VARIATIONS IN PRACTICES

Methodology and elements of interpretation

Selection of themes, elements of data interpretation and analysis method of variations in medical practices

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1. INTRODUCTION

The Appropriate Care Unit was created within the Research-Development-Quality Directorate of the NIHDI's Healthcare Service as a result of the NIHDI's 2016-2018 Administration Contract[1]. In Article 35, this Contract refers to 'the setting up of an Appropriate Care Unit targeting, more specifically, an integrated approach to the rational use of resources'. The Appropriate Care Unit was set up since the second quarter 2017.

The concrete implementation of the Unit was formalised in the '2016-2017 Healthcare Monitoring Action Plan', published by the NIHDI on 18 July 2016[2]. This plan lists around thirty measures aimed at optimizing health-care efficiency by encouraging appropriate practices and by avoiding unnecessary cares.

The plan states that the tasks of the Appropriate Care Unit include analysing the 'relevance of care', with the aim of identifying unexplained variations in consumption emerging after standardisation of the Belgian population. These variations are indeed potentially a sign of non-optimal use of resources.

The reports of 'variations in medical practice' contain the analyses carried out in this context. Each report focuses on a particular topic. The purpose of this document is to set out the overall shared methodology followed in all these analyses.

[1] (National Institute for Health and Disability Insurance, 2016)
[2] (National Institute for Health and Disability Insurance, 2016)

2. CHOICE OF TOPICS

Each 'variations in medical practice' report focuses on one practice. This practice generally covers several nomenclature codes that are selected for their direct link to the practice, whether in terms of volume of intervention or expenditure.

The choice of practices selected for analysis is made according to different criteria. These criteria, which are detailed below, are (in no particular order): availability of data, coverage of specialties, existence of complementary equipment, topicality, potential benefits, existence of a professional network and obsolescence of practices.

1. Availability of data

Our Unit can only carry out analyses when the necessary databases are available. The database that is mainly used is the NIHDI's N Documents. The use of this data base is a restricting factor in the choice of topics. For example, these data do not allow us to assess the redundancy of a practice or the combination of techniques for one patient. Later on, we will describe how we partially compensate for this lack by combining the analysis of the N Documents with those of P, SHA and ADH Documents of the NIHDI.

2. Coverage of specialties

The topics chosen for analysis cover the various fields of medicine. Our objective is that as many specialties as possible be represented through these analyses in order, on the one hand, to be sufficiently extensive and, on the other hand, to avoid any stigmatisation of one specialty in relation to another. In addition, our ambition in the long run is that each specialty should benefit from a complete overview of its practice through an exhaustive analysis of its own nomenclature.

3. Existence of complementary equipment

Our analyses are consolidated by the existence of extra analytical documentation on medical practice. This documentation may be internal (e.g. a report from the MEID[3]), national (e.g. reports from insurance funds or the KCE[4]), or international (similar analyses carried out in other countries). The existence of this material undoubtedly strengthens our analysis through the different angles of approach and the comparability of the data that it allows.

4. Topicality

We may prioritise certain topics on the basis of current concerns or specific requests from the authorities, as long as the data are available.

[3] NIHDI's Medical Evaluation and Inspection Department
[4] Belgian Healthcare Knowledge Centre

5. Potential benefits

We have identified the most prescribed codes by each medical specialty over the past year. From these codes, we were able to deduce a number of common practices within these fields. Given the frequency of these practices, our analyses will be of greater benefit for the general public, in terms of accessibility and quality of care, if unexplained variations are indeed observed.

6. Existence of a professional network

Through their informed viewpoint and through the intermediary they represent with service providers, the availability of scientific contacts linked to the practice being analysed contributes greatly to the impact that this analysis can have on the improvement of practices.

7. Obsolescence of practices

The analysis of obsolete or questionable practices is of particular interest in identifying their residual or problematic use. Such practices are identified, inter alia, by referring to national (KCE) and international recommendations such as the NICE[5] or Choosing wisely[6] recommendations.

[5] National Institute for Health and Care Excellence (https://www.nice.org.uk)
[6] http://www.choosingwisely.org

3. ANALYSIS METHODOLOGY

A. Sources of data

1. N Documents

Our analyses are mainly based on the data in the NIHDI's N Documents.

The N Documents are data sent monthly, within three months, by the insurer-organisations to the NIHDI. These data include the number of services, their dates and the fees. Every six months these data are compiled and supplemented by the insurance funds by adding data on patients: age, gender, social category and district of residence.

Note that regarding patients' age, since 2009, data on people aged 95 and over have been grouped in N Documents.

The data in the N Documents does not allow us to group the services provided to an individual patient. As mentioned above, this limitation does have an impact on our initial selection of topics for analysis. Indeed, using N Documents alone, we cannot validly analyse services that are likely to be repeated within a year for the same patient or bilateral treatments that are potentially duplicated due to their bilateral nature. Nor can we analyse cases where various practices are combined to treat one patient. For these cases, we must use other databases, as explained in the next point.

From 2019 onwards, the analyses take into account the expenditure on services associated with the GPS system (global payment with standardization) introduced that year. Where applicable, the proportion of these lump sums attributable to services is systematically included in the expenditure mentioned.

Note: The N documents are not used in cases where a selection filter has been applied at the level of the health care providers, as the qualification of the latter is not collected in the N documents. In this case, the P documents are used. Due to the inherent limitations of this database, the start of the analysis period is then set at 2015 at the earliest.

2. Combined data

Analysis of combined data, taken from the P, ADH and SHA Documents, usually enables us to supplement data in the N Documents (or P documents in the case that a selection filter is applied on the care providers) with further information on the redundancy of identical or similar practices for the same patient over a year of service, as well as identifying the type of care (outpatient or hospital care).

The P Documents contain data sent semi-annually and within four months by the insurer-organisations to the NIHDI. These data include the services provided by health care providers in the outpatient and hospital sectors, per provider, per prescribing doctor or per hospital establishment.

The ADH and SHA data are sent annually and within six months by the insurer-organisations to the NIHDI. They include all the services provided respectively in day admission and standard hospitalisation, in general hospitals per hospital stay.

It is possible to consolidate P document data with ADH and SHA data for a given service year for each insured person. This consolidation is carried out when the insured's pseudonymised identifiers are sent to us.

For the purposes of our analyses, consolidation by insured person is only carried out for the most recent complete service year available, most often the year preceding the last year of the analysis period, and makes it possible to calculate a division factor by which the annual number of services derived from N documents can be divided to estimate the corresponding **number of patients**.

This division factor is calculated separately for each patient demographic category (i.e. by province of residence, age group, gender and reimbursement scheme).

Dividing the annual number of services by this factor also makes it possible to calculate a utilization rate (of patients) per 100,000 insured and to estimate the rate of expenditure per patient, over the entire analysis period.

The average values of the dividing factors - also known as 'occurrences per year' - and the expenditure per patient are summarised for each analysis in chapter 3. Results, section G. Standardised healthcare expenditure borne by the insurance, in the table 'Standardised expenditure per patient and occurrences of practice per patient, by demographic category'. An example is presented below, in section D. Indicators: graphs and tables.

B. Selection of analyses and extraction of raw data

The selections concern the nomenclature codes to be analysed as well as the population of insured persons taken into account in the analysis:

Selection of codes: Each analysis covers a number of codes relating to the practice under analysis that are used either in the analysis of the volume of services provided, or expenditures, or both. The nomenclature codes used to examine the number of services and expenses are therefore not necessarily identical.

Filter used for insured population: Where appropriate, certain filters may have been applied in order to limit the number of patients considered in the analysis. The filters may be based on gender or age or other criteria (for example, the number of caesarean sections will be reported at delivery, hysterectomies for women, prostatectomies for men).

Some analyses are also filtered according to the qualifications of the care providers. In this case, the data is referred to the general population.

By default, the period of analysis covers the last eleven years of available data (accounting years, for example 2013-2023). This period may be shortened if the analysis over the eleven-year period does not

give a sufficiently uniform analysis, because the number or coverage of the codes has fluctuated during this time.

For each nomenclature code, the following variables are extracted by district, gender, age [7] and reimbursement scheme:

- The **number of insured persons** for whom we know the district (of residence), gender, age and reimbursement scheme
- The **number of services provided** to patients for whom we know the district (of residence), gender, age and reimbursement scheme (as long as this code is included in the analysis of number of services, otherwise no services are taken into account)
- **Expenditure** for patients with known district (of residence), gender, age and preferential scheme (as long as this code is included in the expenditure being analysed – otherwise, the expenditure is not taken into account)

Grouping of districts: Districts with fewer than 100,000 people insured are associated with a neighbouring district in the same province. In all our analyses, the following districts are therefore grouped together: Oostende/Veurne, Ieper/Diksmuide, Roeselare/Tielt, Gent/Eeklo, Charleroi/Thuin, Huy/Waremme, Namur/Philippeville, Neufchâteau/Marche-en-Famenne, Virton/Bastogne/Arlon. These groupings and labels apply to all measurements, maps and graphs produced by district. In all the analyses as well as in this document, the notion of grouped district is reflected in the use of the term "district*".

[7] Since 2009, data on persons aged 95 and older are grouped together in the N Documents. For the purpose of our analyses, we also applied this rule to data previous to 2009.

C. Standardisation of data

The standardised analysis documents present data from 5 different standardisations. These standardisations concern the usage rates (of patients) per 100,000 insured persons and of expenditure per insured person, and are carried out on the basis of:

i. the age, the gender and the reimbursement scheme of the patient in order to obtain data per **domicile** (district* or province or region)
ii. the age and the gender of the patient in order to obtain data per **domicile** (district* or province or region) and **reimbursement scheme**
iii. the age and the reimbursement scheme of the patient in order to obtain data per **domicile** (district* or province or region) and **gender**
iv. the patient's reimbursement scheme in order to obtain data on the basis of the **residence (of the insured)** (district*, province or region), **age group**[8] and **gender**. Standardisation is adjusted by a factor taking into account the age share per age group and per gender.
v. the patient's reimbursement scheme to obtain data per **age group** and per **gender**. Standardisation is adjusted by a factor taking into account the age share per age group and per gender.

The standardisation consists of 3 steps, which are described in the paragraphs below:

1. Calculation of the non-standardised annual usage and expenditure rates
2. Calculation of the distribution in the total population of the last year of the analysis period
3. Calculation of the standardised annual usage and expenditure rates

1. Calculation of the non-standardised annual usage and expenditure rates

For standardisations used to obtain data per location (patient's domicile) (standardisations i, ii, iii and iv), we calculate the annual usage rate per 100,000 insured, and the expenditure per insured per location (district*, province or region), broken down by gender, age and reimbursement scheme. For the standardisation where data should not be obtained on the basis of the patient's domicile (standardisation v), these values are calculated by gender, age and reimbursement scheme.

2. Calculation of the distribution in the total population

Different distributions are used for the different standardisations, and these are calculated on the basis of the total Belgian population of the last year of the analysis period, i.e. all insured persons residing in Belgium for which the district, the gender, age and reimbursement scheme are known or estimated (When filtering on age, sex or deliveries, only the population concerned is selected).

[8] Since 2009, data on persons aged 95 and older are grouped together in the N Documents. For the purpose of our analyses, we also applied this rule to data previous to 2009.

The calculated distributions are as follows:

i. the **age-gender-reimbursement scheme** distribution, to standardise the data on the basis of the age, the gender, and the reimbursement scheme of the patient
   - The age-gender-reimbursement scheme distribution is calculated as the number of insured persons by age, gender and reimbursement scheme relative to the total number of insured persons in the Belgian population.

ii. the **age-gender** distribution, to standardise the data on the basis of the age and the gender of the insured person.
   - The age-gender distribution is calculated as the number of insured persons by age and gender relative to the total number of insured persons in the Belgian population.

iii. the **age-reimbursement scheme** distribution, to standardise the data on the basis of the age and the reimbursement scheme of the patient
   - The age-reimbursement scheme distribution is calculated as the number of insured persons by age and reimbursement scheme relative to the total number of insured persons in the Belgian population.

iv. & v. the **reimbursement scheme** distribution, to standardise the data on the basis of the patient's reimbursement scheme
   - The distribution of the reimbursement scheme is calculated as the number of insured persons per reimbursement scheme compared to the total number of insured persons in the Belgian population.
   - For data presented per age group and sex, the standardisation is adjusted by a factor taking into account the age share per age group and per sex.

Note: To estimate the total population, we consider the maximum number of insured domiciled in each district at three key points in time: 1 January, 30 June and 31 December of the calendar year in question, by age, sex and reimbursement scheme. This total will therefore be greater than the number of insured at the beginning or end of the calendar year.

3. Calculation of standardised annual usage and expenditure rates

The standardised annual usage and expenditure rates are calculated by multiplying the non-standardised rates by the concerned breakdown and adding them together on the basis of the insured person's domicile (standardisation i), the patient's domicile and reimbursement scheme (standardisation ii), the patient's domicile and gender (standardisation iii), the patient's domicile, age group and gender (standardisation iv) and by age group and gender (standardisation v).

For standardised expenditure, in addition to the rate of expenditure per insured person, the rate of estimated expenditure per patient is also calculated. This indicator is calculated as follows

➔ Estimated standardised expenditure per patient =
Standardised expenditure per insured person * 100,000 / Standardised utilisation rate per 100,000 insured persons

D. Indicators: graphs and tables

Note: 2020 was indicated on the evolution graphs by a vertical dashed line, in order to draw the attention on the impact of the COVID-19 crisis.

Note 2 : On January 1, 2019, several modifications were made to the geographical division of the districts of the province of Hainaut. These modifications have an impact on the results published for the province of Hainaut starting from 2019. The list of districts affected by these changes is available at https://statbel.fgov.be/en/news/modification-nsi-codes-municipalities-and-administrative-districts-1st-january-2019.

1. Table: NIHDI nomenclature codes selected for the analysis

The table 'NIHDI nomenclature codes selected for the analysis' contains the outpatient and hospital nomenclature codes covered by the analysis, specifying whether or not these codes are included in the number of healthcare services ('used for rates?') and/or in the expenditure ('used as expenditure?'). It also gives their wording, their creation date, their possible deletion date, the N group to which the codes belong, and their value. The table also has two columns entitled 'Inclusive' and 'Exclusive': these are to be filled in where there is an additional conditional rule stating that the code is used to include certain services in the analysis (*this code must be attested to account for the service*) or to exclude them (*the service can only be accounted for if this code is not attested*).

The list of codes used for 'expenditure' is not intended to be exhaustive. Only those codes directly related to the practice under review are included here, as well as, depending on the case, additional codes (fees, equipment, etc.), if they are exclusively related to the practice under review. The evaluation of expenses is therefore underestimated, since, in order to be complete, we would need to take into account a whole series of related costs which we do not intend to analyse here.

2. Table: Past history of nomenclature codes

The table 'History of nomenclature codes' shows how the nomenclature codes have changed within the period considered with regard to their wording, their N group and their value. If there have been no changes during the target period, only the current data is displayed.

3. Graph: Trends in the breakdown nomenclature codes provided, by volume

This graph is a 100% stacked bar chart, showing the relative distribution of the percentages of services delivered, by nomenclature code, over the years. The graph only represents the nomenclature codes used to determine the volume of services provided, excluding those that would be used only in expenditures. If more than 15 nomenclature codes (or combinations of codes) were to be presented in a graph, only those nomenclature codes representing **more than 5% of services** in at last one year are shown. Nomenclature codes representing less than 5% of services are then grouped in a category called 'Other'.

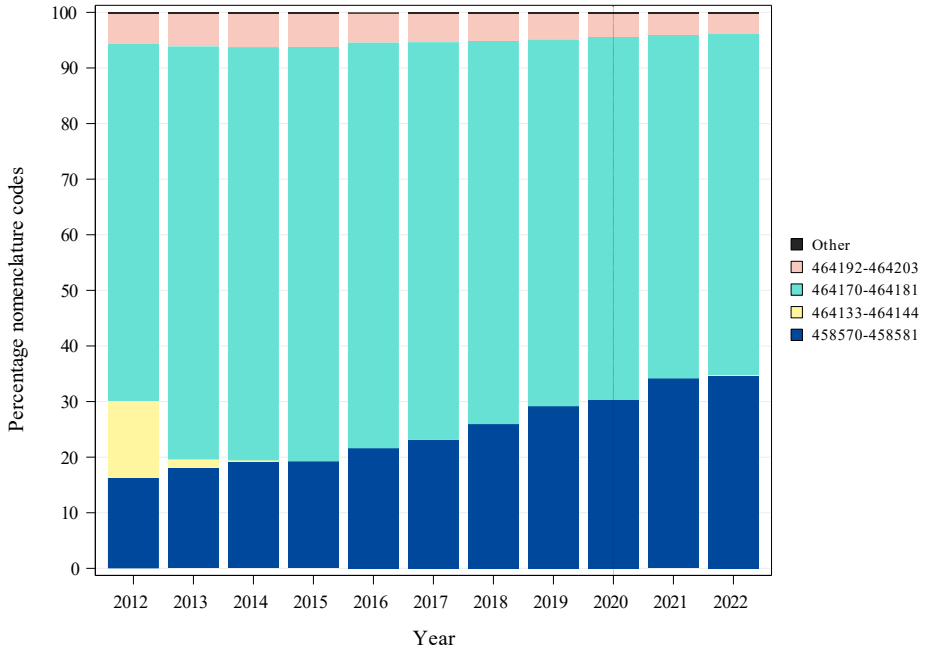


Figure 1 Example of a graph showing the trends in breakdown of nomenclature codes provided, by volume

4. Table: Specialisation of healthcare providers

In this table and throughout the analysis, unless otherwise stated, the figures presented are for the last year of the analysis period (e.g. 2023 if the period analysed is 2013-2023).

The table *Specialty of healthcare providers* contains the following data per speciality:

- Total number of healthcare providers: the number of healthcare providers per specialty who have certified more than one service
- Relevant healthcare providers: the number of providers who have certified, more than once, one of the nomenclature codes covered by the analysis
- % providers: the percentage of the 'total number of healthcare providers' per specialty, compared to the number of 'relevant healthcare providers'

- Median number of healthcare services: the median number of healthcare services per 'relevant healthcare provider'
- Q3 of the healthcare services, or the third quartile or the P75 : Value of the number of healthcare services that is higher than the annual number of healthcare services of 75% of the healthcare providers, but lower than the number of healthcare services of the 25% remaining providers.
- % services: the annual number of healthcare services certified per specialty, as a percentage of the total number of services

Notes:

- Specialties which account for less than 1% of the total number of services provided are grouped together in the 'Other specialties' category.
- For specialities with fewer than 5 providers, either in total or in terms of the number of providers involved, the number is replaced by the value '< 5', to comply with confidentiality rules.
- As the data per specialty comes from the P documents that are eventually available later, it is possible that the numbers are calculated based on one accounting semester and extrapolated in order to correspond to a complete year. In this case, a note will be mentioned in the table.

5. Table: Specialisation of prescribers

The *Specialty of prescribers* table contains the following data per specialty:

- Total number of prescribers: the number of prescribers per specialty who have prescribed more than one of the codes under analysis
- Relevant prescribers: the number of prescribers prescribing the nomenclature codes under analysis
- % prescribers: the 'relevant prescribers' as a percentage of the 'total number of prescribers'
- Median prescription: the median number of services prescribed by each 'relevant prescriber'
- Q3 of the services prescribed, or the third quartile or the P75 : value of the number of services that is higher than the annual number of healthcare services of 75% of the healthcare prescribers, but lower than the number of services of the 25% remaining prescribers.
- % Prescriptions: the number of prescriptions per year per specialty, as a percentage of the total number of prescriptions

Notes:

- Specialties accounting for less than 1% of the total number of healthcare services provided are grouped in the 'Other specialties' category.
- For specialities with fewer than 5 providers, either in total or in terms of the number of prescribers involved, the number is replaced by the value '< 5', to comply with confidentiality rules.
- Where 'No application' appears in the table, this specialisation counts as 1 in the total number of prescribers concerned.

- If there was no prescriber for the service being analysed, the table will not be displayed.
- As the data per specialty comes from the P documents that are eventually available later, it is possible that the numbers are calculated based on one accounting semester and extrapolated in order to correspond to a complete year. In this case, a note will be mentioned in the table.

6. Table: National standardised usage rate

The number of services per year, estimated number of patients per year and utilisation rate refer to the last year of the analysis period.

The estimated number of patients per year is obtained by dividing the number of health care services for the last year of the analysis period by the division factors specific to the different demographic categories of patients (see also combined data).

The 'usage rate per 100,000 insured persons' is the estimated number of insured persons (patients) who used the practice during the year, per 100,000 insured persons.

The division factors specific to the demographic categories, as well as the average occurrences per day, per year and total, are calculated on the basis of the most recent year of service that allows data per insured person to be consolidated (2022 in the case of analyses covering the period 2013-2023).

The total average occurrence represents the average division factor, all demographic categories combined.

	TOTAL
Number of services per year	*83.541*
Average occurrence per patient per day (average number of services per day)	1,00
Average occurrence per patient per year (average number of days per year)	1,19
Total average occurrence (divides the number of services)	1,19
Estimated number of patients per year	*70.404*
Standardised usage rate per 100 000 insured persons	611

Figure 2 Example of a table with the national standardised usage rate

7. Graph: Standardised usage rate and coefficient of variation by age group and by gender

The standardised rate of use by age group (see Figure 3) is presented in a bar chart by gender. The associated coefficient of variation is shown by a red line above the bar chart. The coefficient of variation is a relative measurement of the magnitude of geographical variations. To calculate this coefficient, the standard deviation is divided by the average standardised rate of use per district*. The vertical axis on the left side of the graph shows the standardised rate of use, and the right-hand axis shows the coefficient of variation. The horizontal axis shows the distribution by age groups. The horizontal blue dashed lines represent the total annual rate of use, and the red dashed lines show the overall coefficient of variation (i.e. all age groups combined).

The line of the coefficient of variation is thicker for those age groups for which the value of the coefficient can be validly interpreted, i.e. if that age group is sufficiently represented by its size and by its rate of use of the particular practice.

If a selection is made by gender, only the graph relating to the selected gender is presented. If a selection is made by age, the value of the bars will be zero for groups that contain none of the selected ages.

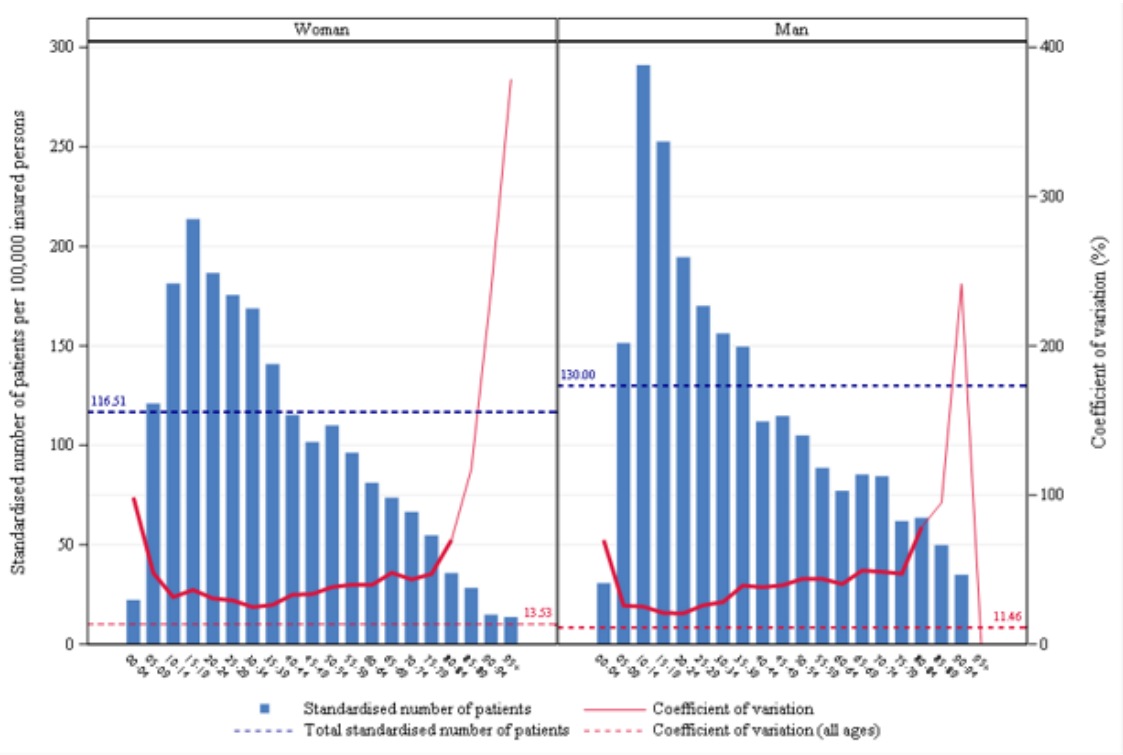


Figure 3 Example of a graph by age group and by gender, with the coefficient of variation

8. Graph: Comparison of standardised usage rates, by gender

On this graph, annual rates of use are shown, by age group, for each gender. A green curve is used for women, and a grey curve for men.

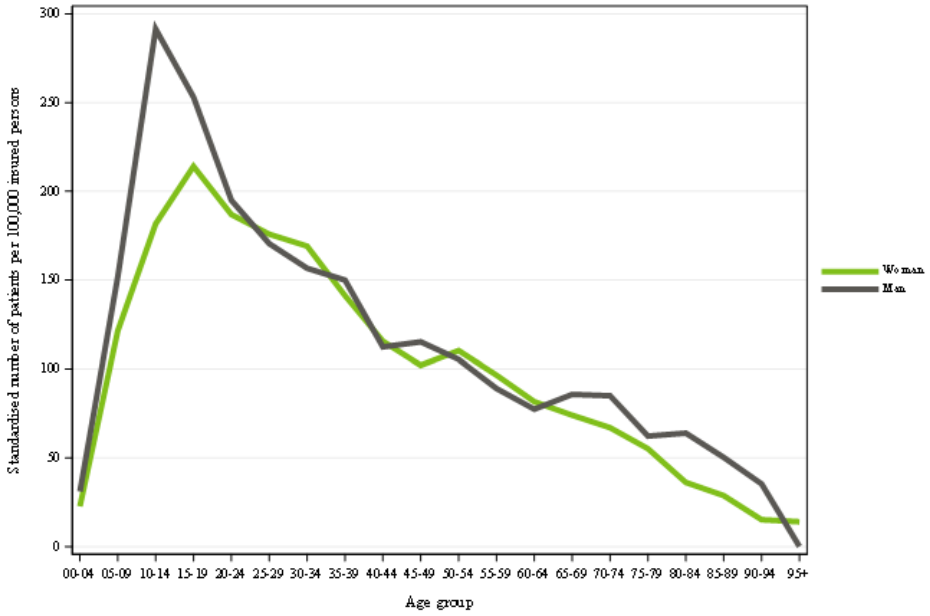


Figure 4 Example of a graph showing annual usage rates, by age group and by gender

9. Graph: Standardised usage rates by gender and by province

Standardised annual rates of use by province (based on the place of residence of the patient), and by gender, are represented by a bar chart with double bars (see Figure 5). The grey bars correspond to the standardised annual rates of use for men, while the green bars show the standardised annual rates of use for women. The grey and green dashed lines show the total annual rates of use for men and women, respectively. If a selection is made by gender on the population, this graph will not be displayed.

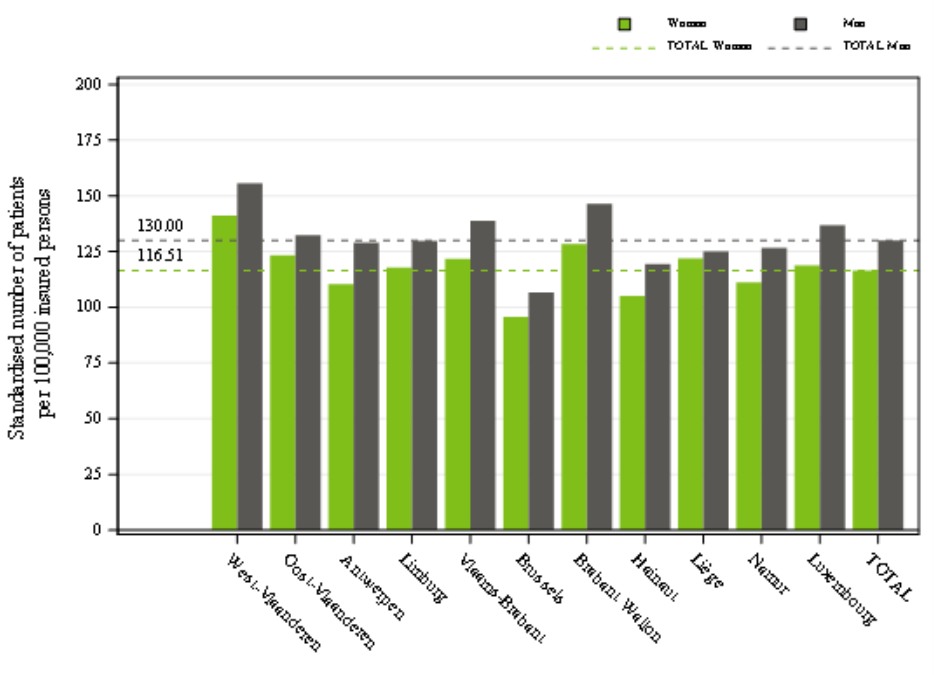


Figure 5 Example of a graph showing usage rates by province and by gender

10. Graph: Rate of outpatient care

The percentage of outpatient services, i.e. the number of outpatient services provided as a proportion of all services provided (outpatient and hospital), is shown by a bar chart (see Figure 6). This contains one bar per region, as well as a bar for Belgium as a whole which is also represented by a dotted line.

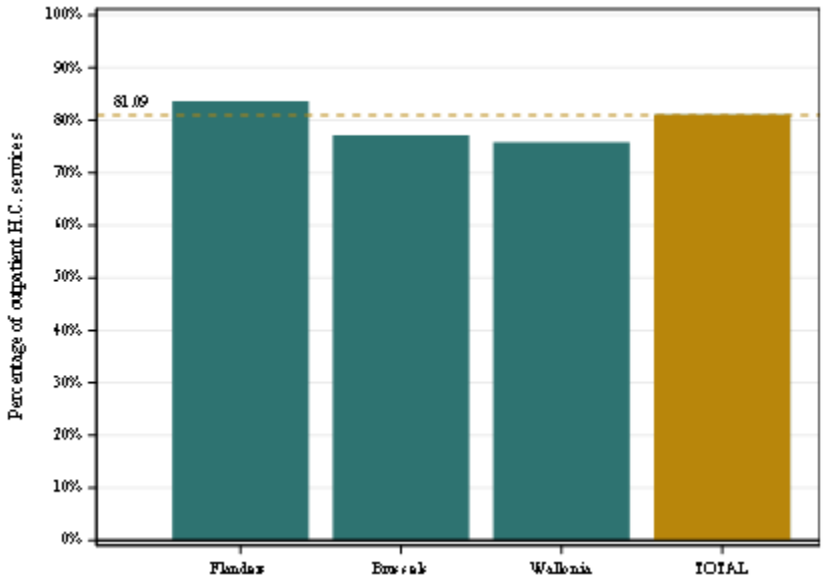


Figure 6 Example of a graph showing the percentages of outpatient care, by region

11. Graph: Trends in the percentage of outpatient care by province

The graph relating to the evolution of the percentage of outpatient services over the years contains a coloured line per province, and a black line for the Belgian population as a whole (see Figure 7). The horizontal axis shows the years of the analysis period. The vertical axis gives the percentage of outpatient services (1=100%). The colors are specific to each region : blue for Flanders, green for Brussels and ochre for Wallonia.

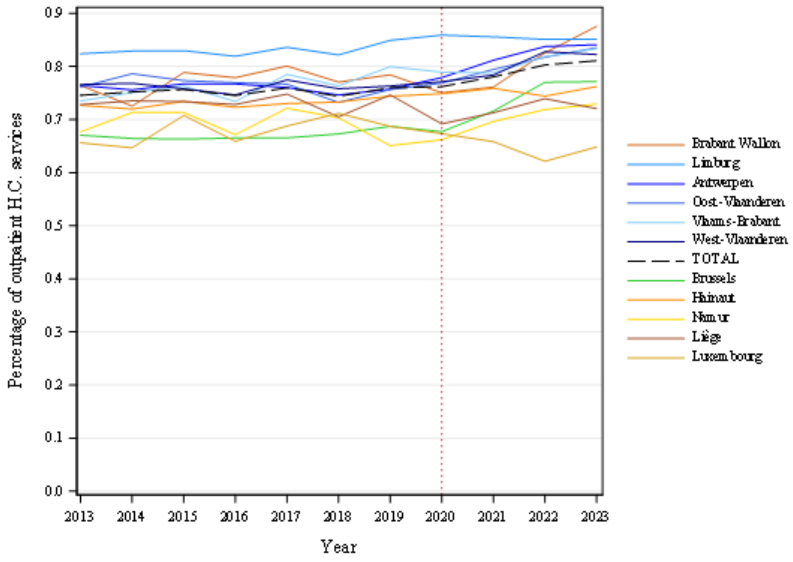


Figure 7 Example of a graph showing the change in the percentage of outpatient services per province

12. Graph: Standardised usage rate by reimbursement scheme and by region

The standardised annual rates of use by region of the patient's residence and by applicable reimbursement scheme are shown by a bar chart (see Figure 8). The red bars are the standardised annual rates of use of insured persons eligible for a preferential scheme. The grey bars are the standardised annual rates of use of insured persons without a preferential scheme. The red dashed line shows the total annual rates of use for patients covered by a preferential scheme, while the grey dashed line shows these rates for patients not covered by a preferential scheme.

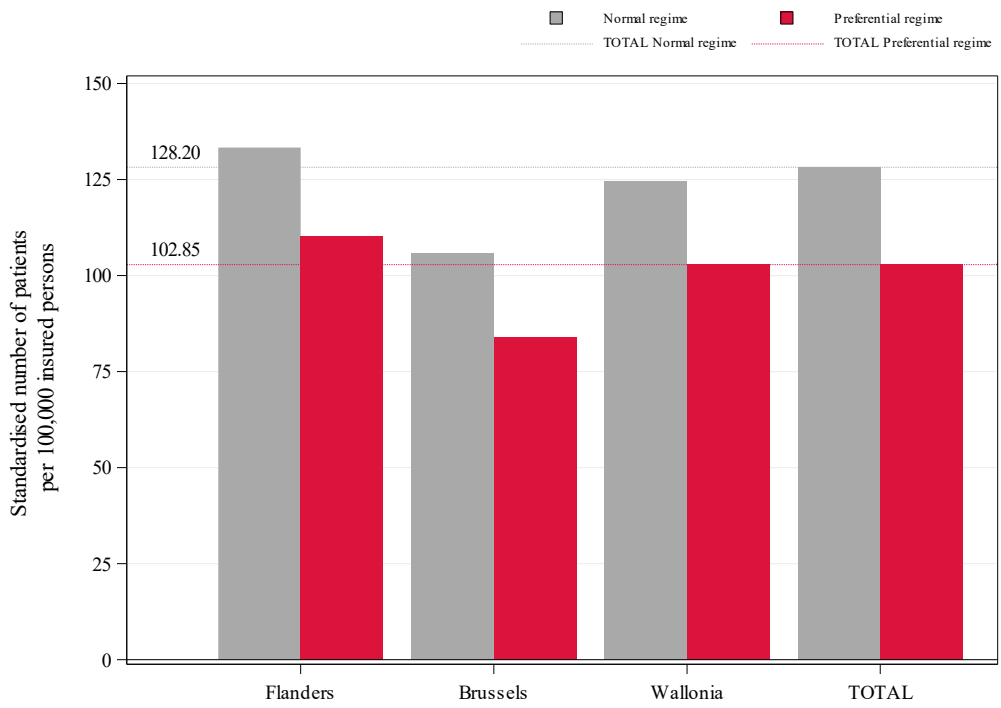


Figure 8 Example of a graph showing the rates of use by region and by reimbursement scheme

13. Table: Trends in the standardised usage rate per 100 000 insured persons

	TOTAL	Statistical significance
Estimated number of patients per year	***126.147***	
Trend (2012-2022)	**3,30%**	***** (3,61%)**
Trend (2012-2019)	3,24%	NS
Trend (2019-2022)	3,41%	

This table shows on the national level:

- The average yearly growth percentage for the entire analysis period
- The average yearly growth percentage for the first period of analysis (that precedes the last three or four years[9])
- The average yearly growth percentage for the last three of four years of analysis

[9] Usually, the trend over the last three years is compared with the trend over the preceding years. For analyses up to the year 2022, the trend for the last four years is compared with the trend for previous years to avoid the problem associated with the COVID year 2020.

- The statistical significance of the trend test on the whole period of analysis, based on a regression model (if the model allows) and the corresponding average yearly growth (between brackets) as estimated by the regression model
- The statistical significance of the test for the change in trend for the last three or four years, based on a regression model (if the model allows)

To know whether the trend on the entire analysis period is significant, a linear mixed model is fitted on the log of the rate of use per 100.000 insured. This model defines a regression line per province and calculates the slope. A significance test for the slope is done at the level of each province, region and at the national level. The test at the national level is shown in the table. Data for 2020 are excluded from the model.

The test for the change in slope is described below in the section «*Table: Trends in rates of use by province and region* ».

The significance level is fixed at 5%. The significance of the tests is indicated by *** (P-value $\leqslant$ 0.001) very significant, ** (P-value $\leqslant$ 0.01), * (P-value $\leqslant$ 0.05) or NS (P-value > 0.05) for a non-significant result. If the significance tests are not available, the significance is indicated as NA.

14. Table: Trends in rates of use by province and region

The table '*Comparison of trends per province and per region*' relates to the last eleven years (as long as the data are available for each year). The title of each column indicates for which periods the data are available. All the data (years, regions and provinces) were standardised with respect to the structure of the population of insured persons of the last year (age , gender and scheme of reimbursement).

The table contains the following data per province and per region, as well as for the entire Belgian population. The rates of use are standardised per 100,000 insured persons :

- The standardised rate of use for the last year
- The average annual growth percentage for (maximum) the entire analysis period
- The average annual growth percentage in the last three or four years of analysis
- The average annual growth percentage for the years before the last three or four years
- The significance of the test for change in slope from the regression analysis, where available

The average annual growth percentage is calculated using the following formula:

$$Annual\ growth\ percentage = \left(\frac{standardised\ usage\ rate_{last\ year}}{standardised\ usage\ rate_{first\ year}}\right)^{\frac{1}{last\ year - first\ year}} - 1$$

In order to find out whether the trend of the data in the last years has changed compared to the trend in the years before, a linear mixed model in two steps was used on the log of the rate of use per 100.000 insured. On the one hand, each model fits a separate regression line per province and on the other hand it calculates the change in slope for the last three years of the analysis period compared to the period before.

The first step tests whether the trend in the last years is different from the trend in the years before at the national level. If that change in slope is significant, a second model is fitted that allows the change in slope to vary by province. The report shows the results of the statistical tests for the change in slope. The first model shows the significance at the national level only. If the test at the national level is significant, the second model shows the significance at the level of the province, region and for Belgium.

The significance level is fixed at 5%. The significance of the tests is indicated by *** (P-value ≤ 0.001) very significant, ** (P-value ≤ 0.01), * (P-value ≤ 0.05) or NS (P-value > 0.05) for a non-significant result. If the significance tests are not available the significance is indicated as NA.

The data of 2020 are excluded from these models.

The graphs below (see Figure 9) are examples of provinces in which the change in slope for the last three years of the analysis period compared to the years before is significant (L) and not significant (R).

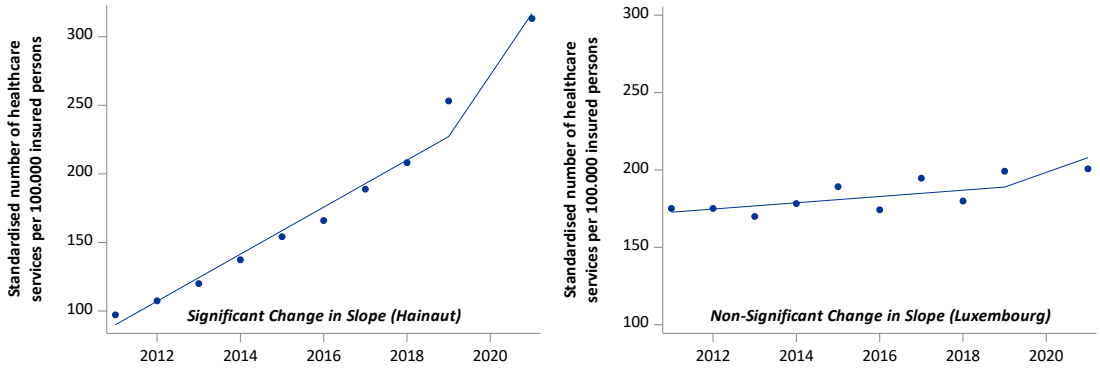


Figure 9 Significant (on the left) and non-significant (on the right) change in slope for the last three years of the analysis period compared to the years before (fictitious examples)

The following table corresponds to the analysis from which the graphs above are issued.

	Standardised rate of use per 100,000 insured persons in 2021	Annual growth of standardized rate of use 2011-2021	Annual growth of standardized rate of use 2011-2019	Annual growth of standardized rate of use 2019-2021	P Value t-test
Province					
Flandre occidentale	241,26	7.39%	6.10%	12.73%	0,027 *
Flandre orientale	220,38	4.25%	3.84%	5.91%	0,076 NS
Anvers	266,76	8.69%	7.59%	13.16%	0,017 *
Limbourg	318,99	5.02%	4.50%	7.12%	0,020 *

	Standardised rate of use per 100,000 insured persons in 2021	Annual growth of standardized rate of use 2011-2021	Annual growth of standardized rate of use 2011-2019	Annual growth of standardized rate of use 2019-2021	P Value t-test
Brabant flamand	266,21	5.80%	4.12%	12.78%	0,022 *
Bruxelles	175,46	12.12%	9.48%	23.34%	0,011 *
Brabant wallon	278,36	7.67%	4.87%	19.61%	0,012 *
Hainaut	313,25	12.42%	12.71%	11.24%	0,008 **
Liège	255,46	8.96%	8.63%	10.29%	0,021 *
Namur	279,41	10.13%	9.97%	10.80%	0,011 *
Luxembourg	200,72	1.37%	1.62%	0.39%	0,227 NS
Région					
Flandre	255,41	6.42%	5.39%	10.63%	0,273 NS
Bruxelles	175,46	12.12%	9.48%	23.34%	0,011 *
Wallonie	278,32	9.62%	9.29%	10.96%	0,090 NS
TOTAL	253,50	7.74%	6.85%	11.36%	0,000 **

As a visual illustration of the evolution of the rate of use by province as estimated by the mixed regression model, Figure 10 Trend break assessment model by province – Regression lines, was added to the report. As the data of 2020 were excluded from this analysis, they were indicated on the graph for information.

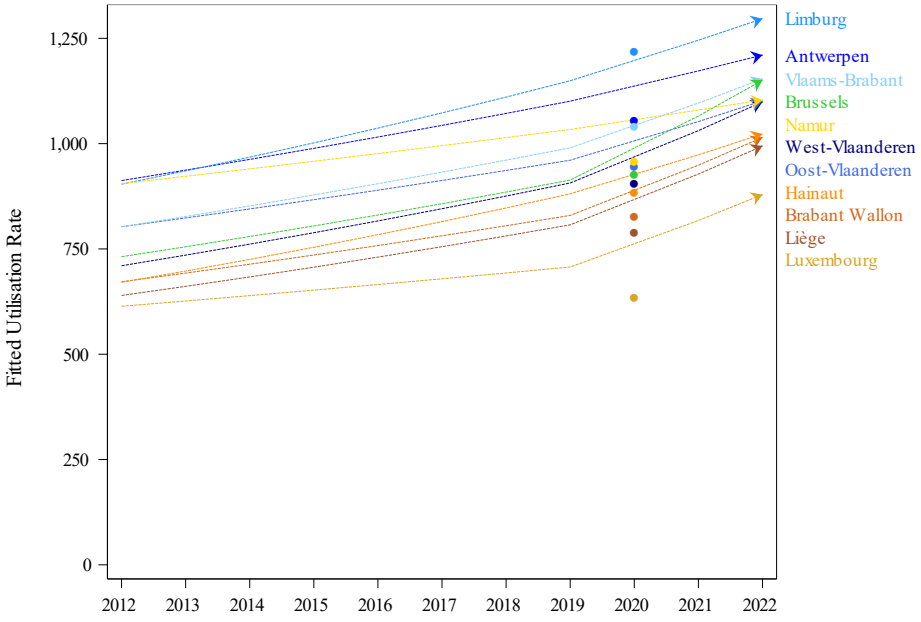


Figure 10 Trend break assessment model by province – Regression lines

15. Graph: Trend in standardised usage rates

The change in the usage rates is illustrated by two graphs, one showing the regions and the other showing the districts* (see Figure 11). These graphs contain a coloured line by place (region or district*) and a black line for the Belgian population as a whole. On the horizontal axis are indicated the years, from the first up to and including the last, of the period of analysis for which services are recorded. The vertical axis shows the standardised rate, i.e. the standardised number of patients per 100,000 persons insured. The colors are specific to each region : blue for Flanders, green for Brussels and ochre for Wallonia.

The graph showing trends per region shows all the regions and the standardised rates of use per year. The graph on the evolution by district* shows trends over a three-year period of the average of the standardised rate (moving average). For example, for 2015 it is the average of the rates from 2013 to 2015 included that is represented, and for 2016 it is the average of the rates from 2014 to 2016 included.

The trend in the average usage rate is not presented for all 33 Belgian districts*. Only the districts* with the five highest and the five lowest average standardised usage rates over the last three years of the period of analysis are shown, excluding Hainaut districts particularly affected by the 2019 administrative reorganisation (La Louvière, Ath, Soignies, Charleroi/Thuin).

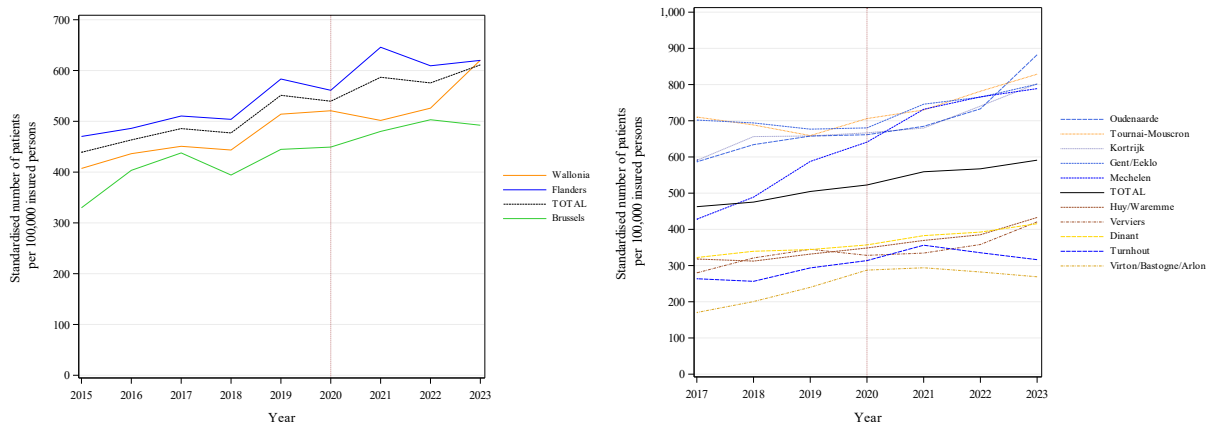


Figure 11 Example of graphs showing annual trends, by region (left) and by district* (right)

16. Graph: 'Dot plot' distribution of standardised usage rates

A dot plot graph is a scatter plot in which, for each observation, the points are plotted on a categorical scale. These simple graphs can be used to highlight groupings and gaps, as well as outliers. Here, the dot plot is used to present the distribution of the standardised annual rates of use by district*, with each dot representing a district*, first for all patients, and then by gender (see Figure 12). If a selection is made on the basis of gender, only the data for the selected gender are shown.

In order to convert the continuous data into categorical data, the rates of use are rounded to the nearest multiple (unit, ten, hundred, etc.), depending on the size of the maximum rate.

The graph also shows boxes with the 25th, 50th and 75th percentile of the unrounded rates, first for all patients, and then by gender. The 25th percentile is indicated by the bottom line of the box, the 75th percentile by the top line, and the 50th percentile by the middle line of the box.

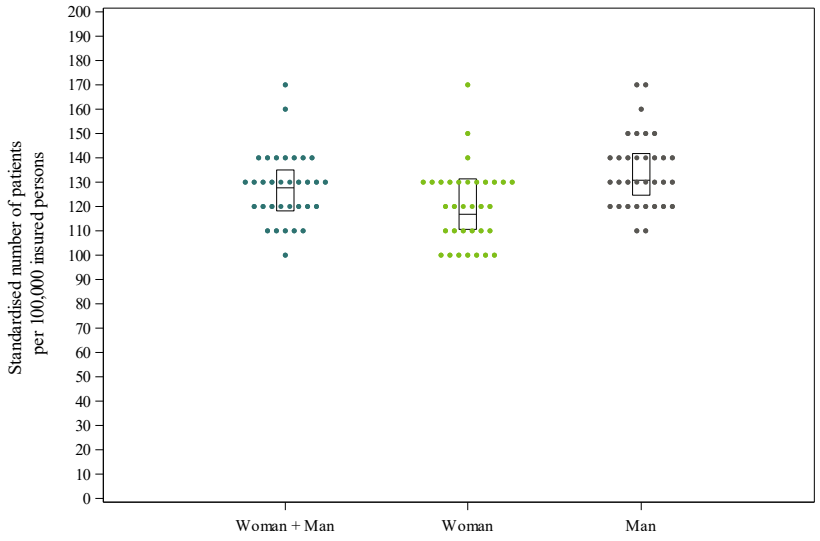


Figure 12 Example of a 'dot plot' graph of usage rates

17. Graph: Maps showing distribution of standardised usage rates by district*

On a map of Belgium (see Figure 13), where the district boundaries are represented by thin lines and the province boundaries by thick lines, the districts* are coloured according to a comparative scale with, firstly, the median rate of use, and, secondly, the median expenditure. This comparative scale is expressed as a percentage of difference compared to the median rate or median expenditure: between -10 and 10 %, the value for the district* is considered as equal to the median value; between 10 and 30 %, the value for the district* is considered as 20 % higher than the median value; between -10 and -30 %, the value for the district* is considered to be 20 % below the median value, etc. These percentages are calculated based on standardised rates of use for the last year of the analysis. They are divided into categories of 20 %. The following colours have been defined for the different categories of the comparison scale:

Colour	Category	Description
	Below - 50 %	The rate for the district* is at least 50% below the overall rate.
	Between -50 % and -30 %	The rate for the district* is between 30 % and 50 % below the overall rate.
	Between -30 % and -10 %	The rate for the district* is between 10% and 30% below the overall rate.
	Between -10 % and 10 %	The rate for the district* is between 10% below and 10% above the overall rate.
	Between 10 % and 30 %	The rate for the district* is between 10 % and 30 % higher than the overall rate.
	Between 30 % and 50 %	The rate for the district* is between 30% and 50% higher than the overall rate.
	Above 50 %	The rate for the district* is at least 50% higher than the overall rate.
	No service	No services of this type have been provided in this district*.

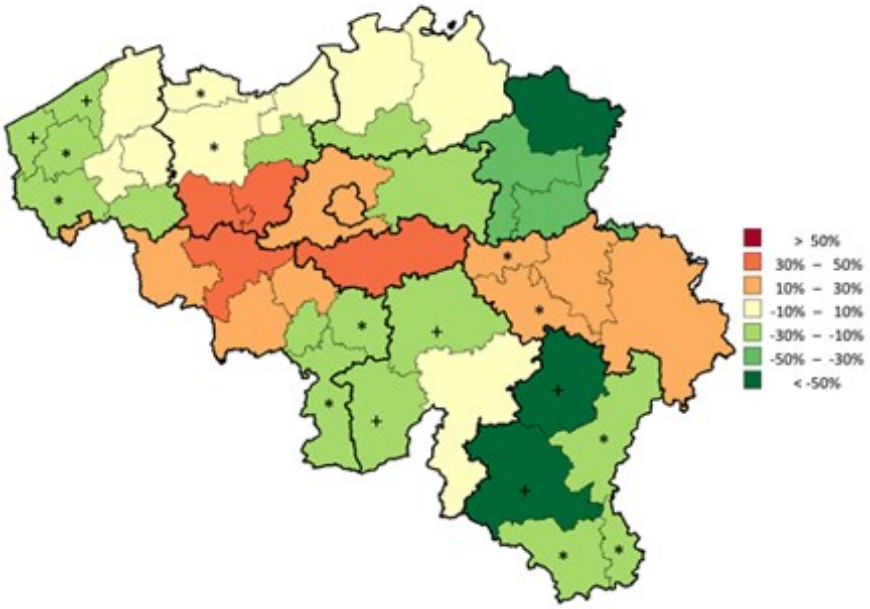


Figure 13 Example of the map of Belgium showing the geographical variation in the usage rates

Districts marked with * or + are grouped together within the same province.

18. Graph: 'Funnel plot' of standardised usage rates per district*

This funnel plot is a scatter plot which shows the annual usage rates (i.e. the standardised number of patients per 100,000 insured persons) per district*, in relation to the size of the population of the district*. In addition to the dots per district*, the confidence limits are also displayed on the graph. The confidence intervals have a typical shape of a funnel: the smaller the population of a district*, the greater the expected variation, and, conversely, the larger the population, the smaller the expected variation.

The graph below (see Figure 14) is an example of a funnel plot showing the standardised rate of use per 100,000 insured persons, per Belgian district*. The horizontal line represents the national annual rate of use (i.e. the number of patients per 100,000 insured persons in the Belgian population). The funnel-shaped lines show the 95% (two standard deviations from the national mean) and the 99.7% (three standard deviations from the national mean) confidence limits.

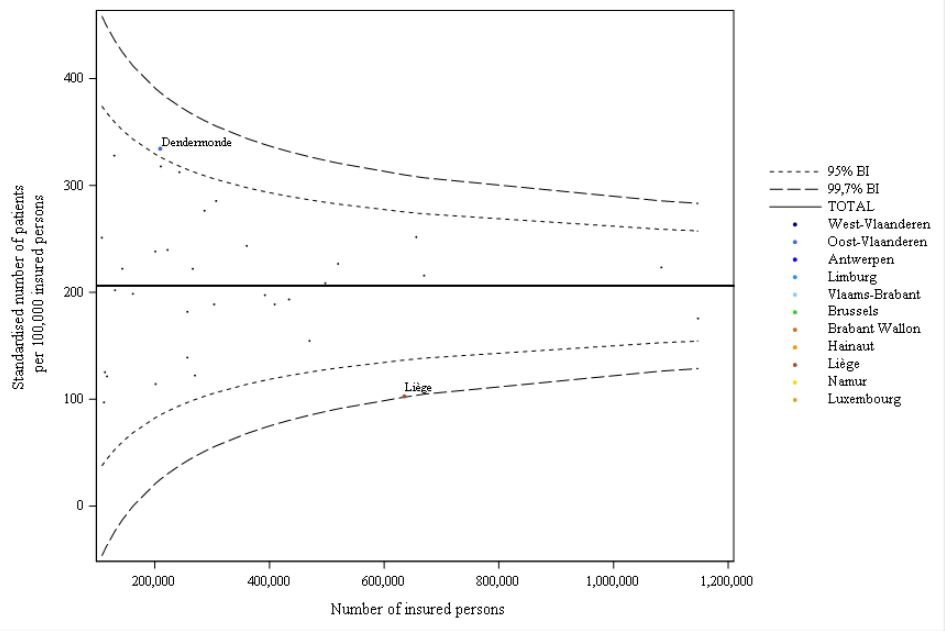


Figure 14 Example of a 'funnel plot'

The districts* between the curves are considered to be 'average'. The districts* outside the upper and lower 99.7% confidence limits are considered 'outliers'. The zone between the confidence limits at 95% and those at 99.7% is considered as a 'warning zone'. Only the titles of the districts* outside the 95% confidence limits are spelled out.

As we represent the standardised number of patients per 100,000 insured persons on the vertical axis, the confidence intervals per district* are based on a Poisson distribution and are dependent on the national yearly usage rate and on the volume of the population in the district*. The 95% and 99.7% confidence intervals for the 33 Belgian districts* are calculated as follows :

1. Calculation of the standardised annual rate of use (number of patients per 100,000 insured persons) per district* *i:*

$$Y_i = (standardised\ rate\ of\ use)_i$$

2. Calculation of the national annual rate of use (number of patients per 100,000 insured persons)

$$\theta = \frac{\sum_i (number\ of\ insured\ persons)_i * Y_i}{\sum_i (number\ of\ insured\ persons)_i}$$

3. Calculation of the standard error in the district* *i* on the basis of aggregate data

$$SE_i = \sqrt{\frac{100{,}000 * \theta}{(number\ of\ insured\ persons)_i}}$$

4. Calculation of overdispersion

When the confidence intervals are calculated directly based on the Poisson distribution, many districts* are outside the confidence intervals. This has to do with overdispersion (more variability in the usage rates than what is expected based on a Poisson distribution). To remedy this issue, the overdispersion is calculated and taken into account in the confidence intervals.

For each district*, a z-score is calculated:

$$z_i = \frac{Y_i - \theta}{SE_i}$$

In order to avoid that the most aberrant districts* influence the calculation of the overdispersion too much, the 10% smallest z-scores are replaced by the P10 and the 10% largest z-scores are replaced by the P90 before the overdispersion is calculated as follows.

$$\rho = \frac{\sum_i {z_i}^2}{33}$$

5. Determination of confidence intervals by district* i

$$\text{lower 95\% confidence interval}_{\,i} = \theta - 2 * SE_i * \sqrt{\rho}$$

$$\text{upper 95\% confidence interval}_{i} = \theta + 2 * SE_i * \sqrt{\rho}$$

$$\text{lower confidence interval 99.7\%}_{\,i} = \theta - 3 * SE_i * \sqrt{\rho}$$

$$\text{upper confidence interval 99,7\%}_{\,i} = \theta + 3 * SE_i * \sqrt{\rho}$$

19. Table: Standardised healthcare expenditure borne by the insurance

Annual expenditure per patient (average cost per patient) and per insured person (average cost per insured person) is summarised at the national level in the first table. It is important to note that when a filter is applied to the population, the cost per insured person relates only to selected insured persons, for example only women or insured persons in a specific age group.

The average cost per patient is based on an estimated number of patients.

Standardised expenditure per insured person is then broken down by province and region, with an indication of the relative difference compared with the total.

20. Table: Trends in expenditure per healthcare service and per nomenclature code

This table shows, for each year of the period of analysis, expenditure per healthcare service, i.e. total expenditure divided by the total number of services, expressed by the combined nomenclature code (outpatient and hospital care).

For example:

Nomenclature	2015	2016	2017	2018	2019	2020	2021	2022	2023	Average annual growth rate
350276-350280	59,44	59,44	59,44	0,00	61,54	0,00	0,00	0,00	0,00	NA
350291-350302	0,00	0,00	95,11	0,00	0,00	0,00	0,00	0,00	0,00	NA
350372-350383	95,11	0,00	95,63	98,47	0,00	98,47	100,39	101,40	109,40	1,77%
350394-350405	20,21	20,21	20,51	20,83	20,92	21,20	21,47	21,77	22,82	1,53%
350416-350420	29,25	29,72	30,25	30,67	30,77	31,07	31,53	31,78	33,34	1,65%

Figure 15 Change over time in expenditure, by service and by nomenclature code

In this table, the average annual growth rate is calculated using the following formula:

$$Average\ annual\ growth\ rate = \left(\frac{Expenditure\ per\ service_{last\ year}}{Expenditure\ per\ service_{first\ year}}\right)^{\frac{1}{last\ year - first\ year}} - 1$$

This rate is therefore calculated by taking into account only the values for the first and last years of the period of analysis, without considering the intermediate variations.

21. Table : Expenditure per patient and occurrences of the practice, by demographic category

This table shows the estimated standardised expenditure per patient for the last year of the analysis period, for different demographic categories. These estimates were calculated using the following formula:

➔ Standardised expenditure per insured person * 100,000 / Standardised usage rate per 100,000 insured persons

The utilization rate per 100,000 insured represents the estimated number of patients per 100,000 insured. This estimated number of patients is derived by dividing the number of services by a division factor specific to the demographic category of the patient who used the practice. The average division factor for each category illustrated is shown in the table in the 'Occurrence per year (Services)' column. The average values for occurrence per year (Days) and occurrence per day (Benefits) are also presented.

These three occurrence values were calculated for the most recent services year for which consolidation by patient was possible (see also Combined data).

Note: Only results for categories relevant to the analysis and for which data exists for both the last year of the analysis period and the consolidated prestation year are presented. In the example in Figure 16 below, the analysis is specific to insureds aged between 19 and 60, but no occurrence data has been found

for insureds aged 60. The 60-64 category is therefore left blank, even if benefits exist in the last year of the analysis period (in which case the average global division factor is applied for these policyholders).

	Estimated std. expenditure per patient		Occurrence per year	Occurrence per year	Occurrence per day
	(€)	Tot. Relative Diff. (%)	(Services)	(Days)	(Services)
TOTAL	116,63		1,00	1,00	1,00
Sex					
Men	116,54	-0,08%	1,00	1,00	1,00
Women	116,65	0,02%	1,00	1,00	1,00
Reimbursement scheme					
General	115,26	-1,17%	1,00	1,00	1,00
Preferential	124,69	6,91%	1,00	1,00	1,00
Region					
Flanders	116,32	-0,27%	1,00	1,00	1,00
Brussels	117,29	0,57%	1,00	1,00	1,00
Wallonia	116,68	0,04%	1,00	1,00	1,00
Age					
00-04					
05-09					
10-14					
15-19	117,81	1,01%	1,00	1,00	1,00
20-24	117,65	0,87%	1,00	1,00	1,00
25-29	117,21	0,50%	1,00	1,00	1,00
30-34	116,97	0,29%	1,00	1,00	1,00
35-39	116,92	0,25%	1,00	1,00	1,00
40-44	116,69	0,05%	1,00	1,00	1,00
45-49	116,54	-0,08%	1,00	1,00	1,00
50-54	116,45	-0,15%	1,00	1,00	1,00
55-59	116,44	-0,16%	1,00	1,00	1,00
60-64					
65-69					
70-74					
75-79					
80-84					
85-89					
90-94					
95+					

Figure 16 Example of standardised expenses per patient and occurrences of the service, by demographic category

22. Table: Summary of key data

The 'Summary of Key Data' table contains the following data for the Belgian population (data which are also contained in the different chapters of the report and whose methodological details are given in the relevant paragraphs of this document):

- Main healthcare providers:
    - The specialty identified as providing the majority of the practice under analysis, with the percentage of the total number of services provided
- Main prescribers:
    - The specialty identified as prescribing predominantly for the practice analysed, with percentage of total volume prescribed. If the practice is mostly not prescribed (provided at the initiative of the healthcare provider), the term 'not applicable' is displayed.

- Rates of use:
    - Number of services per year for the last year of the analysis period
    - Average occurrence per patient per day (services): average number of services per day per patient
    - Average occurrence per patient per year (days): average number of days per year per patient
    - Total average occurrence: corresponds to the total number of services provided divided by the total number of different insured persons who have used these services.

    The three preceding indicators are calculated on the basis of the most recent consolidated prestation year available.

    - Estimated number of patients (per year): Is the result of dividing the number of services in the last year of the analysis by the division factors specific to each demographic category. The average division factor is equal to the total average occurrence above.
    - Standardised usage rate per 100,000 insured persons: the estimated number of patients per 100,000 insured persons
    - Percentage of outpatient care: Percentage of services as outpatient care, including one-day hospitalisation
- Population:
    - % of the selected population compared to the total number of insured people: will be equal to 100% if the analysis concerns the entire insured population domiciled in Belgium, and will be lower if the analysis is limited to gender, age or the number of births during the year
    - Median age of the patients
    - Max/min ratio of the median age (per district*, excluding outliers[10])
    - Percentage of women (patients)
    - Ratio Preferential rate/General rate (patients): ratio of standardised usage rate for patients under a preferential scheme, in relation to the standardised usage rate for patients not eligible for a preferential scheme
- Trends:
    - Average annual growth percentage over the whole period of analysis
    - Average annual growth percentage for the last three or four years of the period of analysis
    - Average annual growth percentage for the years before the last three or four years

[10] Outliers are values below Q1 - 1.5*IQR or above Q3 + 1.5* IQR, with Q1 the first quartile, Q3 the third quartile and IQR the interquartile range (Q3 - Q1).

- Statistical significance of the slope over all the years of the analysis period
- Statistical significance of the change in trend for the last three or four years of the analysis compared to the years before

– Geographical variations

- On the one hand, the coefficient of variation (of the standardised usage rate by district*) calculated in the first three years of the analysis period and, on the other hand, this coefficient of variation for the last three years of the analysis period. The coefficient of variation is a measure of relative spread and is calculated as the standard deviation divided by the average. The coefficients of variation for the first and last three years of analysis are compared with each other with a test that is based on a Bootstrap procedure. The difference between the coefficients of variation is considered significant if the p-value is less than or equal to 0.05.
  As the coefficient of variation is a relative value, the importance of a dispersion can essentially be evaluated in a comparative logic.
- Max/min ratio of the usage rate (per region, excluding outliers)
- Max/min ratio of the usage rate (per district*, excluding outliers)

– Direct expenditure

- Annual expenditure of the health insurance system in the last year of the analysis period
- Average annual (standardised) expenditure of the health insurance system per person insured
- Max/min ratio of the expenditure per person insured (per region, excluding outliers)
- Max/min ratio of the expenditure per person insured (per district*, excluding outliers)
- Average annual expenditure per patient, based on the estimated number of patients

– Coding variations and practice alternatives:

- Variations in practice coding, by choice of nomenclature codes, observed by province with indication of the degree of statistical significance of the Chi-squared test (see Statistical analysis)
- Variations in the choice of practice alternatives, observed by province with an indication of the degree of statistical significance of the Chi-squared test (see Statistical analysis)

If the max/min ratio cannot be calculated because the minimum is 0, it is indicated NA (not available) in the table.

If the period between the base year (i.e. the first year of the period of analysis) and the last year is less than three years, NA (not available) is indicated for the trend.

If the results show a significant difference, the degree of statistical significance is symbolised by one to three asterisks, in increasing order of significance: * P-value ≤ 0.05 / ** P-value ≤ 0.01 / *** P-value ≤ 0.001. Otherwise, NS is displayed ("not significant").

23. Graphs : Frequency of practice occurrences (per patient)

Some services may be invoiced several times for the same patient in the same year, even on the same day. This may be due to a repetition of the service, but also when two services are invoiced on the same day, due to the bilateral nature of the anatomical topography of the operation.

The frequencies of occurrences presented here are based on the raw number of services from the P, SHA and ADH documents, consolidated by patient for the most recent available services year. (See also Combined data).

The year considered is indicated in the legend of the graphs.

- Frequency of services per day:

This pie-chart shows the distribution of patient days according to the number of services performed on the same day for the same patient. In the example below: 68.9% of care days included a single service, 31% of care days included two services, and less than 0.1% of care days included three or more services.

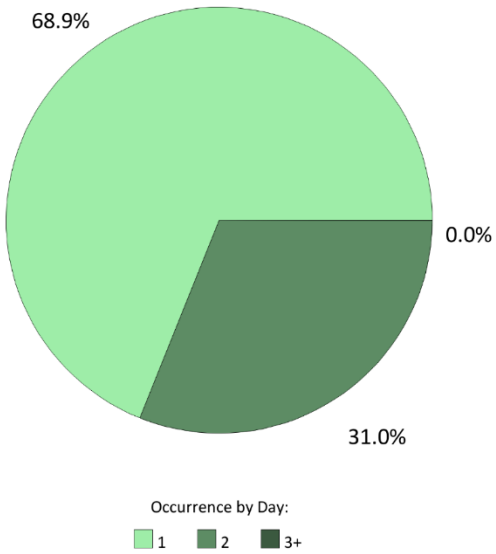


Figure 17 Example of a table and pie chart showing the distribution of practice recurrences per year

The average number of services per day per patient is also shown in the following graph, by province and at national level (bottom dotted line, right-hand scale), as well as the variation in provincial values in relation to the national value (bars, left-hand scale).

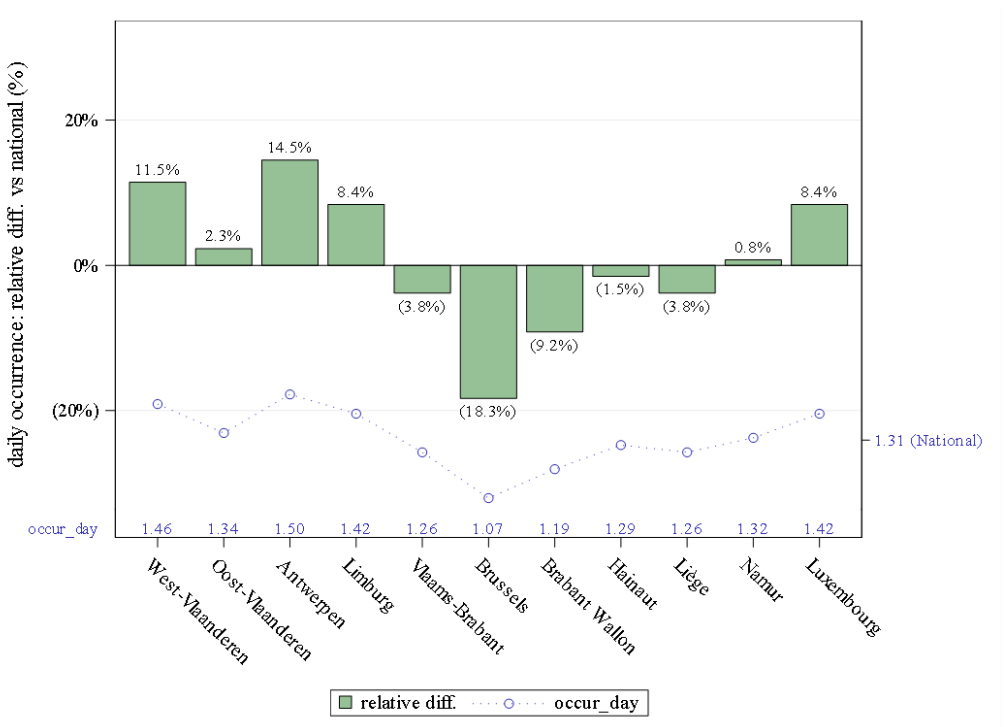


Figure 18 Example of graph of practice recurrence by province and variability relative to the national value

- Frequency of contacts per year:

After taking into account the occurrence per day, it also happens that one or more services of the same practice are billed on several different days for the same patient during the same year.

The following histogram shows the distribution of patients according to the occurrence of the practice over the year (which does not include occurrence per day).

In the example below, 64.4% of patients received one day of care, 31.1% received two days of care and 3.3% received three or more days of care.

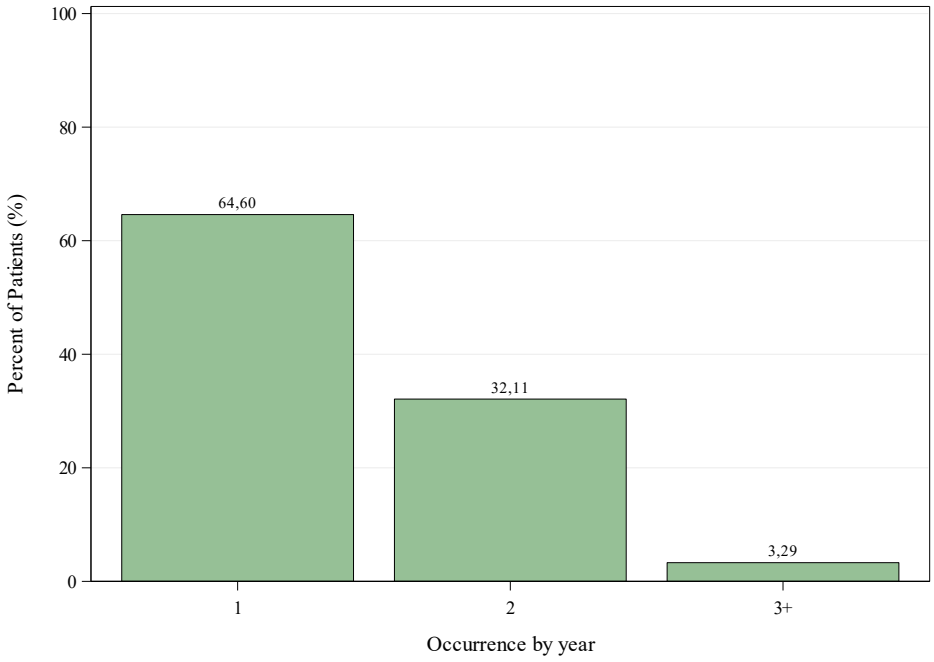


Figure 19 Example of histogram showing the distribution of patients according to the occurrence of the practice in the year

The average number of care days per patient over the year is also shown in the following graph, by province and at national level (bottom dotted line, right-hand scale), as well as the variation in provincial values compared with the national value (bars, left-hand scale).

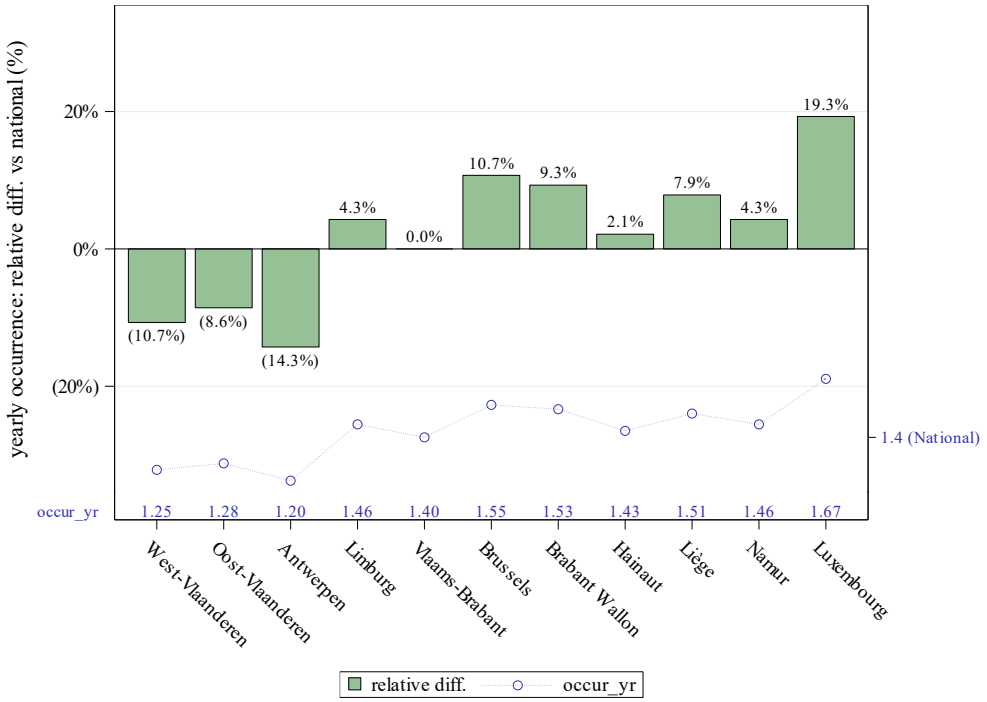
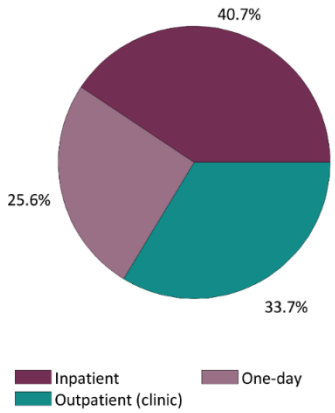


Figure 20 Example of graph of the average number of days over the year per patient and the variation with respect to the national value

24. Table and graph: Distribution of types of patient care

This pie chart shows the type of care for the service or practice under analysis provided to patients, broken down by the various sectors and sub-sectors: outpatient (private or polyclinic), hospital care (one-day or inpatient) (see Figure 21).

These occurrence frequency analyses are performed using the data in the P, ADH and SHA documents (See also Combined data). The year considered is indicated in the legend of the graph.

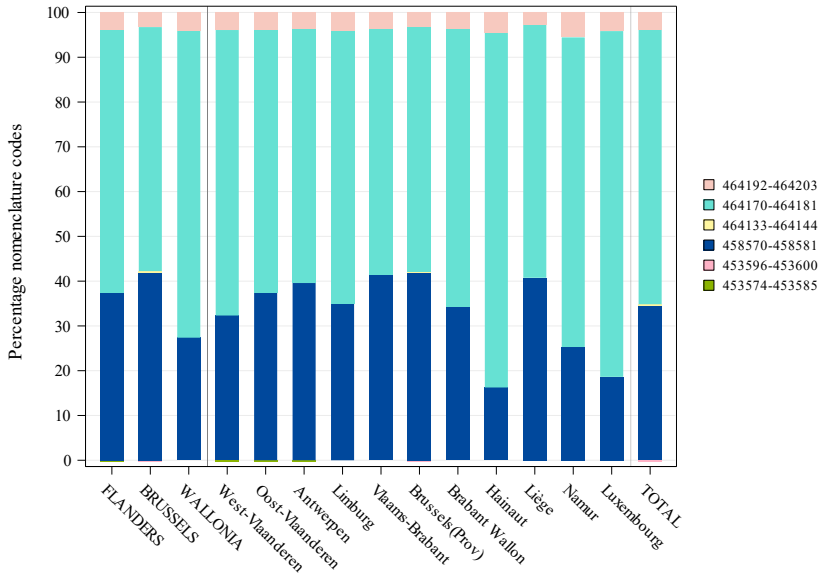


Care Settings	
Outpatient (private)	*0,0%*
Outpatient (polyclinic)	*33,7%*
(Day) Hospital	*25,6%*
Hospital (stay)	*40,7%*

Figure 21 Example of a pie chart and table illustrating the distribution of types of care

25. Graph: Distribution of coding variations

There may be variations in the choice of codes used to record the same practice. This potential variation is illustrated by a 100% stacked histogram graph for both regions and provinces (see Figure 22).



Significance	By region	By province
Use of **Nomenclature codes**[11]	***	***

Figure 22 Example of coding variation

In this representation, the distribution by region and province of the volumes of the nomenclature codes defined for the analysis is analysed in order to determine whether this distribution is homogeneous across the territory. The data are those of the latest year available.

In order to verify whether the variations observed are significant, a Chi-square test was applied. The results are displayed in a table below the graph. The number of asterisks represents the degree of statistical significance: * P-value ≤ 0.05 / ** P-value ≤ 0.01 / *** P-value ≤ 0.001 and NS for a non-significant result.

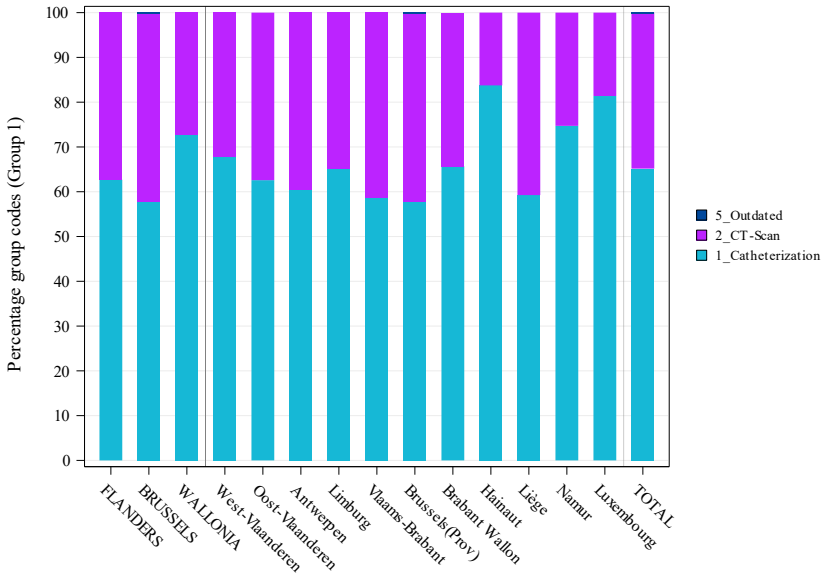
26. Graph: Distribution of variations in the choice of practice alternatives

If different practice alternatives could be identified for the practice analysed through groupings of nomenclature codes, they are illustrated in this histogram, which makes it possible to visualise the distribution of choice between the different techniques over the whole territory on the one hand, but also by region and by province (see Figure 23). The graph is a 100% stacked histogram. For the same analysis, up to two distribution logics can be presented, identified in the reports as "Group 1" and "Group 2".

In some cases, among the identified practice alternatives, sub-alternatives exist. If they can be clearly identified, they will be illustrated in the histogram in a gradient of the same colour in order to clearly visualise the different sets of alternatives.

The groupings of nomenclature codes corresponding to each alternative are presented in a separate table, together with the degree of statistical significance of the Chi-square test.

11 The calculation of significance is carried out here by comparing the geographical differences in the use of the different nomenclature codes to code the practice.



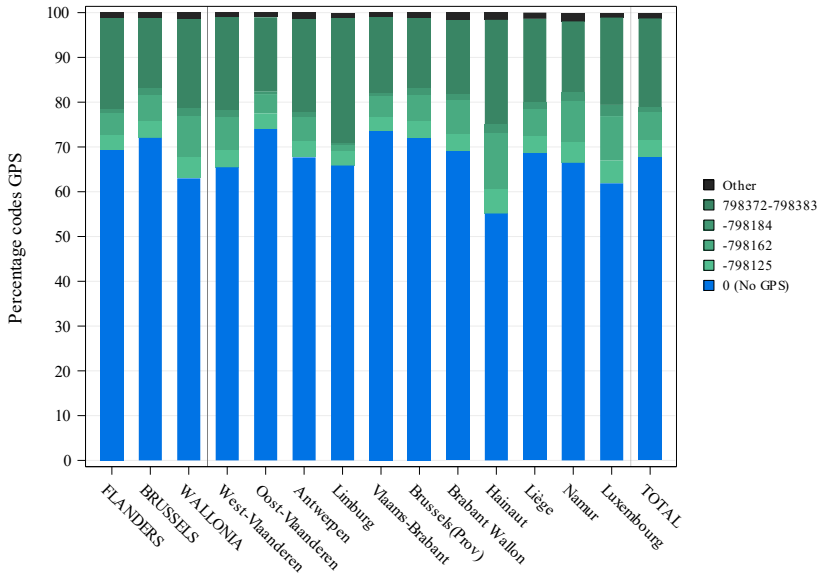
Significance	By region	By province
Choice of **Practice alternatives**	***	***

Figure 23 Example of a histogram illustrating the distribution of alternative techniques for the same practice (alternative 1 in blue, alternative 2 in purple - with colour gradient for identified sub-alternatives)

27. Graph: Distribution of variations in the use of low-variability care

Analyses from 2019 onwards take into account the expenditure on services associated with GPS (Global Payment with Standardization). The graph below represents the proportion in volume of GPS codes associated with services for the latest year available, again in the form of a 100% stacked histogram broken down by region and by province (see Figure 24). Services that are not associated with a GPS code are represented by the code 0 (No GPS).

As for the two previous graphs, the statistical significance of the variations observed between regions and provinces is summarised in a separate table. Pseudocodes descriptions of relevant packages are also presented in addition to the graph.



Significance	By region	By province
Use of **Global Payment with Standardisation**[12]	***	***

Figure 24 Example of variations in the use of low-variability care

12 The calculation of significance is carried out here by comparing the use of Global Payment with Standardisation as a whole compared to the non-use of these packages.

4. STATISTICAL ANALYSIS

In order to ensure that the rate of use and the expenditure can be properly compared, all the data were standardised on the basis of age, gender, and preferential reimbursement scheme for the Belgian population of the last year of the analysis period.

All the data presented in this document are based on the entire population, and are summarised by descriptive statistics (average, median). Nevertheless, some statistical analyses may be relevant to perform on these data. The following hypotheses were tested in this report :

1) To what extent do region, gender and reimbursement scheme explain differences in rates of use?
   A linear mixed model ANOVA was used based on the standardised data with respect to age for each district*, region, gender and reimbursement scheme. Region, gender and reimbursement scheme were taken into account in the model as fixed effects as well as all two-way interactions and the 3-way interaction. Type III significance tests were used to find out which effects have a significant influence on the usage rate. For a correct interpretation of the analysis, first the significance of the 3-way interaction should be checked, followed by the two-way interactions and then by the main effects. If the 3-way interaction is significant, the interpretation of differences should be done on this level and two-way interactions and main effects should not be interpreted. If the 3-way interaction is not significant, the 2-way interactions can be checked for significance. Each effect that is part of a significant interaction should be interpreted at the level of the interaction and not at the level of the main effect. Only if an effect is not part of a significant interaction, the main effect can be interpreted directly. This analysis only covers the last year of the data presented in the report and only used data from Flanders and Wallonia.

2) To what extent do the trends observed differ from one period to another?

   To check whether there is a break in trend for the 3 most recent years of the analysis period compared to the years before (for the whole country, by province and by region), a linear mixed model was fitted on the data of all provinces and a significance test was done to find out whether the change in slope for the last three years was significant (see Table: Trends in the standardised rate of use per 100 000 insured persons).

3) To what extent does the geographical variation differ from one period to another?
   The coefficient of variation for the first three years of the analysis and that of the three most recent years were compared using a test based on a Bootstrap procedure (see Table: Summary of key data).

4) To what extent do the distributions of coding choices, practice alternatives and use of use of low variability care differ between geographical areas?
   A chi-squared test is used to determine whether the differences in the distribution of the different choices between geographical areas are significant.