Identifying the key drivers of biosimilar uptake in Paris University Hospitals using a Principal Component Analysis

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INTRODUCTION

Biosimilar (BS) drugs have been on the European market for almost ten years and represent the opportunity to generate cost savings for the healthcare system. In France, the biosimilar prescription target set by the Ministry of Health is 80%. The hospital then represents the first vector likely to favor the market penetration of biosimilars (MPBS).

The study objective is to identify the drivers of biosimilar uptake in the 39 Paris University Hospitals (AP-HP), where the financial impact and the market penetration of biosimilar differ substantially between products, pathologies, and physician prescriptions.

METHODS

Selection of the biosimilar groups

- Seven drugs are included in the analyze, for which biosimilars are in competition with the brand name drug (set by international non-proprietary name INN): infliximab, rituximab, trastuzumab, bevacizumab, adalimumab, etanercept and pegfilgrastim.

Selection of the key variables

- We have selected seven variables whose correlation with the savings made at AP-HP is supposed. They are related to the drug (1) or the competitive environment around it (2) and can positively or negatively impact the MPBS
  - (1) the overall quantity used in AP-HP, the drug reconstitution in hospital pharmacy rather than in units care, the pathology chronicity, the presence of an only one administration route (intravenous route)
  - (2) the tender's long standing, the number of biopharmaceuticals per INN and the drug's availability through retail pharmacies.

Principal Component Analysis (PCA) on R software

- Statistical method to graphically describe the information contained in the database. The seven variables described above have been set as main variables, and the MPBS is set as an additional variable.
- All of these variables were normalized by default when launching the PCA.

SOURCES: National Agency for the Safety of Medicines and Health Products (ANSM), AMELI website (Health Insurance), Theriaque, Social Security Financing Law (LFSS), National Health Strategy, Ministry of Health and Solidarity, APHP internal database (including for tenders)

RESULTS

- In average, MPBS reached 82%. This number corresponds to the average MPBS rate since the first tender for each drug and covers the period from 2016 to 2021. The number of actors and the penetration rate varies according to the years and the drug.
- Regarding the quantities per year, they are stable per product.
- Finally, the significant variables are:
  - drugs that have at least one indication for a chronic pathology: infliximab, adalimumab and etanercept
  - drugs available in retails pharmacies: adalimumab, etanercept and pegfilgrastim
  - drugs reconstituted in hospital pharmacy rather than in units care: rituximab, trastuzumab and bevacizumab
  - drugs that present also a subcutaneous route: rituximab, trastuzumab

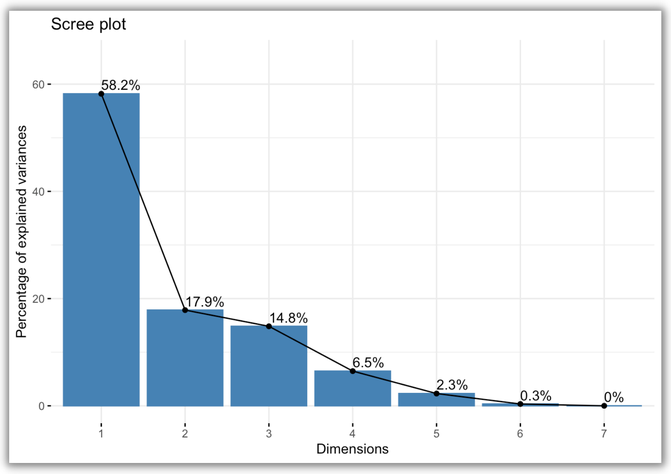


Figure 1 - Barplot representing the percentage of variance explained by each dimension

- In this study, it was first necessary to determine the dimensions to analyze the variables
- A dimension corresponds to the axis with which we observe our data, it is a point of view
- Each dimension is assigned a value that relates the percentage of variance observed
- The dimensions of the PCA chosen are dimensions 1 and 2, which together explain 76.1% of the observed variance

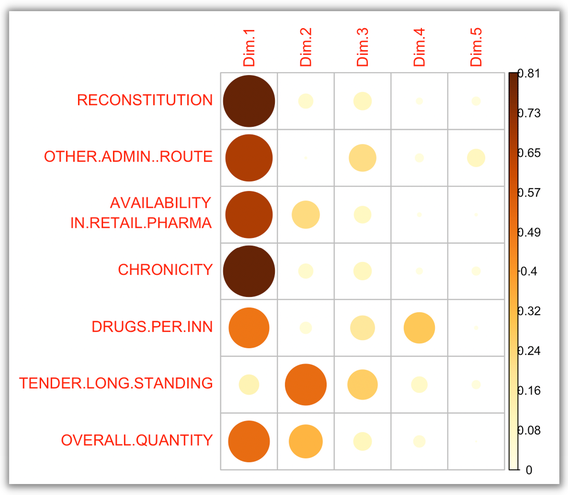
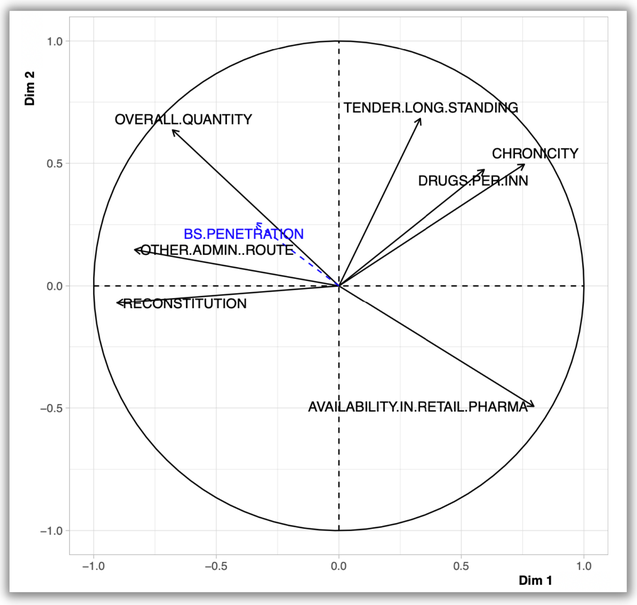


Figure 2 - Heatmap illustrating the quality of representation of the principal component variables using the cos2 function.

- A high cos2 value means that the variable is correctly represented, and will present an arrow close to the circumference on the correlation circle.
- We observe that the variables are best represented on dimensions 1 and 2.
- Indeed, all our variables are represented at more than 50% on dimensions 1 and 2.



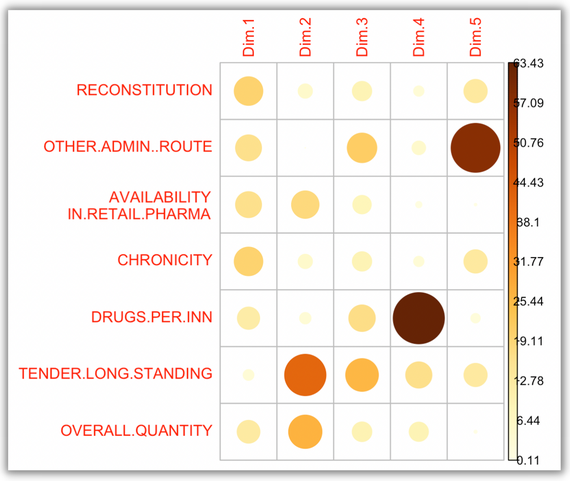


Figure 3 - Heatmap illustrating the contribution of variables to the Principal Components

- We observe this time that on dimensions 1 and 2, some variables do not contribute to correctly explain the variability in our dataset.
- The contribution only determines the impact of a variable on the principal component, it does not indicate whether this impact influences positively or negatively the principal component.

Figure 4 - ACP's Correlation Circle showing the active variables (black arrows) and the additional variable (blue arrow).

- Six variables are positively correlated to MPBS: the overall quantity used in AP-HP, the tender's long standing, the pathology chronicity, the presence of an only one administration route, and the number of biopharmaceuticals per INN.
- Otherwise, the drug's availability through retail pharmacies contributes negatively to the MPBS.

DISCUSSION - CONCLUSION

Our results suggest that MPBS is related to AP-HP drug policy for biopharmaceuticals mainly used at hospital, which represent a significant financial issue (high volume consumed, long standing tenders). The analysis was carried out only on dimensions 1 and 2, although they do not contribute to explain correctly the variance according to the variables. It would then be necessary to analyze each variable in the dimension where it contributes the most and to synthesize the results obtained. Future researches should be conducted in each AP-HP facility to confirm the findings and should broaden the analysis to other hospitals.

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