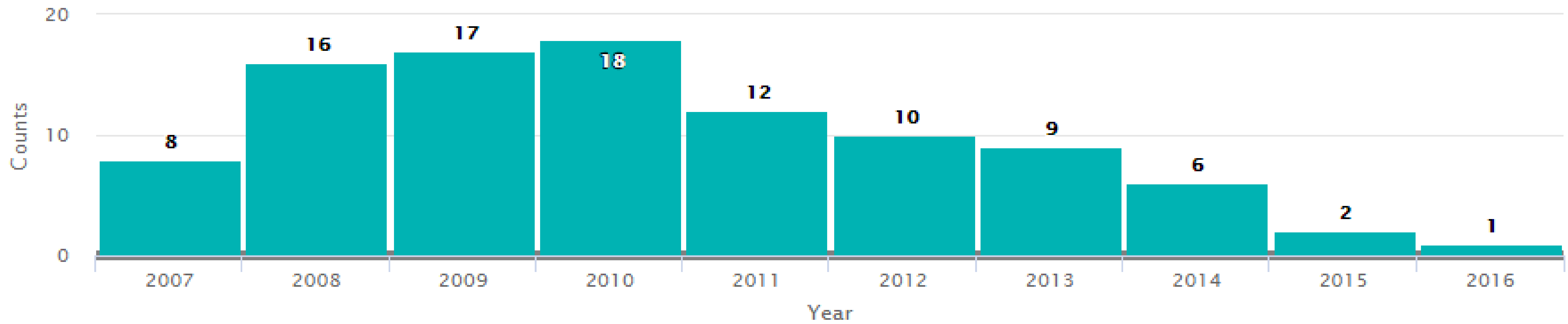


Meningococcal Disease Trend, ages 19 years and older

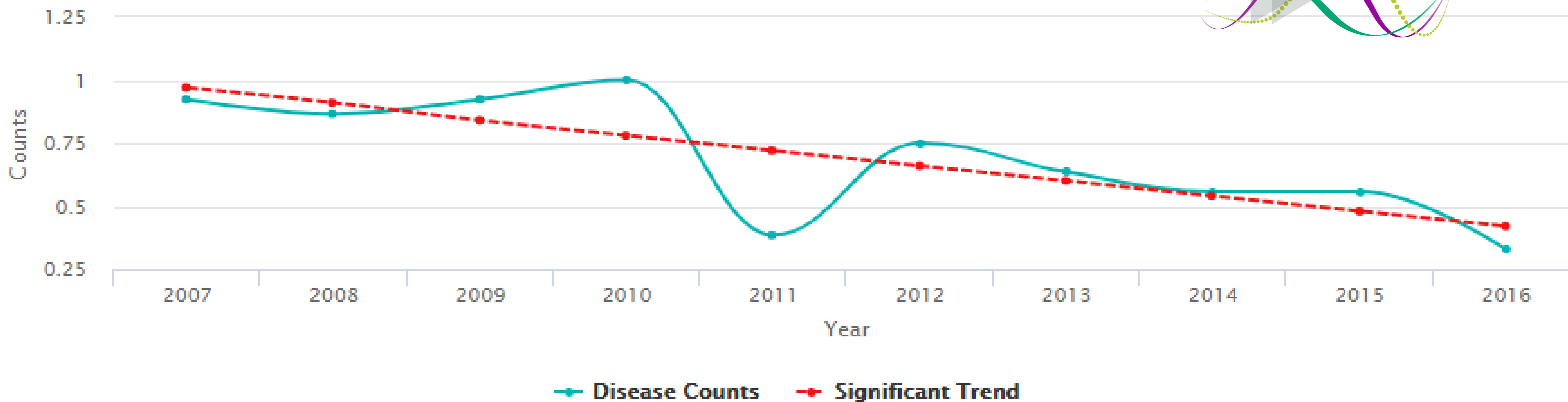


Highcharts.com

Meningococcal Disease Cases, ages 19 years and older

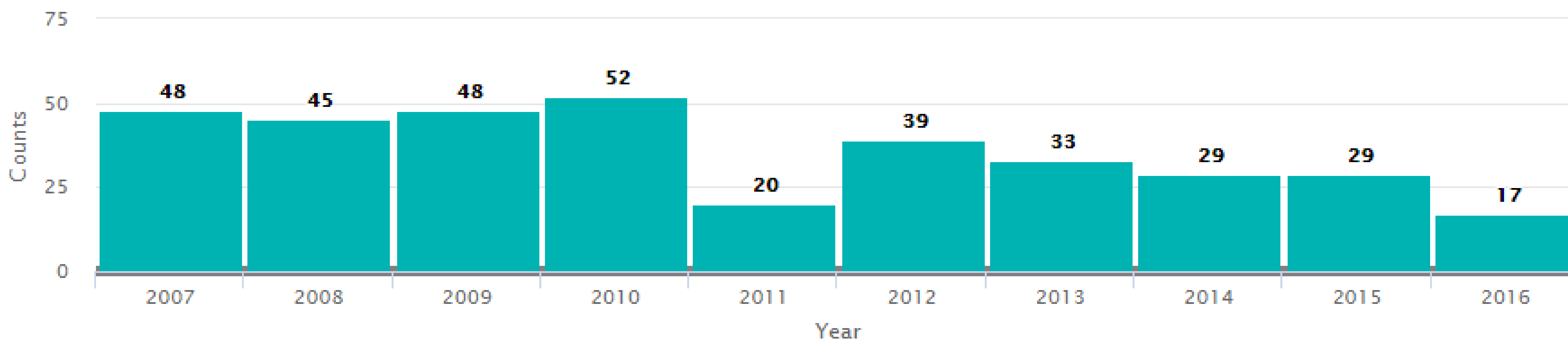


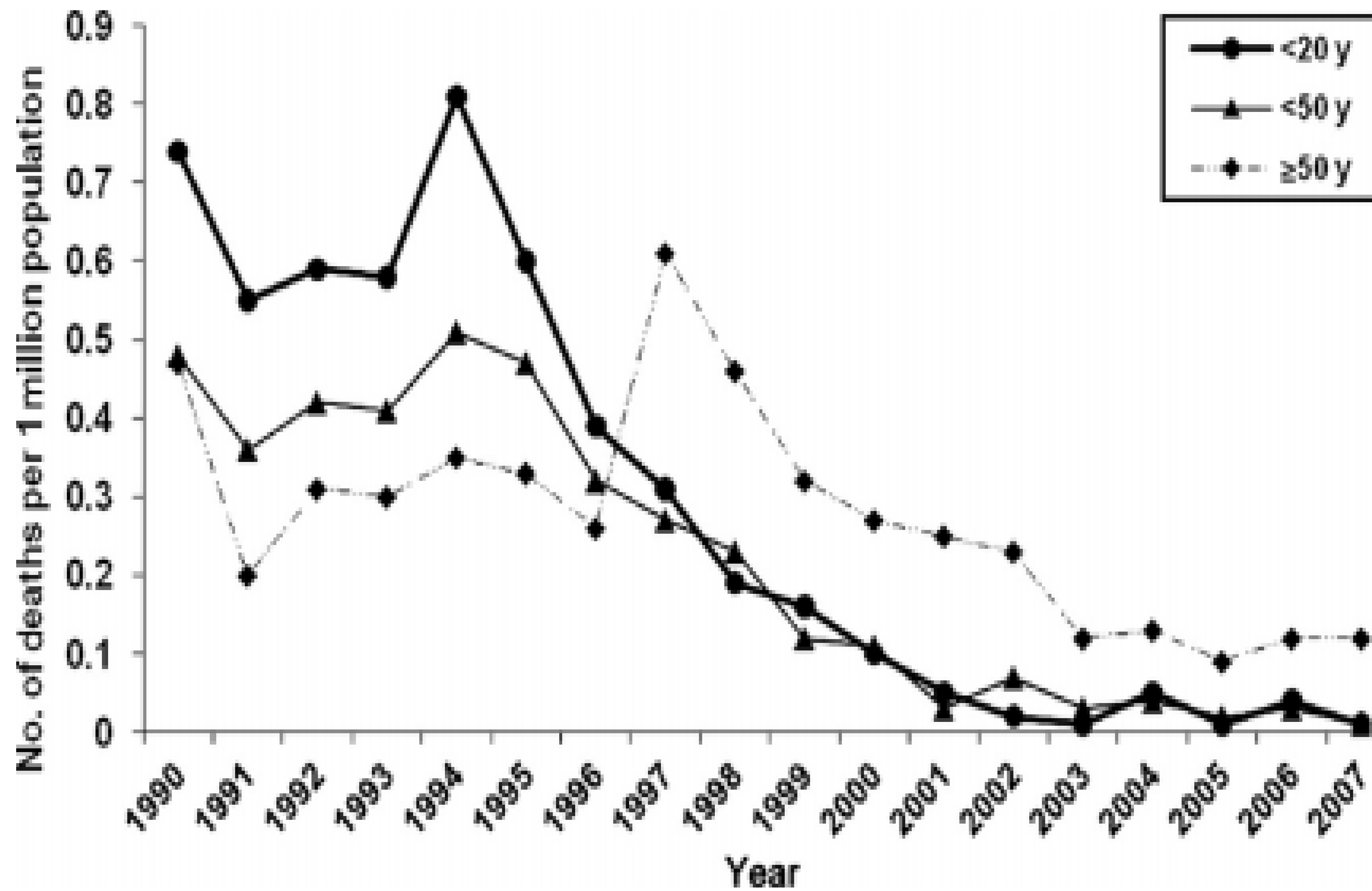
Varicella Trend, ages 19 years and older



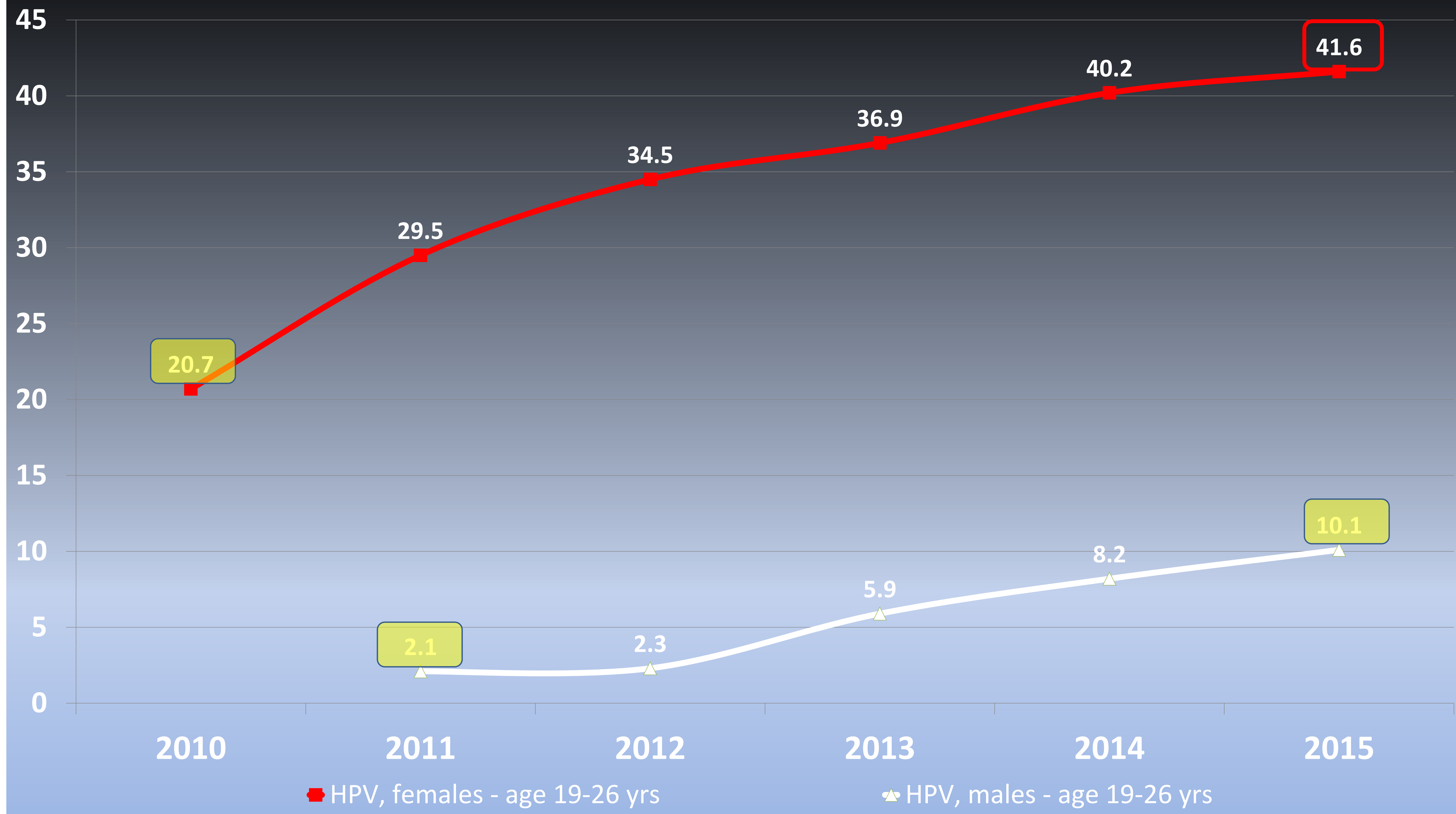
Highcharts.com

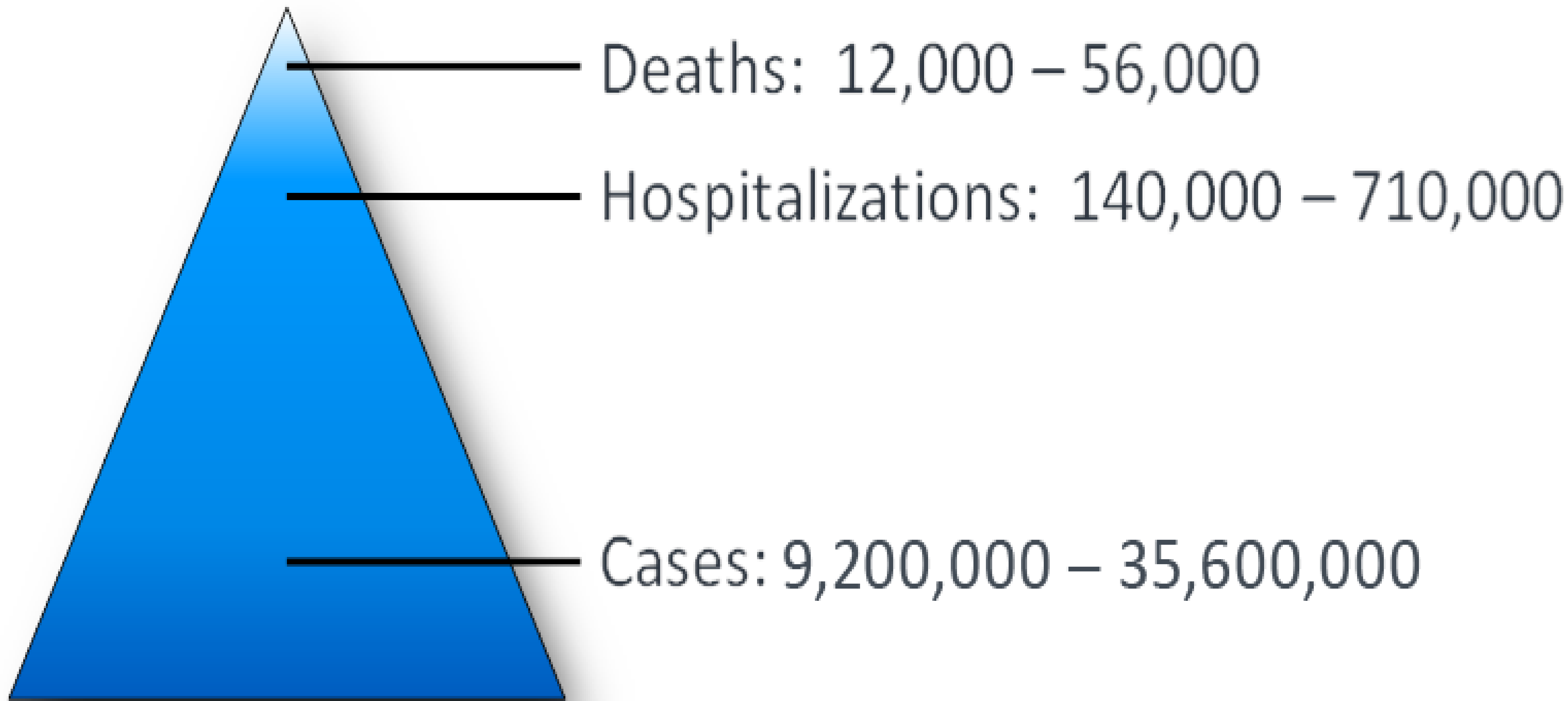
Varicella Cases, ages 19 years and older





Estimated proportion of adults aged 19-26 years who received human papillomavirus vaccines, by sex — NHIS, USA, 2010–2015

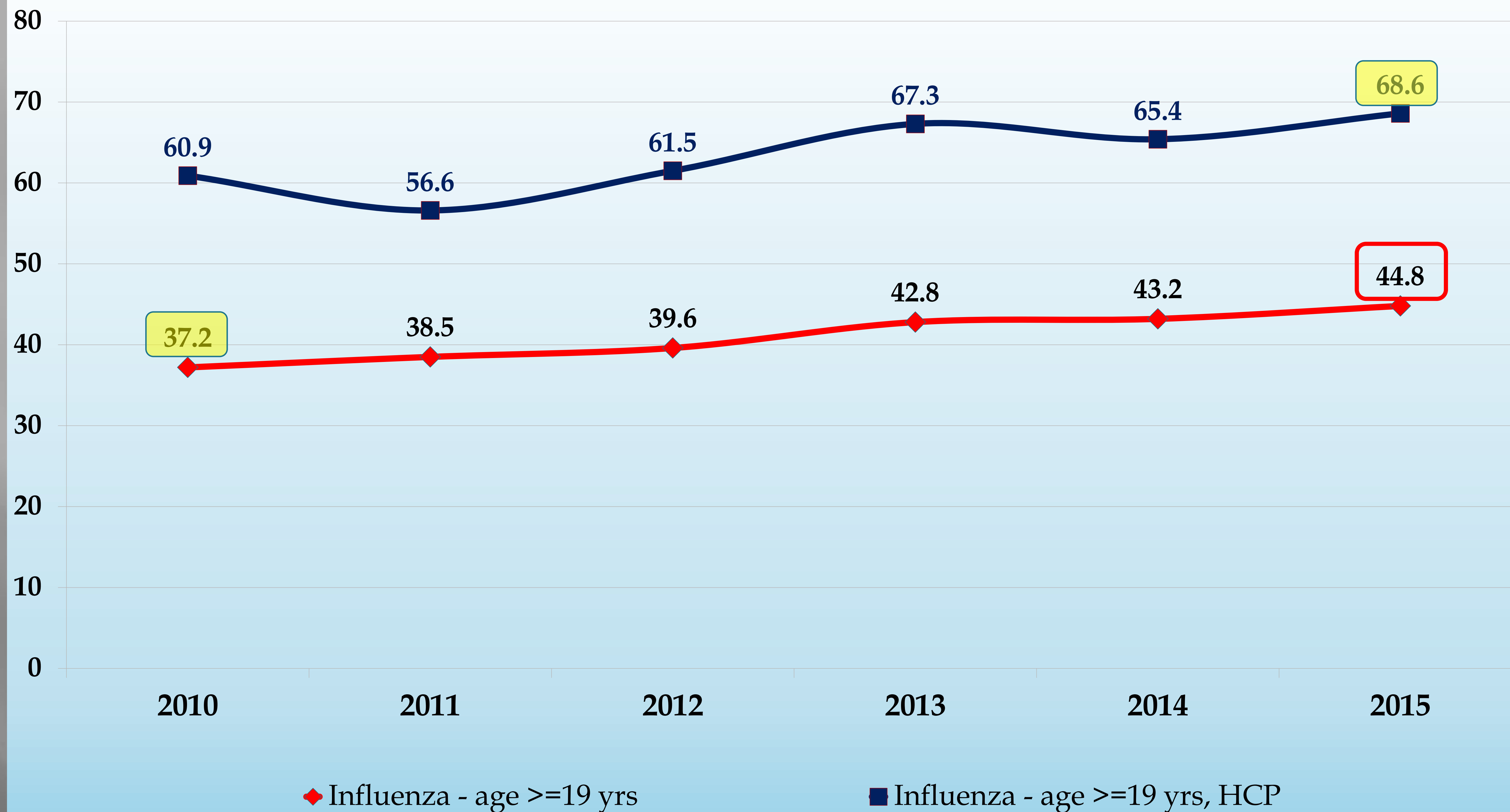




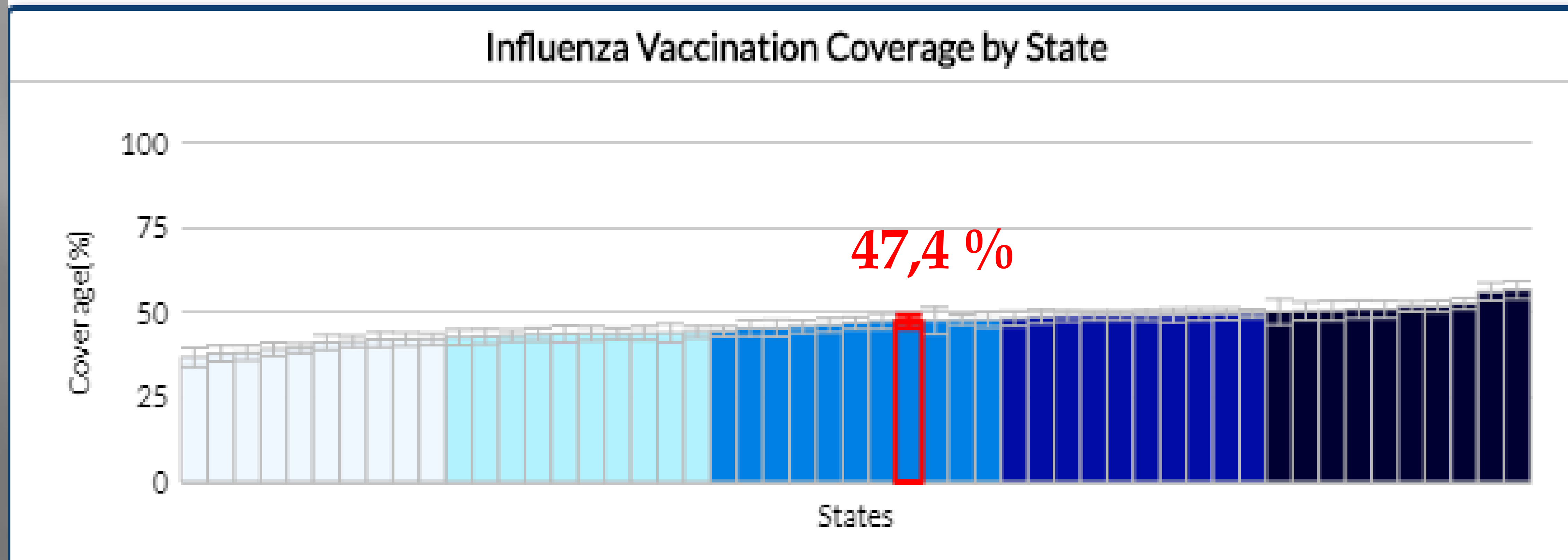
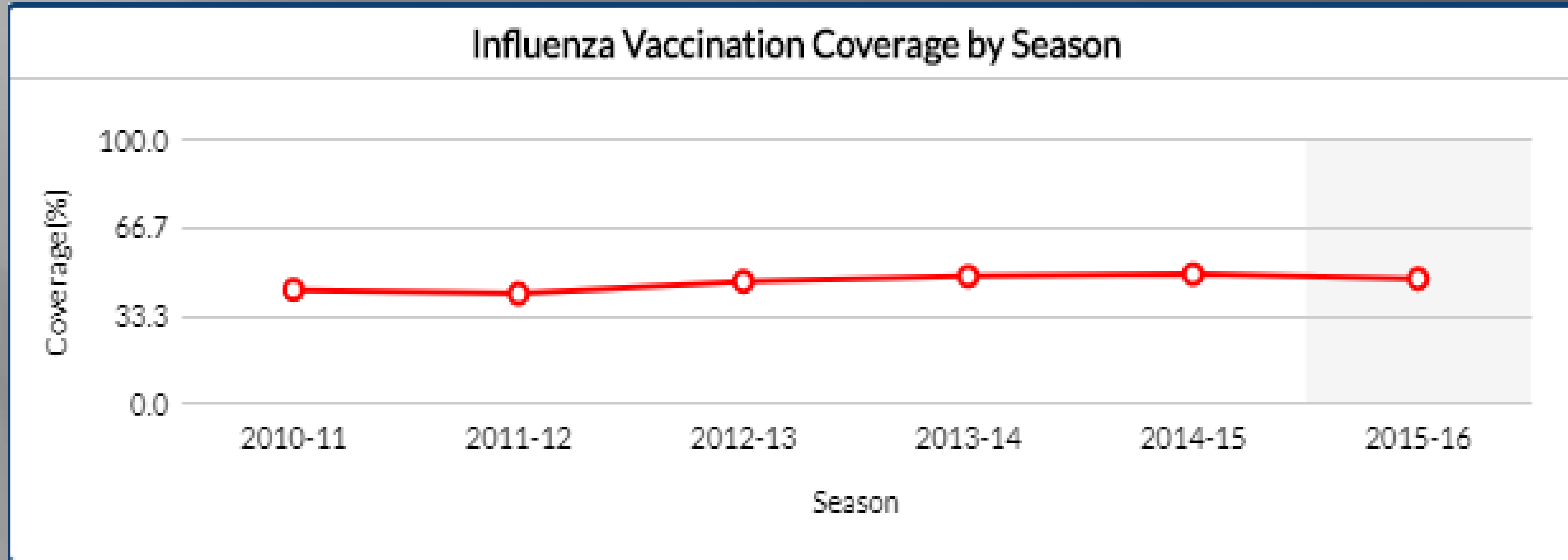
Disease Burden of Influenza, USA



Estimated proportion of adults who received influenza vaccines, by age and increased risk status – NHIS, USA, 2010-2015

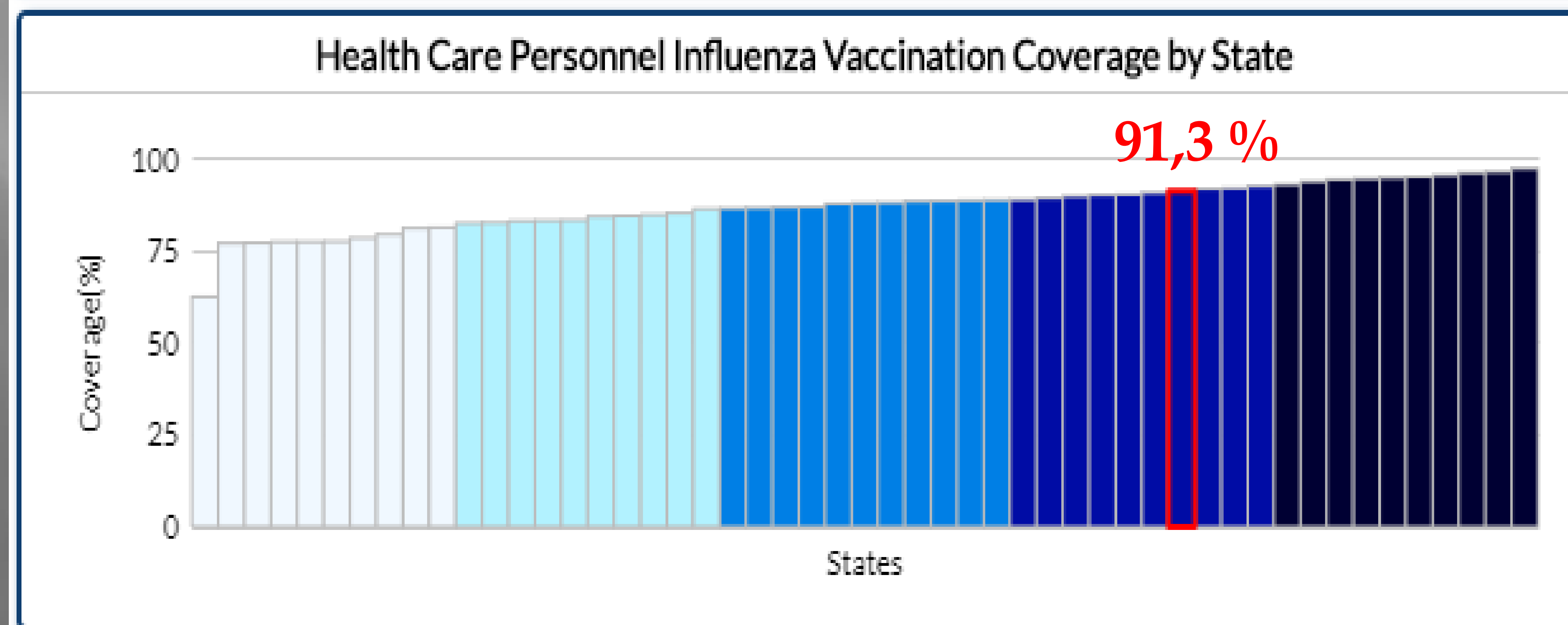
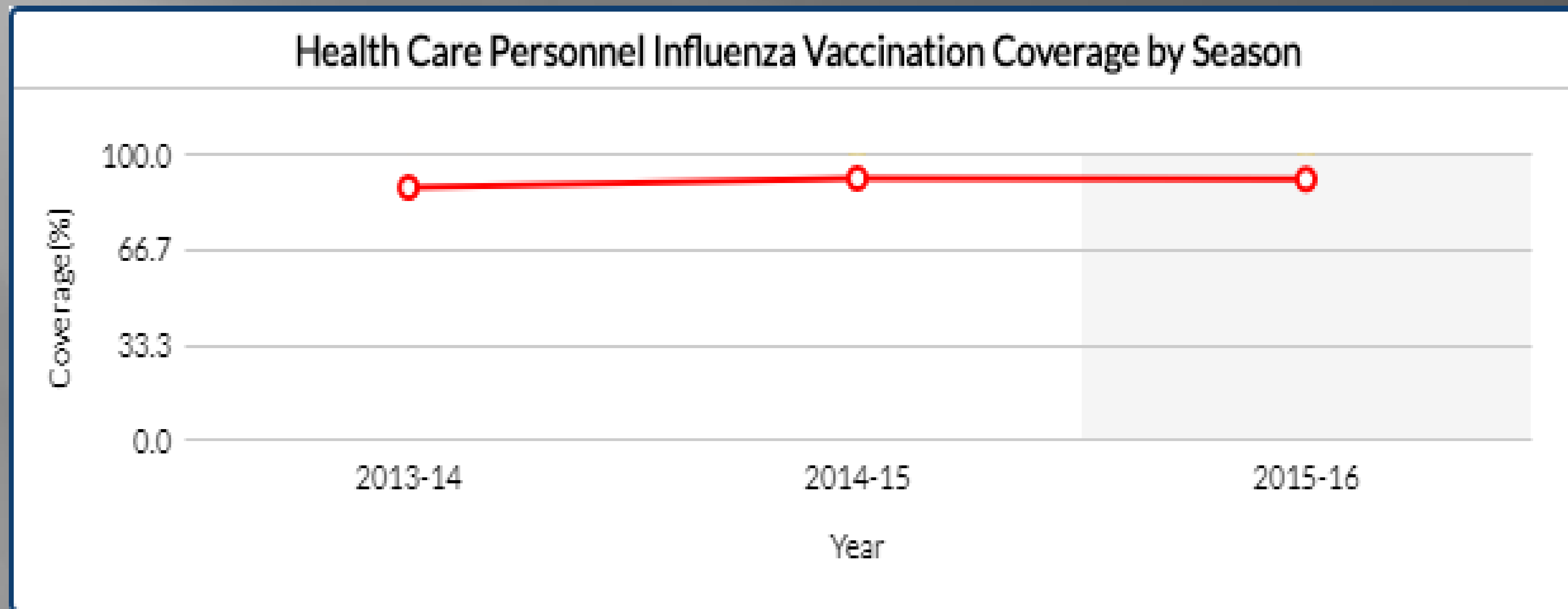


Influenza vaccination coverage for persons ≥ 6 months old, Missouri, NIS-Flu and BRFSS, 2015-16

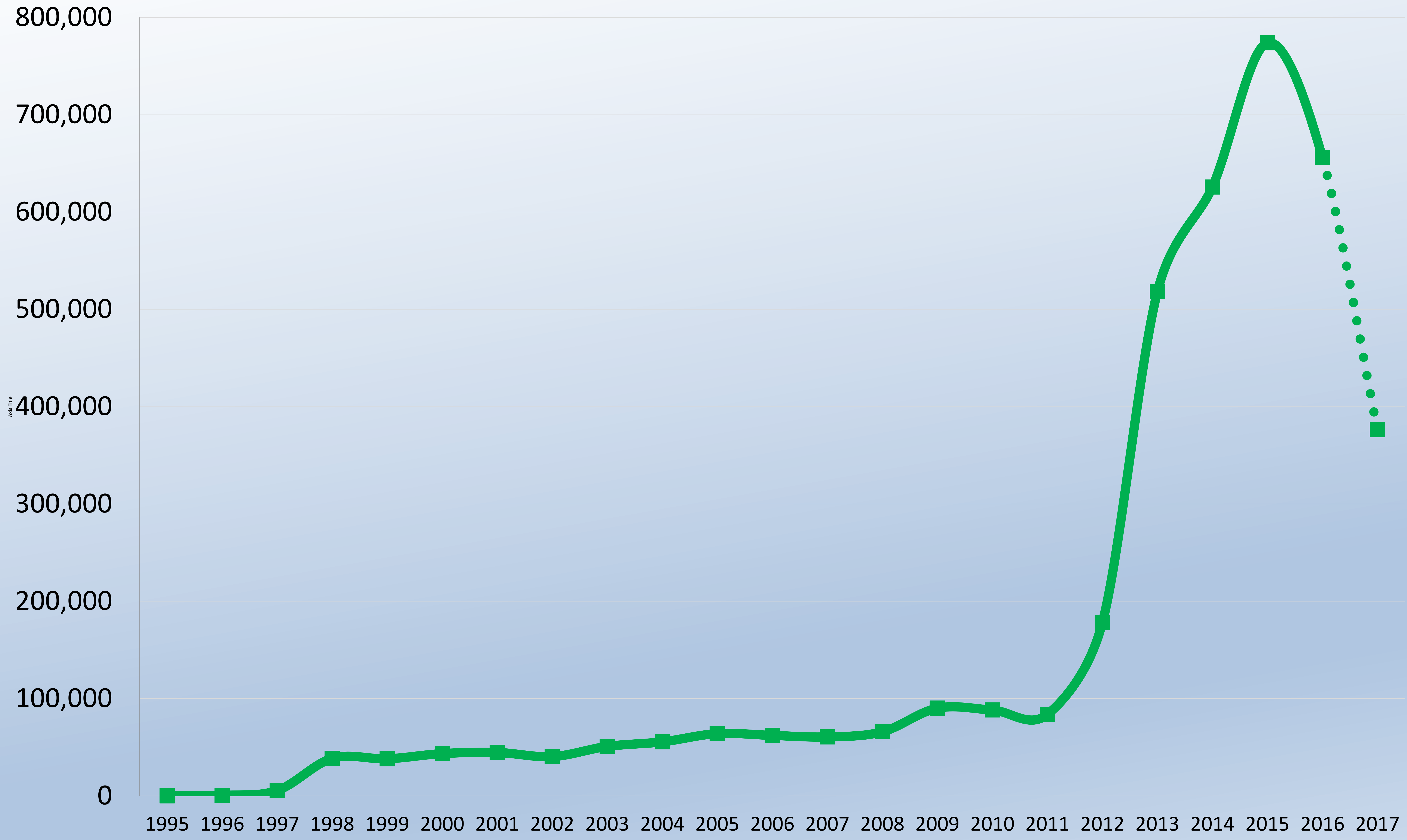


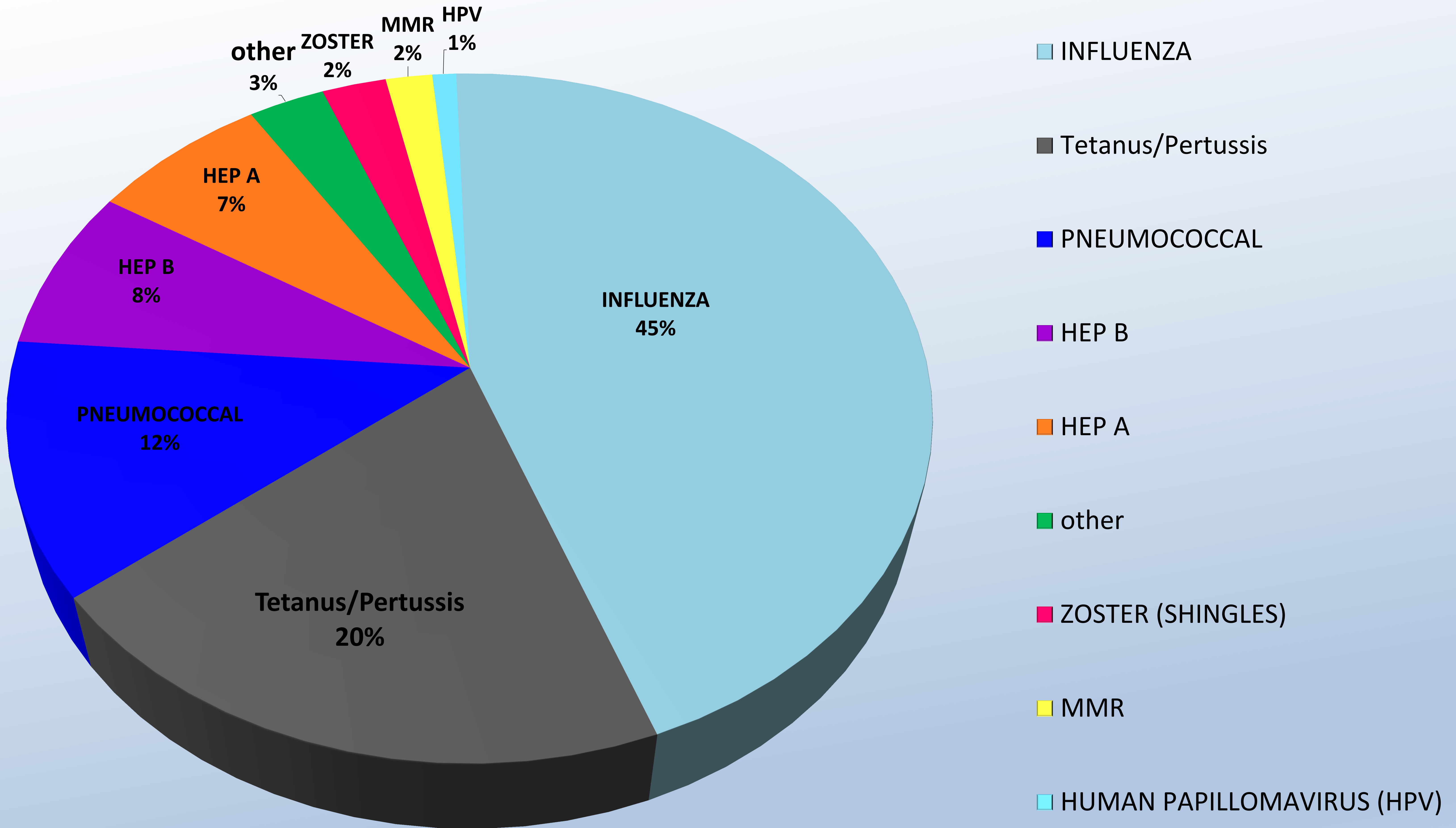
● HP 2020 Target	NA	70.0	NA
● United States	446,013	45.6	(± 0.4)

Proportions of hospital-based health care personnel, National Healthcare Safety Network (NHSN), Missouri, 2015-16 season

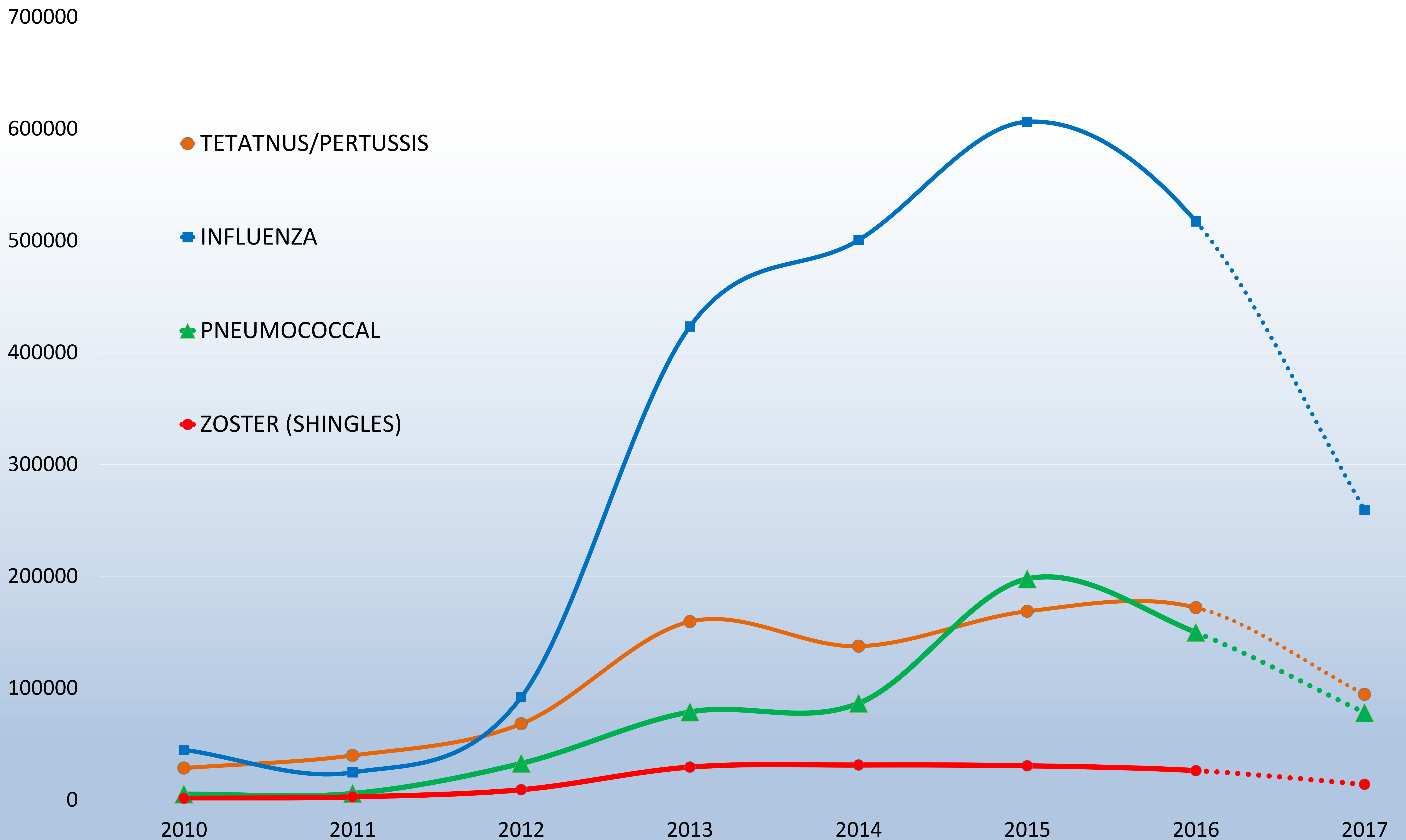


Adults ≥ 19 years with One or More Vaccine Dose per Year, *ShowMeVax, 2017*



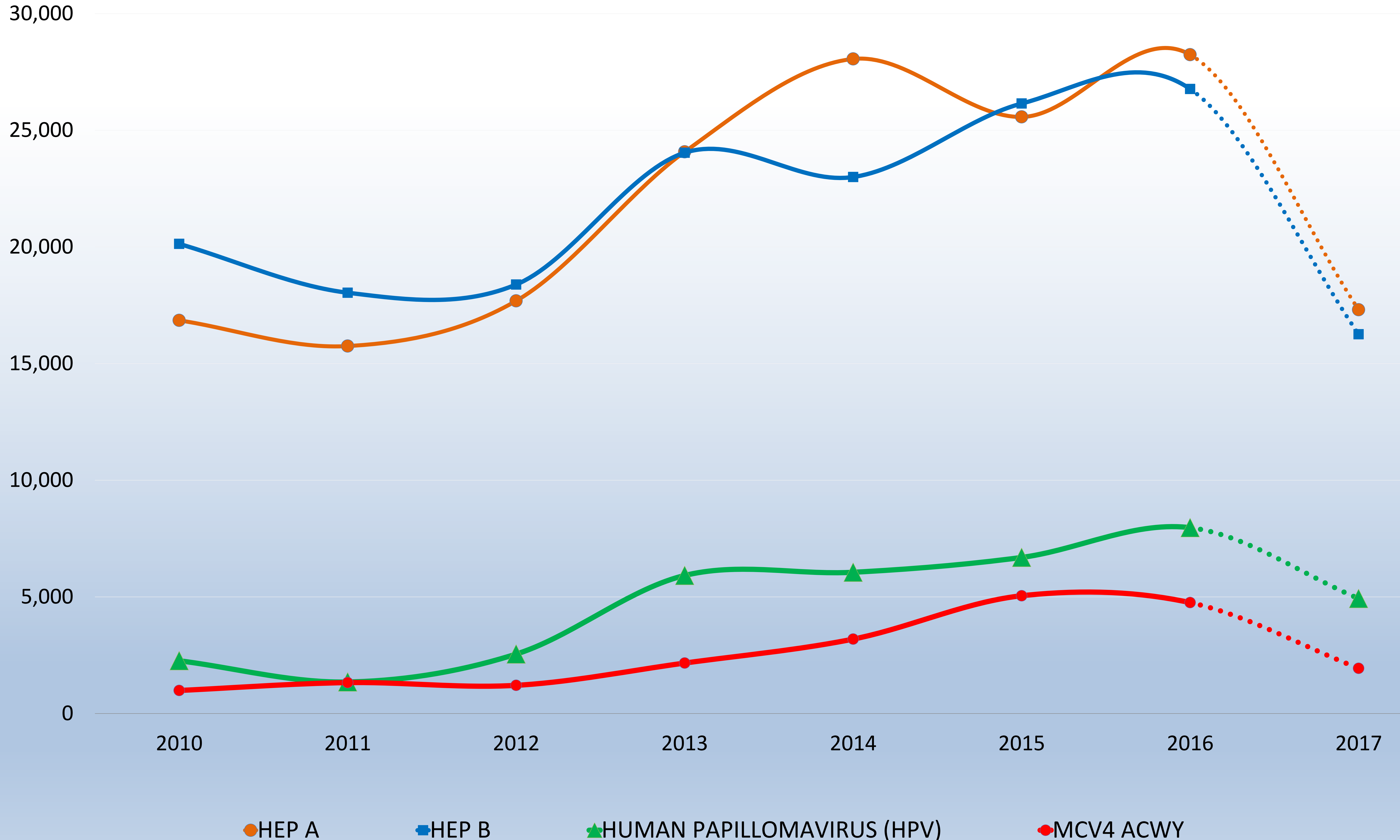


Percentage of Adult Vaccine Doses, *ShowMeVax*, 2017



Annual Adult Vaccine Doses, *ShowMeVax*, 2017

Annual Adult Vaccine Doses, *ShowMeVax*, Missouri, 2017



Improving Adult Vaccinations in Missouri

- ▣ Adult vaccination should become **priority** for physicians and patients
- ▣ Improved adult vaccine **information**
- ▣ Address **vaccination fears**
- ▣ Improved vaccine **accessibility**
- ▣ Remove **systemic and operational** issues



