

I. Kislaya<sup>1,2</sup>, A.P. Rodrigues<sup>1</sup>, M. Sousa-Uva<sup>1,2</sup>, V. Gómez<sup>1</sup>, P. Gonçalves<sup>3</sup>, F. Froes<sup>2,4</sup>, B. Nunes<sup>1,2</sup>

<sup>1</sup>Departamento de Epidemiologia, Instituto Nacional de Saúde Doutor Ricardo Jorge, IP, Lisboa, Portugal. <sup>2</sup>Centro de Investigação em Saúde Pública, Escola Nacional de Saúde Pública, Universidade Nova de Lisboa, Lisboa, Portugal. <sup>3</sup>Departamento de Doenças Infecciosas, Instituto Nacional de Saúde Doutor Ricardo Jorge, IP, Lisboa, Portugal. <sup>4</sup>Thorax Department, Centro Hospitalar Lisboa Norte, Lisboa, Portugal.

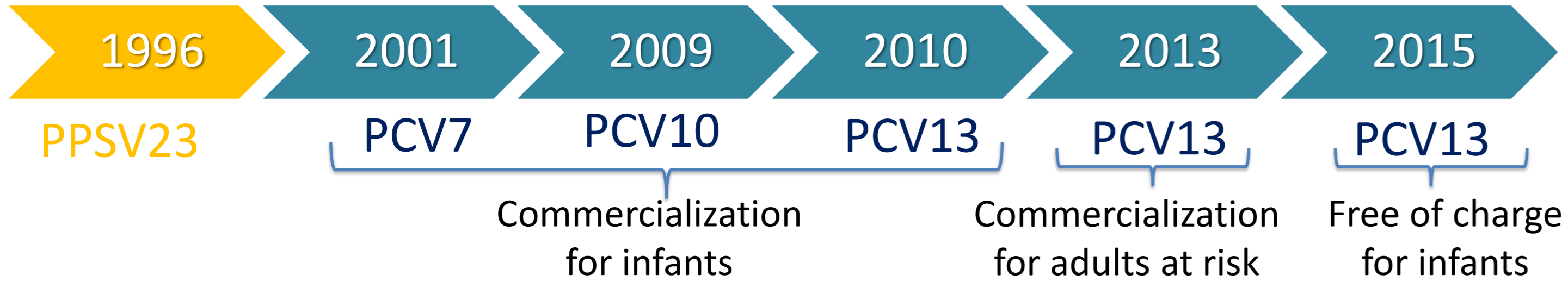
## INTRODUCTION

Pneumonia is an important cause of morbidity, mortality and expenditure of health resources. Since the introduction of conjugated pneumococcal vaccines (PCV) in infant immunization programs in 2000s, there is consistent evidence of pneumonia reduction in vaccinated children<sup>1</sup>. Limited data are available on indirect effect of infant immunization on pneumonia burden in unvaccinated population subgroups<sup>2</sup>.

This study aims to assess indirect effect of infant PCV7/PCV13 vaccination on the pneumonia burden among 65+ years old (yo) in Portugal, through comparison of trends in Pneumococcal Pneumonia (PP) hospitalization rates before and after the introduction of PCV7 and PCV13.

## METHODS

### Vaccination program settings:



**Study design:** Ecological study based on the National Hospital Discharge Registry data (July 1998 to June 2016). Target population included individuals aged 65+yo resident in Portugal mainland.

**Outcome:** Hospitalizations ( $\geq 24$  hours) with primary discharge diagnosis of PP coded as 481/J13 International Statistical Classification of Diseases

**Statistical analysis:** Interrupted time series analysis. Poisson regression models adjusted for seasonality and influenza like illness (ILI) were fitted separately for men and women for 65-74yo, 75-84yo and 85+yo age groups with a monthly count of PP hospitalizations ( $Y_t$ ) as outcome variable:

$$\log E(Y_t) = \beta_0 + \beta_1 T_t + \beta_2 X_t T_t + \beta_3 \sin(2\pi T_t/12) + \beta_4 (\cos 2\pi T_t/12) + \beta_5 ILL_t + \log(Pop_t),$$

$\beta_0$  - a baseline rate;  $T_t$  - time in months since the start of the study;  $X_t$  - a dummy variable representing the PCV use (0 in pre-PCV period, 1 otherwise);  $\beta_1$  - a slope in pre-PCV period;  $\beta_2$  - a change in the slope after PCV introduction.

## RESULTS

During the study period, the PP annual hospitalization rate varied between 10.2 and 4.0 per 10<sup>4</sup> inhabitants, being highest among 85+yo.

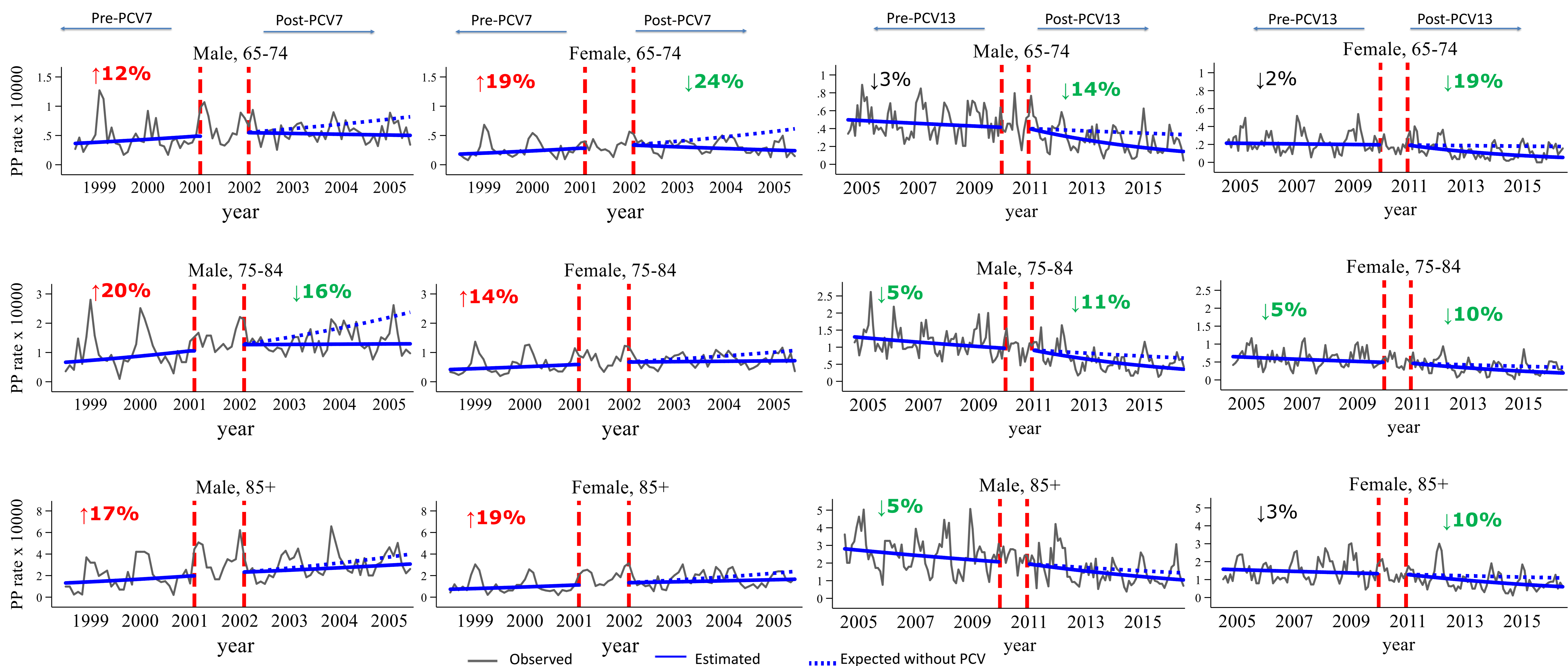


Figure 1. Trends in monthly PP hospitalization rates before and after PCV7 / PCV13 introduction by sex and age group

PP hospitalization rate increased in pre-PCV7 period in all population subgroups. Statistically significant decline in PP rate was observed in post-PCV7 period in 65-74yo women (RR=0.76, CI95%: 0.64; 0.90) and 75-84yo men (RR=0.84, CI95%: 0.70; 0.99), resulting in 4.6 fewer hospitalizations per 10<sup>4</sup> inhabitants, in 2004/05.

The decreasing trend continued after PCV13 introduction (RR=0.89; CI95%: 0.86 to 0.91). The largest PP rate reduction was observed in 65-74yo, 14% per year (RR=0.86; CI95%: 0.79, 0.93) for men and 19% per year (RR=0.81; CI95%: 0.72, 0.92) for women, resulting in 2.9 fewer hospitalizations per 10<sup>4</sup> inhabitants, in 2015/16.

## CONCLUSIONS

Using nationwide hospitalization registry data, we found a decrease in the PP hospitalization rates in 65+yo adults following infant PCV7/PCV13 introduction in Portugal. The ageing of the population highlights the importance of this indirect effect on PP prevention. The possibility of a pneumococcal serotype replacement reinforces the need for continuous monitoring of this health problem along time.

## REFERENCES

- (1) Esposito, S, Principi, N. Impacts of the 13-Valent Pneumococcal Conjugate Vaccine in Children. Journal of Immunology Research, Volume 2015, Article ID 591580: <http://dx.doi.org/10.1155/2015/591580>
- (2) Tsaban G, Ben-Shimol S. Indirect (herd) protection, following pneumococcal conjugated vaccines introduction: A systematic review of the literature. Vaccine 2017; 35: 2882-2891.

## FUNDING

The I-MOVE+ project has received funding from the European Union's Horizon 2020 research and innovation programme under the grant agreement N° 634446.