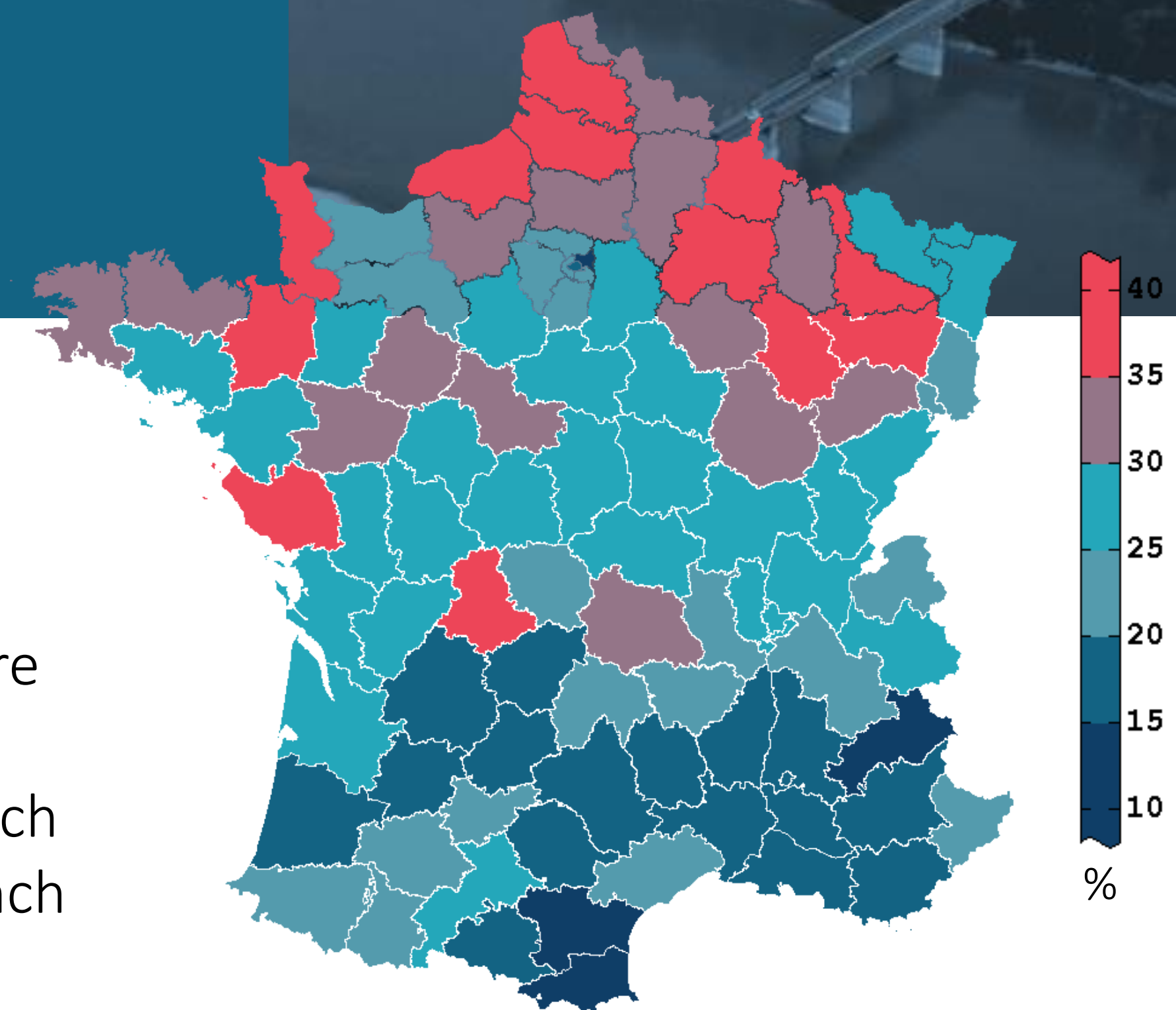


GEOSTATISTICAL ALGORITHM TO BETTER IDENTIFY CONTEXTUAL AND CLINICAL FACTORS ASSOCIATED TO HPV VACCINE COVERAGE IN FRANCE

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2016 regional VCR data
HPV initiation 15 y.o. girls
Source: INVS

Background and objectives

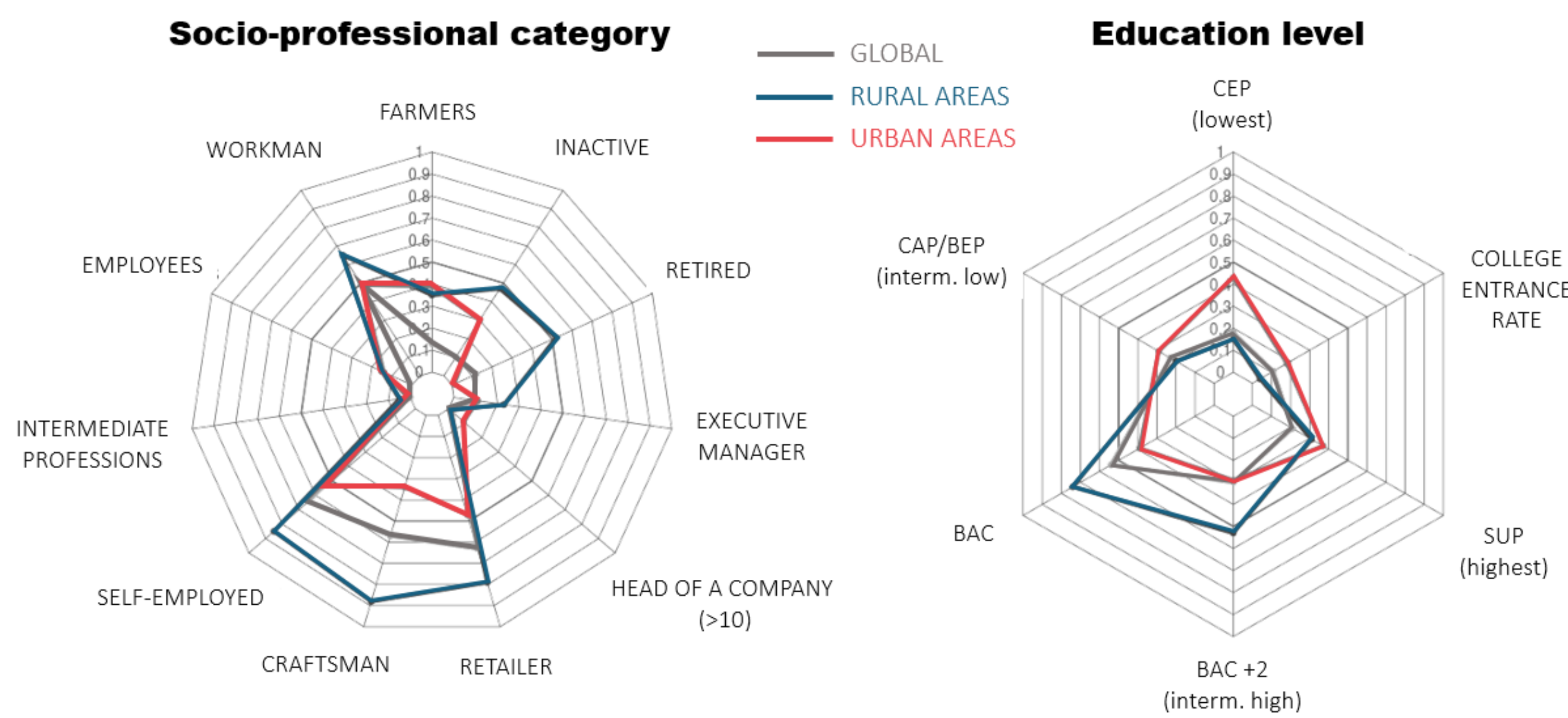
Large disparities of the Human Papillomavirus (HPV) vaccine coverage rates (VCR) are observed over the French territory. Its regional variations range between 10% and 40% for the HPV initiation in 2016. The study aims at identifying clinical and contextual factors explaining such variations. Geostatistics, a branch of spatial statistics, are used to determine key variables among a large set of potential explanatory variables. The approach enables the regionalization of the factors determination. Meaning that different factors may act in different areas of the French territory. Currently, French politic regarding vaccination is at the national level, using tools developed by the French National Cancer Institute. Initiative at the regional level are scarce.

Understanding which community-level or individual-level factors are associated with HPV vaccination is a key aspect for designing targeted programs toward VCR improvement.

Methods

EXPLORATORY DATA ANALYSIS

At the departmental level, the HPV VCR are crossed with a large number sociological, economic, clinical, political and behavioral variables (2016)*. It includes web and social network data. The spatial analysis enables to determine geographical areas which are homogeneous in regard to the observed correlations.



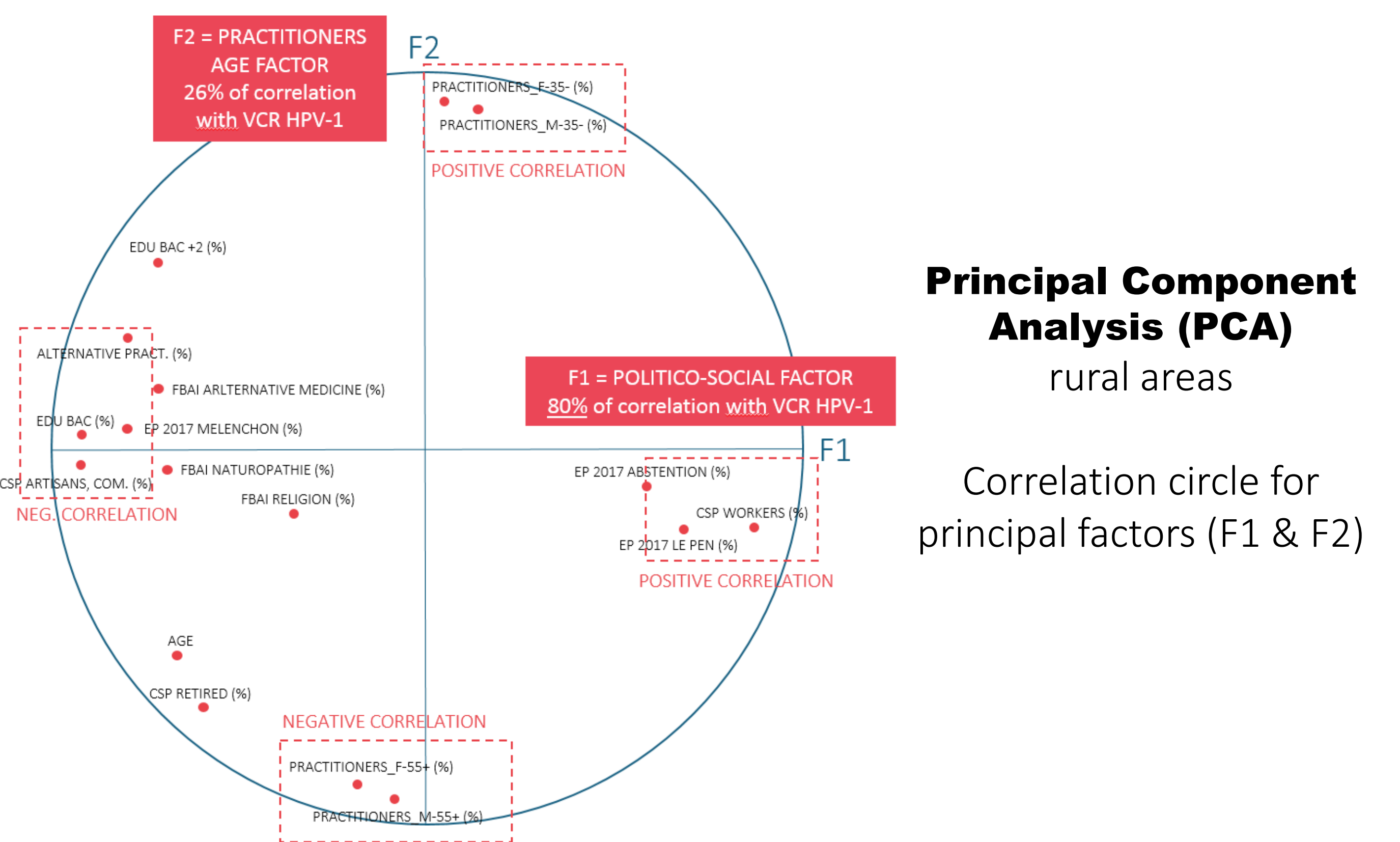
* LIST OF DATA ANALYSED

Open data (city): inhabitants density, mean age, education level (5), education success, socio-professional category (9), living standard (€), poverty rate, unemployment rate, single people rate, immigrants rate, foreigners rate, practitioners demography, practitioners accessibility, density of alternative medicine practitioners, CMU rate, presidential election results (1st round 2017).

Web/Social networks (city-aggregated data), centers of interest: alternative medicine, naturopathy, animals rights, religion, anti-vaccine poll

MULTI-VARIATE ANALYSIS

In each homogeneous area, an PCA is carried out to gather redundant explanatory variables and interpret factors.



Principal Component Analysis (PCA)
rural areas
Correlation circle for principal factors (F1 & F2)

Results

The study shows that HPV VCR spatial variations in France cannot be fully explained by a unique model. Rural areas are more influenced by political and sociological factors (especially socio-professional categories and education level), while urban areas are preferentially associated with economic and migration related factors.

Two secondary geographical areas are determined: Ile-de-France and 10 North Eastern departments. Discriminating them contributes to a better characterization of the VCR variations. The Ile-de-France shows even more economic factors impact than the urban area as a whole, and the North Eastern departments located in the urban area were showing very high level of VCR despite a poorer economic situation.

Conclusions

Our geostatistical modeling approach leads to a better comprehension of the HPV VCR disparities. It is the first time that such innovative method is applied to identify factors influencing HPV VCR. Using this model, future localized vaccination programs should be targeted in specific sub-populations of interest.

Ile-de-France

VCR HPV negative correlations with:
UNEMPLOYMENT, POVERTY, CMU RATE, IMMIGRANTS RATE, NATUROPATHY

North East (NE)

High VCR HPV rates, even with poor economic factors

Urban areas

VCR HPV negative correlations with:
UNEMPLOYMENT, POVERTY, CMU RATE, IMMIGRANTS RATE, NATUROPATHY

Rural areas

VCR HPV negative correlations with:
AGE, CSP-SELF-EMPLOYED & NATUROPATHY

VCR HPV positive correlations with:
EDUCATION-BAC, POLITICIAN-A

