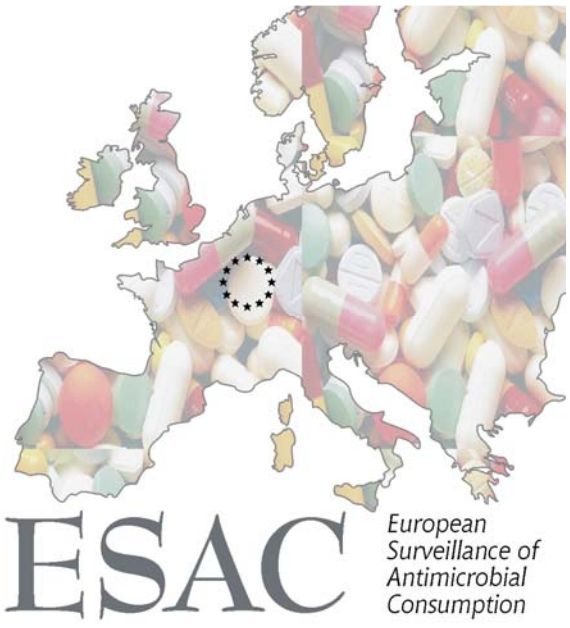
ESAC – European Surveillance of Antimicrobial Consumption

ESAC YEARBOOK 2006



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In 2001, the European Commission (Directorate-General SANCO – Health Monitoring Program) funded the European Surveillance of Antimicrobial Consumption (ESAC) project.
A pilot project was established from 2001 to 2003 (referred to as ESAC-1). The aim of the project was to collect comparable and reliable data on antibiotic use in Europe in ambulatory and hospital care from publicly available sources, and to assess the time trends in human exposure to antibiotics. In this project a 'network of networks' approach was adopted. A multidisciplinary management team based at the University of Antwerp, Belgium, established a network of dedicated national representatives (NR), collaborating on a voluntary basis. In each country, the national representative was to contact potential data providers. Data collection was aggregated at the level of the active substance (not at brand level), using the taxonomy of the Anatomical Therapeutic Chemical (ATC) classification system, as recommended by the World Health Organisation (WHO). The original data collection was limited to the ATC class J01. Consumption was expressed in defined daily doses (DDD).

In 2004, the European Commission (Directorate-General SANCO – Health Monitoring Program) decided to continue funding ESAC from 2004 to 2007 (referred to as ESAC-2). The main objective of the second phase of the ESAC project was to consolidate the continuous collection of comprehensive antibiotic consumption data. In addition, use data (i) on antibiotics not included in ATC class J01 (combinations for eradication of Helicobacter pylori, oral metronidazole, ornidazol, vancomycin, and colistin), (ii) at the package level, and (iii) of antimycotics for systemic use, were collected. In-depth consumption data for ambulatory care, hospital care, and nursing homes were investigated, and a pharmaco-economic evaluation was carried out. Finally, a set of twelve quality indicators for outpatient antibiotic use, which can be derived from ESAC data, were developed.

In 2007, the ESAC project was funded by the European Centre for Disease Prevention and Control (ECDC). The project aims to consolidate the continuous collection of comprehensive antimicrobial consumption data, from ambulatory and hospital care, from the 27 EU Member States, 3 European Economic Area/European Free Trade Association (EEA/EFTA) countries (Iceland, Norway and Switzerland), 3 candidate countries (Croatia, Former Yugoslavian Republic of Macedonia and Turkey) and 2 other countries (Russian Federation and Israel). Additionally, the project aims to deepen the knowledge of antibiotic consumption by focusing on specific consumption groups and/or patterns in collaboration with those countries where the appropriate data are available.

An interactive database is available at www.esac.ua.ac.be

Period of data collection: 2006

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SUMMARY

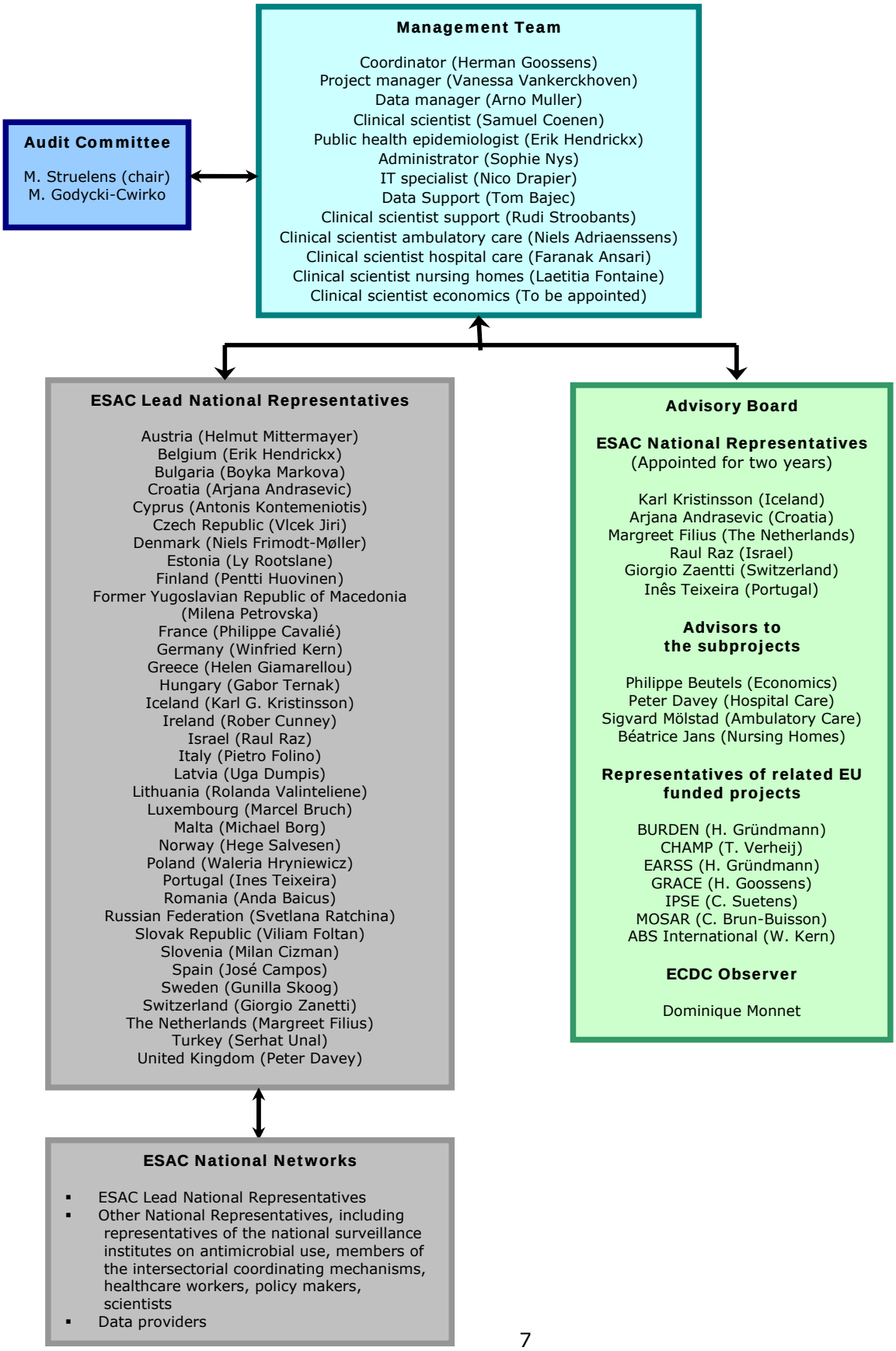
ESAC (European Surveillance of Antimicrobial Consumption) is an international network of national surveillance systems, collecting comparable and reliable antibiotic use data granted by ECDC (European Centre for Disease Prevention and Control; Grant Agreement GRANT/2007/001, Specific Agreement ECD.609).
ESAC aims to maintain a continuous, comprehensive and comparable (using ATC/DDD classification) database on antimicrobial consumption for all EU Member States, EU candidate countries and European Economic Area – European Free Trade Association (EEA–EFTA) countries, ensuring high standards of data collection, collation and validation (using national registers) in a timely fashion. ESAC aims to improve and expand the scope of the database on consumption data in consultation with ECDC. Additionally, the project aims to deepen the knowledge of antibiotic consumption by focusing on specific consumption groups and/or patterns in collaboration with those countries where the appropriate data are available.
The overall aim of the project is to consolidate the continuous collection of comprehensive antimicrobial consumption data, from ambulatory and hospital care, from the 27 EU Member States, 3 EEA/EFTA countries (Iceland, Norway and Switzerland), 3 candidate countries (Croatia, Former Yugoslavian Republic of Macedonia and Turkey) and 2 other countries (Russian Federation and Israel).
The ESAC yearbook 2006 covers the 1999-2006 consumption data for antimicrobials for systemic use (ATC group J01), antimycotics for systemic use (ATC group J02) and additional specific substances i.e. the data available in the ESAC database which were collected by the ESAC Management Team in 2007. Of the 35 participating countries, 21 were able to deliver outpatient data, 14 hospital data and 4 total data including both sectors together for 2006.
In summary, in 2006, the outpatient consumption of antimicrobials for systemic use (ATC group J01) varied from 9.58 Defined Daily Doses (DDD) per 1,000 Inhabitants per Day (DID) in the Russian Federation to 32.4 DID in Greece with a median of 18.7 and an interquartile range from 15.4 to 22.7 DID. The most used J01 subgroup were the penicillins (J01C), followed by the macrolides (J01F) or tetracyclines (J01A) depending on the country. The ranking of the countries did not change compared to previous years, although among the highest consumers, the consumption in general decreased or stabilised in 2006. During the reported eight years, the countries presented different temporal patterns. Some countries had continuous trends (increasing or decreasing), other countries showed stable use and the remaining countries have a pattern in sawtooth. More and more countries have implemented or plan to implement actions to control antimicrobial resistance in the community through rational use of antimicrobials.
In 2006, the hospital consumption of antimicrobials for systemic use (ATC group J01) varied from 0.6 DID in Iceland to 3.5 in Finland. The most used subgroup in the hospital sector was also penicillins (J01C), but followed by cephalosporins and other beta-lactams (J01D) and quinolones (J01M).
In 2006, 16 countries reported data on outpatient consumption of antimycotics for systemic use (ATC group J02). The use of this class varied from 0.11 DID in Norway to 1.47 in Belgium. Three substances, itraconazole, fluconazole and ketoconazole represented more than 95% of the outpatient use of antimycotics. Unfortunately, data on terbinafine was not available for 2006. These data will be collected in 2008.
ESAC aims to collect consumption of other antimicrobials, such as antivirals and antituberculosis, next to antibiotics and antimycotics for systemic use.
Finally, antibiotic consumption for specific groups has been studied in those countries where the appropriate data are available, and data has been collected for sub-national regions.

LIST OF ABBREVIATIONS AND RELATED PROJECTS

ABS International	Antibiotic Strategies International
AC	Ambulatory Care
ATC	Anatomical Therapeutic Chemical
BAPCOC	Belgian Antibiotic Policy Coordination Committee
BURDEN	Burden of Resistance and Disease in European Nations
CHAMP	Changing behaviour of Health care professionals And the general public towards a More Prudent use of antimicrobial agents
DDD	Defined Daily Dose
DID	Defined Daily Doses per 1000 inhabitants per day
DPP	DDD per package
DRG	Disease related groups
EARSS	European Antimicrobial Resistance Surveillance System
EC	European Commission
ECDC	European Centre for Disease Prevention and Control
EEA	European Economic Area
EFTA	European Free Trade Association
ESAC	European Surveillance of Antimicrobial Consumption
ESCMID	European Society of Clinical Microbiology and Infectious Diseases
ESF	European Science Foundation
EuroDURG	European Drug Utilisation Research Group
GP	General Practioner
GRACE	Genomics to combat Resistance against Antibiotics in Community-acquired LRTI in Europe
GRIN	General Practice Respiratory Infections Network
HC	Hospital Care
ICD	International Statistical Classification of Diseases and Related Health Problems
ICPC	International Classification of Primary Care
IPH	Institute of Public Health Brussels
IPSE	Improving Patient Safety in Europe
LNR	Lead National Representative
LTC	Long Term Care Facility
MOSAR	Mastering Hospital Antimicrobial Resistance and its spread into the community
MT	Management Team
NH	Nursing Homes
NN	National Network
NR	National Representative
PPS	Point Prevalence Survey
RoA	Route of Administration
SAR	Self-Medication with Antibiotics and Resistance Levels in Europe
TB	Tuberculosis
TC	Total Care
WHO	World Health Organisation

ESAC NETWORK ANNO 2007

ESAC Organisation chart



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CHAPTER 1. INTRODUCTION

ESAC (European Surveillance of Antimicrobial Consumption) is an international network of national surveillance systems, collecting comparable and reliable antibiotic use data. After a successful pilot phase of the ESAC project (2001-2004), another three-year term was approved by DG SANCO for the period 2004-2007 (Agreement number: 2003/211). This was followed by another 3 year-term from 2007-2010, granted by ECDC (Grant Agreement GRANT/2007/001, Specific Agreement ECD.609).
ESAC aims to maintain a continuous, comprehensive and comparable (using ATC/DDD classification) database on antimicrobial consumption for all Member States, candidate countries and EFTA-EEA countries, ensuring high standards of data collection, collation and validation (using national registers) in a timely fashion. ESAC aims to improve and expand the scope of the database on consumption data on antiviral, antimycotic and anti-TB drugs in consultation with ECDC. Additionally, the project aims to deepen the knowledge of antibiotic consumption by focusing on specific consumption groups and/or patterns in collaboration with those countries where the appropriate data are available.

A multi-disciplinary Management Team (MT) (with expertise in information technology, data management, microbiology, infectious diseases, epidemiology, ambulatory care medicine, hospital care medicine, pharmacology, and health economics) was installed at the University of Antwerp, Belgium, but also has members in Brussels, Dundee (UK) and Ljubljana (Slovenia). This MT ensures day-to-day management and monitoring of the network activities. Participating countries have established National Networks (NN) consisting of relevant experts in the field of antimicrobial consumption. These networks are coordinated by Lead National representatives (LNR). An Advisory Board was established which (i) provides scientific support to the MT and (ii) liaises with ECDC as well as EU funded projects on antimicrobial use and resistance. Next to an Advisory Board, an Audit Committee was established which monitors the progress of the project and helps resolve problems.

In the current report, chapter 2 gives an overview of the aims and objectives as well as the methodology used in ESAC. In chapter 3, data is presented on antimicrobial consumption in Europe from 1999 until 2006, and chapter 4 summarizes the dissemination activities of ESAC in 2007. Finally, data for 2006 at the country level can be found in the different country sheets in Appendix I.

CHAPTER 2. ESAC OBJECTIVES AND METHODOLOGICAL APPROACH

Aims and Objectives

The overall aim of the project is to consolidate the continuous collection of comprehensive antimicrobial consumption data, from ambulatory and hospital care, from the 27 Member States, 3 EEA/EFTA, 3 candidate countries (Croatia, Former Yugoslavian Republic of Macedonia and Turkey) and 2 other countries (Russian Federation and Israel). The project aims to provide the community with timely information, on antimicrobial consumption. The European database is used to develop (i) health indicators of antimicrobial use and (ii) evidence-based guidelines and educational tools to manage the risk of infections and antimicrobial resistance. The project provides regular feed-back to the relevant authorities of the participating countries.

Additionally, the project aims deepen the knowledge of antibiotic consumption by focusing on specific consumption groups and/or patterns in collaboration with those countries where the appropriate data are available. For hospital care, data will be collected for individual hospitals with a linkage of the consumption to the DRG (Disease Related Groups). For ambulatory care, detailed data will be collected on the consumption in specific age and sex categories, specific prescriber groups, specific high consumers groups and for specific indications (in collaboration with existing networks of sentinel practices). For nursing homes, detailed information will be collected on the frequency, indications, characteristics and seasonal variations of antibiotic prescriptions, as well as on the institutional determinants of antibiotic use. Additionally, the effects of socio-economic determinants on antimicrobial consumption of European countries will be explored, and regional variation within a particular country will be studied, by means of econometric models.

Data collection protocol version 2007

The 2006 data on antibiotic use, for ambulatory care (AC) and hospital care (HC), according the ATC/DDD classification, 2007 version, were delivered at the product level, and expressed in number of packages in a worksheet (Excel) format. Moreover a valid national register of available antibiotics with DDD values assigned. Alternatively data and register could be merged in one worksheet.
In the participating countries that were not able to deliver data on a product level due to objective constraints, data on volume of antibiotic consumption for 2006 was collected on the ATC5 + Route of Administration (RoA) level. As the number of antibiotics with multiple DDDs for an "Oral" and "Parenteral" is increasing over the time, Oral/Parenteral form had to be separated form for all ATC codes to allow retrospective data adjustments.

Items of the data collection

- Volume:
  - Number of packages per medicinal product (used in a given period, area and sector) + valid national register of available antibiotics with DDD values assigned.
- Classification:
  - Medicinal product package level
- Time frame: 2006
- Periodicity: quarterly for AC, total year for HC (quarterly if available)
- Area: country
- Sector: AC / HC
- Scope:
  - J01 + J02 + additional substances
- National register:
  - Worksheet format was recommended, with all entries in separate columns allowing further calculations
- Required fields:

- national ID number, commercial name of product (label), Route of administration (e.g. oral), number of administration units per package (e.g. 16), quantity of active substance per administration unit (e.g. 500), measuring unit (e.g. mg), ATC code, number of DDDs per package (or per administration unit if applicable).

CHAPTER 3. ANTIMICROBIAL CONSUMPTION IN EUROPE IN 2006

In 2006, ESAC collected data on antibiotic (ATC group J01) and antimycotic (ATC group J02) use in the ambulatory and hospital care sector in 26 out of the 35 participating countries. Lithuania and Cyprus were able to provide reliable data for 2006. Conversely, five countries that provided data during the previous years did not report data for 2006. This was explained by two major reasons. Firstly, in 2007, ESAC started a third phase in which it extended its approach of "network of networks" by consolidating the existing national networks, but also by including new National Representatives as well as the substitution of some (lead) national representatives. The reshuffling of some of the national networks disrupted the process of the 2006 data collection in a few countries. Secondly, in some countries a modernisation of the IT system to gather antimicrobial data from the data sources was carried out and were therefore unable to deliver data. However, these problems should be solved for the 2007 data collection which will enable ESAC to report on more countries in the future.

Ambulatory care

Of the 35 participating countries (27 EU Member States, 3 EEA/EFTA countries, 3 candidate countries and 2 others), 21 were able to deliver outpatient data on antibiotic use, while Bulgaria, Cyprus, Greece and Lithuania provided only total data, covering both Ambulatory Care (AC) and Hospital Care (HC) use. The total outpatient use varied from 9.58 DID in the Russian Federation to 32.4 DID in Greece (Table 1). The median use and interquartile range (25%-75%) were respectively 18.7 DID and [15.4-22.7]. Additionally, Figure 1 shows a map of Europe presenting the total outpatient antibiotic use in Europe in 2006.

The distribution among the participating countries of the total outpatient antibiotic use between 1999 and 2006 is shown in Figure 2. The general distribution of the outpatient use among the reporting countries did not change during the eight years except for a slightly general decrease. However, when comparing the trends of outpatient antibiotic use per country different temporal patterns were seen (Figure 3). Three countries (Italy, Ireland, Denmark) had a continuous increase of total outpatient antibiotic use over the study period. In Greece and Croatia, for which a continuous increase until 2005 was also seen, a decrease in outpatient antibiotic use was denoted for 2006. Conversely, the outpatient antibiotic use decreased in some countries (France, Belgium, Slovenia and until 2004 in Sweden). Norway and The Netherlands showed a stable outpatient antibiotic use until 2005 followed by an increase in 2006. The other countries showed more complex temporal patterns such as short-term increases or decreases while others showed sudden changes.

Since 2004, more countries in addition to Belgium, France, Slovenia and Sweden have implemented or plan to implement actions to control the antimicrobial resistance through the rational use of antimicrobials. In countries that have recently implemented these types of actions, 2006 data showed a decrease in outpatient antibiotic use of which the best example is Greece. However, longer periods of data collection are needed to ascribe these decreases in antimicrobial consumption to these actions.

Table 1: Total outpatient antibiotic use in Europe from 1999 to 2006 expressed in DDD per 1000 inhabitants and per day

Country	1999	2000	2001	2002	2003	2004	2005	**2006**
Austria	13.1	12.3	11.8	11.8	12.5	12.5	14.5	**14.3**
Belgium	26.2	25.3	23.7	23.8	23.8	22.7	24.3	**24.2**
Bulgaria[1)]	15.1	20.2	22.7	17.3	15.5	16.4	18.0	**17.2**
Croatia		18.4	18.5	22.6	23.4	23.0	23.4	**21.2**
Cyprus[1)]								**31.9**
Czech Rep.	18.6				16.7	15.8	17.3	**15.9**
Denmark	12.1	12.3	12.8	13.2	13.5	14.1	14.6	**15.2**
Estonia				11.7	11.1	10.4	11.7	
Finland	18.4	19.0	19.8	17.9	18.7	17.2	18.1	**17.4**
France	34.1	33.2	33.2	32.2	28.9	27.0	28.9	**27.9**
Germany	13.6	13.6	12.8	12.7	13.9	13.0	14.6	
Greece[1)]	30.7	31.7	31.8	32.8	33.6	33.0	34.7	**32.4**
Hungary	23.5	18.5	18.6	17.1	19.1	18.2	19.5	**17.2**
Iceland[2)]	21.7	20.5	20.0	20.6	20.3	21.4	23.2	**20.0**
Ireland	18.0	17.6	18.7	18.7	20.1	20.2	20.5	**21.2**
Israel				19.6	20.1	19.6	20.5	**22.2**
Italy	24.5	24.0	25.5	24.3	25.6	24.8	26.2	**26.7**
Latvia					11.7	11.8	12.1	
Lithuania[1)]								**17.4**
Luxembourg	26.8	25.9	26.5	26.4	27.5	24.1	25.2	**23.9**
Norway			15.6	15.7	15.6	15.7	16.8	**15.4**
Poland	22.2	22.6	24.8	21.4		19.1	19.6	
Portugal	25.2	24.9	24.5	26.5	25.1	23.8	24.5	**22.7**
Russian Federation					9.8	9.3	9.1	**9.6**
Slovakia	25.7	27.6	29.1	26.7	27.6	22.5	25.1	**22.5**
Slovenia	19.8	18.0	17.4	16.3	17.0	16.7	16.3	**14.7**
Spain[3)]	20.0	19.0	18.0	18.0	18.9	18.5	19.3	**18.7**
Sweden	15.8	15.5	15.8	15.2	14.7	14.5	14.9	**15.3**
Switzerland						9.0		
The Netherlands	10.0	9.8	9.9	9.8	9.8	9.7	10.5	**10.8**
United Kingdom	14.8	14.3	14.8	14.8	15.1	15.0	15.4	

1) Bulgaria, Cyprus, Greece, Lithuania: total use, including the hospital sector.

2) Iceland: total use until 2005, outpatient use in 2006.

3) Spain: reimbursement data, does not include over-the-counter sales without prescriptions

Figure 1: Map of Europe showing total outpatient antibiotic use in 2006 in the participating countries

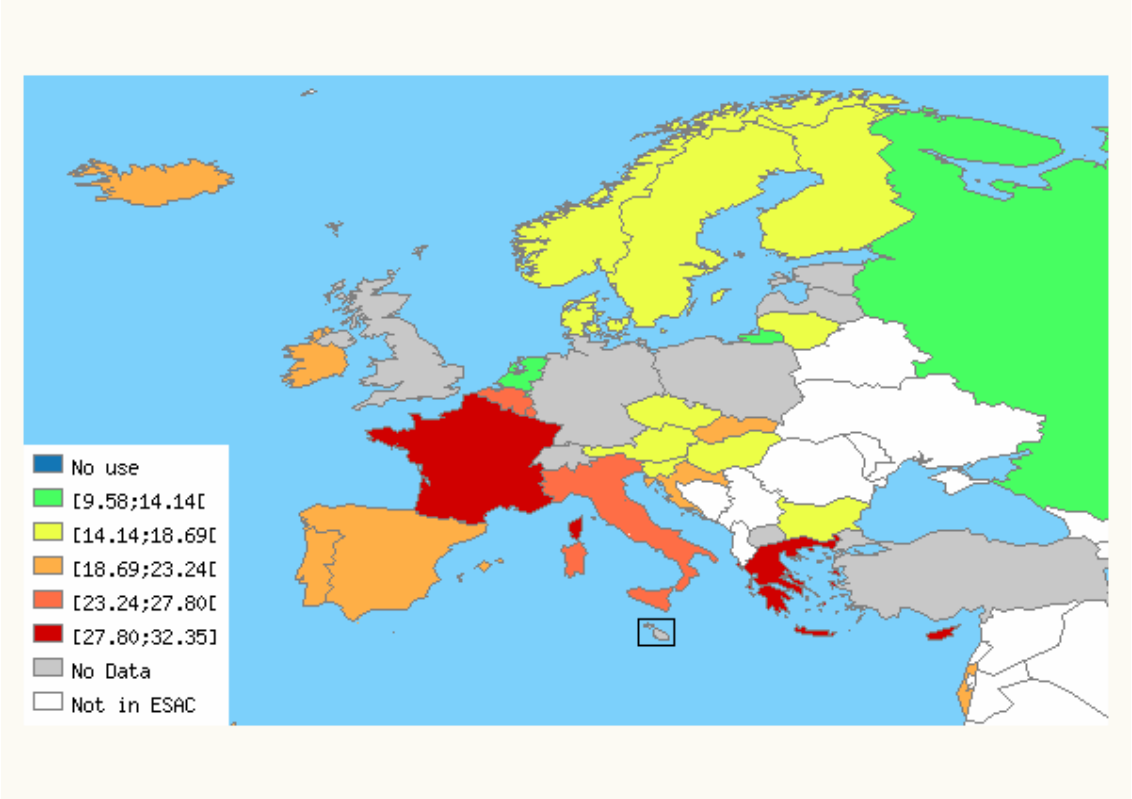


Figure 2: Distribution (boxplot) of outpatient antibiotic use between 1999 and 2006 among the participating countries

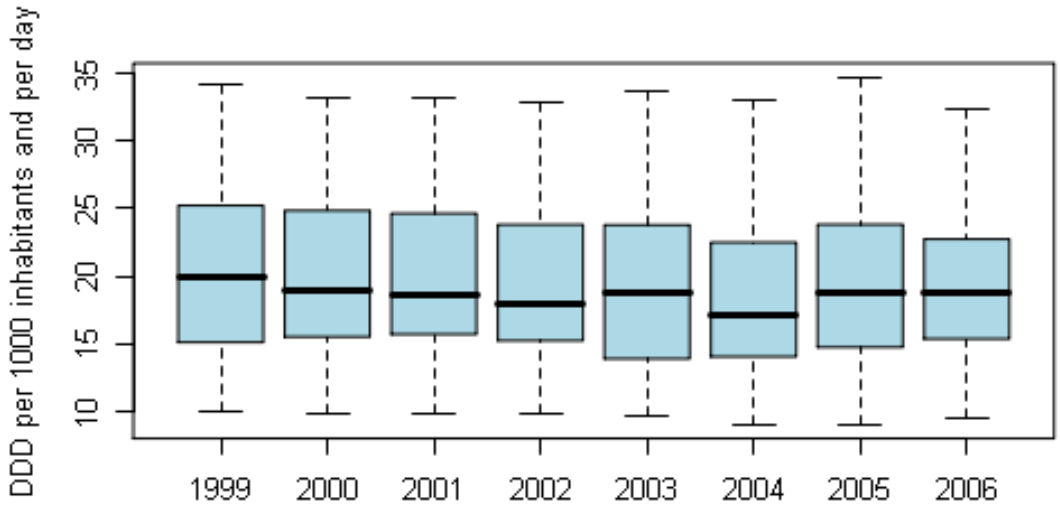
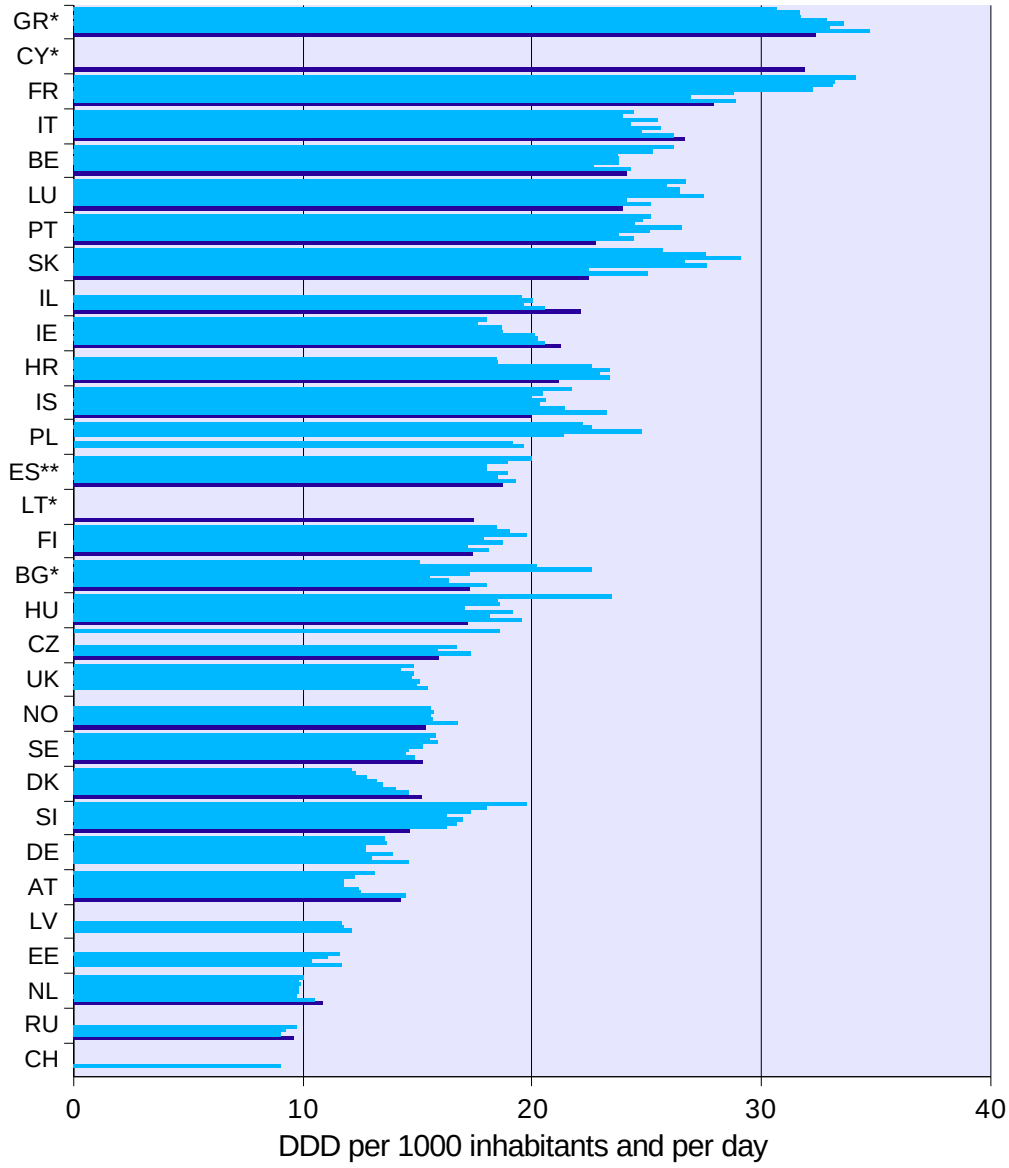


Figure 3: Trends of total outpatient antibiotic use (ATC group J01) in Europe from 1999 to 2006



* Bulgaria, Cyprus, Greece, Lithuania: total use, including the hospital sector.

** Spain: reimbursement data, does not include over-the-counter sales without prescription

Table 2 and Figure 4 present the outpatient antibiotic use broken down into seven major antibiotic groups according to the ATC classification: penicillins (J01C), cephalosporins and other beta-lactams (J01D), macrolides (J01F), tetracyclines (J01A), quinolones (J01M), sulphonamides and trimethoprim (J01E) and the other antibiotics including amphenicols (J01B), aminoglycosides (J01G), combinations (J01R) and other antibacterials (J01X).

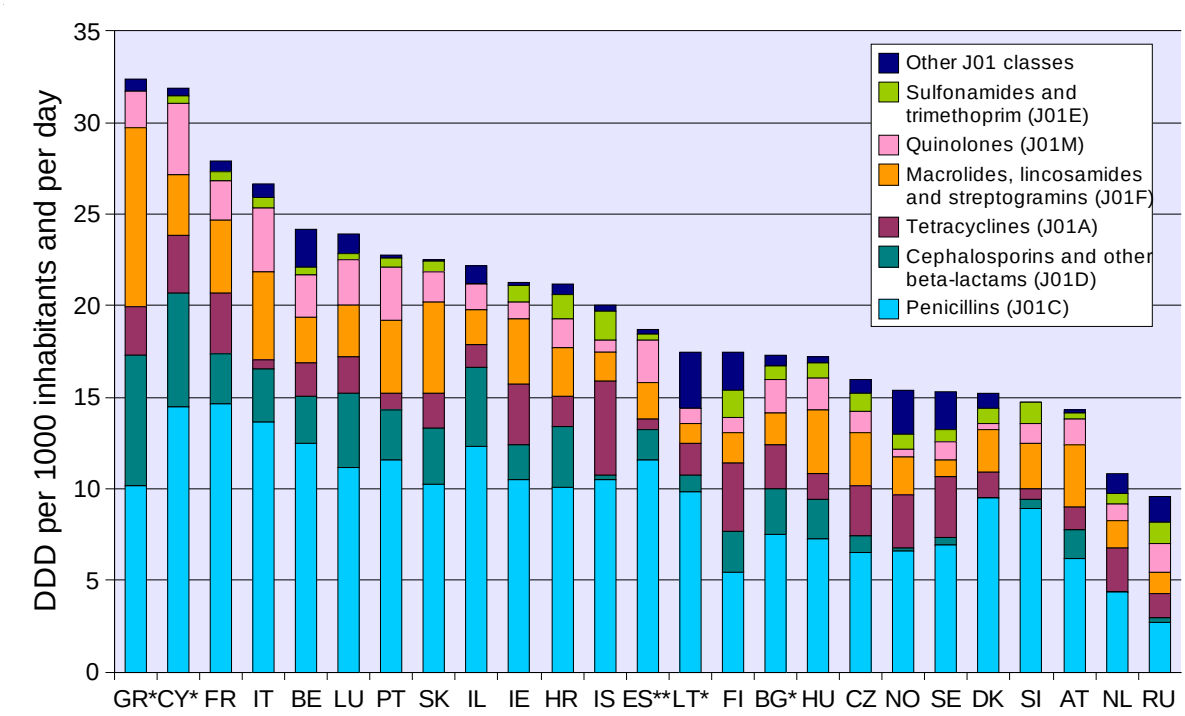
Table 2: Outpatient antibiotic use in 2006 subdivided into the major antibiotic classes according to ATC classification

Country	Penicillins (J01C)	Cephalosporins and other beta-lactams (J01D)	Tetracyclines (J01A)	Macrolides, (J01F)	Quinolones (J01M)	Sulfonamides and trimethoprim (J01E)	Other J01 classes	Total J01
Greece*	10.1	7.2	2.6	9.7	2.0	0.0	0.6	32.4
Cyprus*	14.5	6.3	3.1	3.3	3.8	0.4	0.5	31.9
France	14.6	2.8	3.3	3.9	2.2	0.5	0.6	27.9
Italy	13.6	2.9	0.5	4.9	3.5	0.6	0.8	26.7
Belgium	12.4	2.6	1.9	2.5	2.4	0.4	2.1	24.2
Luxembourg	11.1	4.1	2.0	2.8	2.5	0.3	1.1	23.9
Portugal	11.6	2.7	0.9	4.0	2.9	0.5	0.1	22.7
Slovakia	10.2	3.0	1.9	5.0	1.7	0.6	0.0	22.5
Israel	12.3	4.3	1.3	1.9	1.3	0.0	1.0	22.2
Ireland	10.5	1.9	3.3	3.5	0.9	0.9	0.2	21.2
Croatia	10.1	3.3	1.7	2.7	1.5	1.3	0.6	21.2
Iceland	10.5	0.2	5.2	1.6	0.6	1.6	0.4	20.1
Spain**	11.5	1.7	0.6	2.0	2.3	0.3	0.3	18.7
Lithuania*	9.9	0.9	1.7	1.1	0.8	0.0	3.0	17.4
Finland	5.4	2.2	3.8	1.6	0.8	1.5	2.0	17.4
Bulgaria*	7.5	2.5	2.4	1.8	1.8	0.8	0.6	17.2
Hungary	7.3	2.1	1.4	3.5	1.8	0.8	0.3	17.2
Czech Republic	6.5	0.9	2.8	2.9	1.1	1.0	0.7	15.9
Norway	6.6	0.2	2.9	2.1	0.5	0.8	2.4	15.4
Sweden	7.0	0.4	3.3	0.9	1.0	0.7	2.1	15.3
Denmark	9.5	0.0	1.4	2.3	0.4	0.8	0.8	15.2
Slovenia	8.9	0.5	0.6	2.5	1.1	1.2	0.0	14.7
Austria	6.1	1.6	1.3	3.4	1.4	0.3	0.2	14.3
The Netherlands	4.3	0.0	2.4	1.5	0.9	0.6	1.1	10.8
Russian Federation	2.7	0.3	1.3	1.2	1.6	1.1	1.5	9.6

* Bulgaria, Cyprus, Greece, Lithuania: total use, including the hospital sector.

** Spain: reimbursement data, does not include over-the-counter sales without prescriptions

Figure 4: Outpatient antibiotic (J01) use in 2006 subdivided into the major antibiotic classes according to ATC classification



* GR, LT, CY, and BG: total use, i.e. including the hospital sector

** ES: reimbursement data, does not include over-the-counter sales without prescription

Penicillins represented the most frequently prescribed antibiotics in all countries, ranging from 28% (Russian Federation) to 62% (Denmark and Spain) of the total outpatient antibiotic use. For cephalosporins, the proportional use ranged from 0.2% (Denmark) to 22% (Greece), from 6% (Sweden and Lithuania) to 30% (Greece) for macrolides, and from 2% (Denmark) to 16% (Russian Federation) for quinolones.

Figure 5 Outpatient use of tetracyclines in 2006 in the participating countries

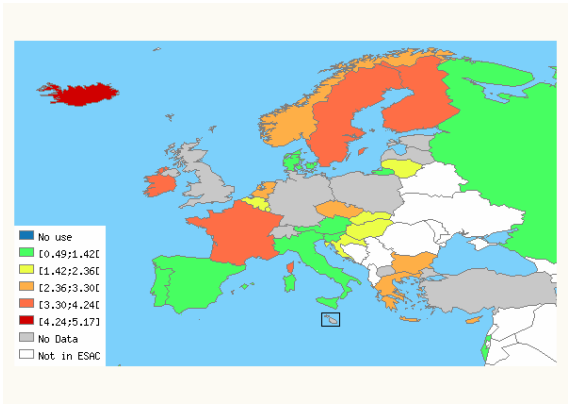
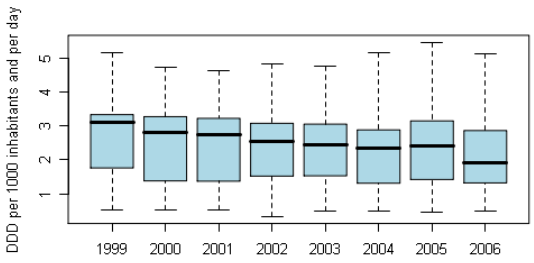


Figure 6: Distribution of outpatient use of tetracyclines during the study period (1999-2006)



In 2006, the outpatient use of tetracyclines varied from 0.5 DID in Italy to 5.2 DID in Iceland. In general, the Scandinavian countries had a higher outpatient use of tetracyclines (Figure 5). The main used substances were doxycycline and minocycline. Since 1999, the outpatient use of this class is continuously decreasing among the participating countries in general (Figure 6).

Figure 7: Outpatient use of penicillins in the participating countries in 2006

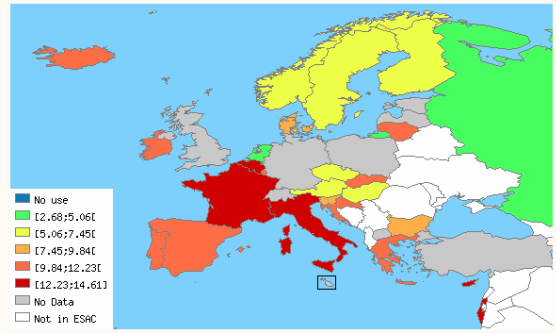
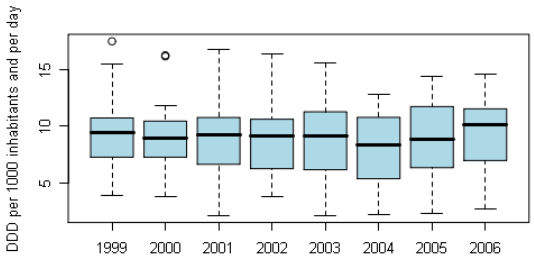


Figure 8: Distribution of outpatient use of penicillins during the study period (1999-2006)



In 2006, the outpatient use of penicillins varied from 2.7 DID in Russian Federation to 14.6 DID in France (Figure 7). The main used sub-classes were penicillins with extended spectrum (J01CA) and combinations of penicillins, incl. beta-lactamase inhibitors (J01CR02). The two most used substances were amoxicillin (J01CA04) and amoxicillin and enzyme inhibitor (J01CR02). In the Scandinavian countries, the drug with the highest use was phenoxymethylpenicillin. During the study period (1999-2006), the general level of use of this drug did not changed (Figure 8).

Figure 9: Outpatient use of other beta-lactam antibacterials in the participating countries in 2006

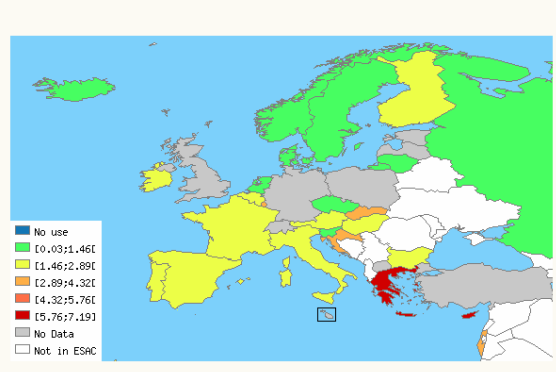
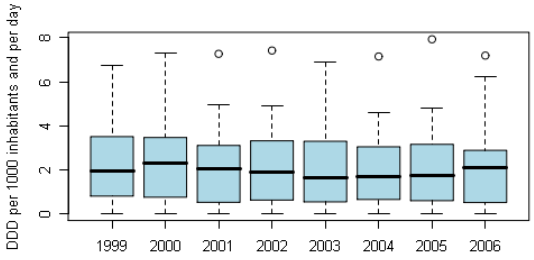


Figure 10: Distribution of outpatient use of other beta-lactam antibacterials during the study period (1999-2006)



The outpatient use of other beta-lactam antibacterials varied from 0.05 DID in the Netherlands to 7.2 DID in Greece (Figure 9). The cephalosporins group contributed for almost the entire total use within this class. Due to the reporting of total use (including hospital care sector), Greece and Cyprus had a level of use of cephalosporins which was twice the use in Croatia (third most user of this class of antibiotic). During the study period, the distribution of the use of this class followed more or less a wave shape (Figure 10).

Figure 11: Outpatient use of sulfonamides and trimethoprim in the participating countries in 2006

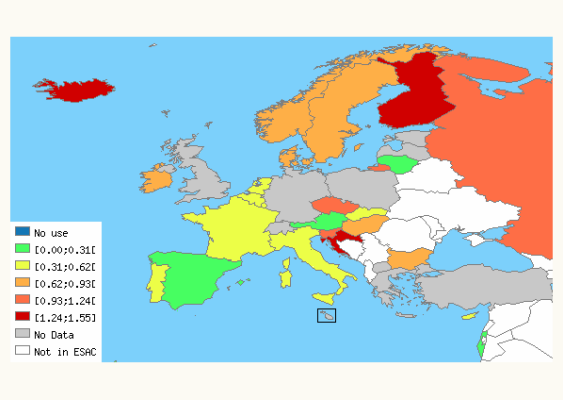
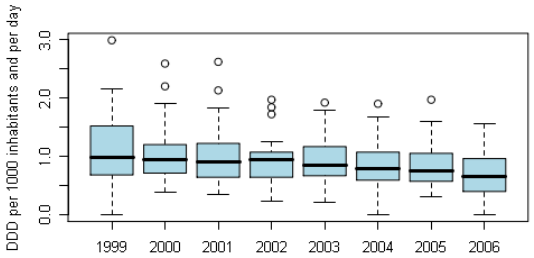


Figure 12: Distribution of outpatient use of sulfonamides and trimethoprim during the study period (1999-2006)



In 2006, the outpatient use of sulfonamides and trimethoprim varied from less than 0.01 DID in Israel to 1.6 DID in Iceland (Figure 11). Almost, all the use was use of combination of sulfomethoxazole and trimethoprim (J01EE01). The general level of use of this class decreased continuously over the study period (Figure 12).

Figure 13: Outpatient use of macrolides, lincosamides and streptogramins in the participating countries in 2006

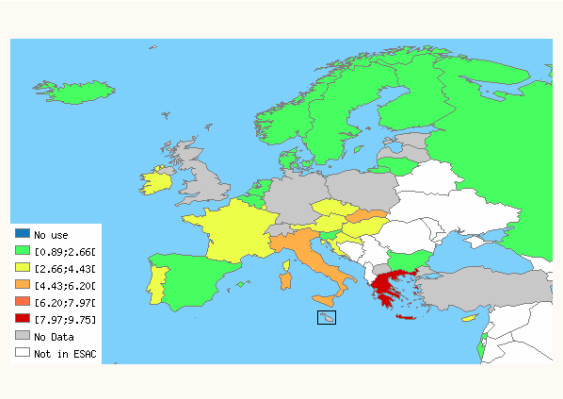
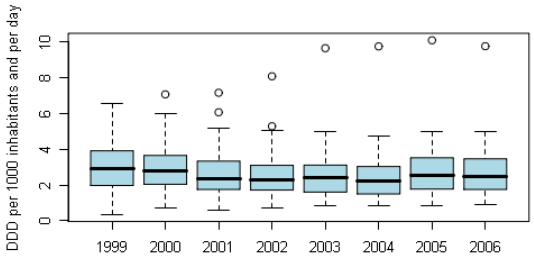


Figure 14: Distribution of use of macrolides, lincosamides and streptogramins during the study period (1999-2006)



The outpatient use of macrolides, lincosamides and streptogramins varied from 0.9 DID in Sweden to 9.8 DID in Greece (Figure 13). The most used sub-group were the macrolides. More specifically, the most used substances were clarithromycin (J01FA09) and azithromycin (J01FA10). In France, the second most used substance in this group was pristinamycin (J01FG01), a streptogramin. In three countries (Austria, Hungary and Sweden), clindamycin (J01FF01), a lincosamide was one of the two most used substances within this class. The level of use of this class was stable over the study period (Figure 14).

Figure 15: Outpatient use of quinolones in the participating countries in 2006

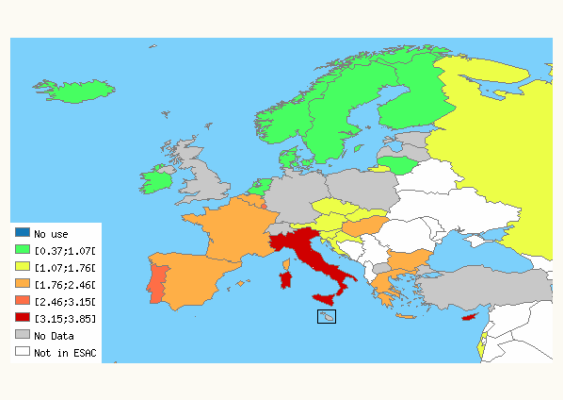
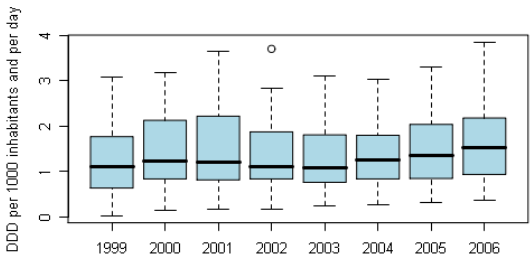


Figure 16: Distribution of outpatient use of quinolones during the study period (1999-2006)



The outpatient use of quinolones varied from 0.4 DID in Denmark to 3.8 DID in Cyprus (Figure 15). Fluoroquinolones (J01MA) represented almost the entire consumption within this class. The most used substances were ciprofloxacin (J01MA02) and norfloxacin (J01MA06). The consumption of this class slightly increased over the study period (Figure 16).

Figure 17: Outpatient use of the other J01 classes (J01B, J01G, J01R, J01X) in the participating countries in 2006

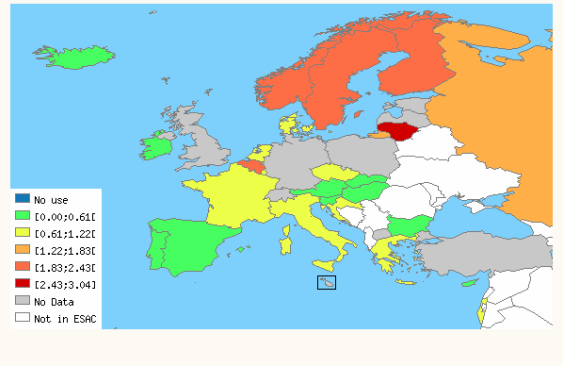
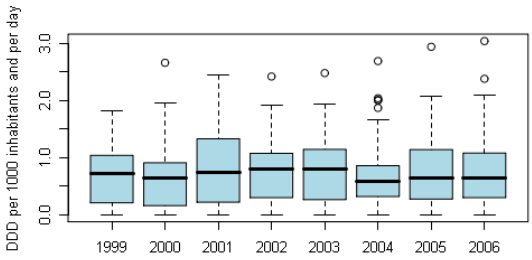
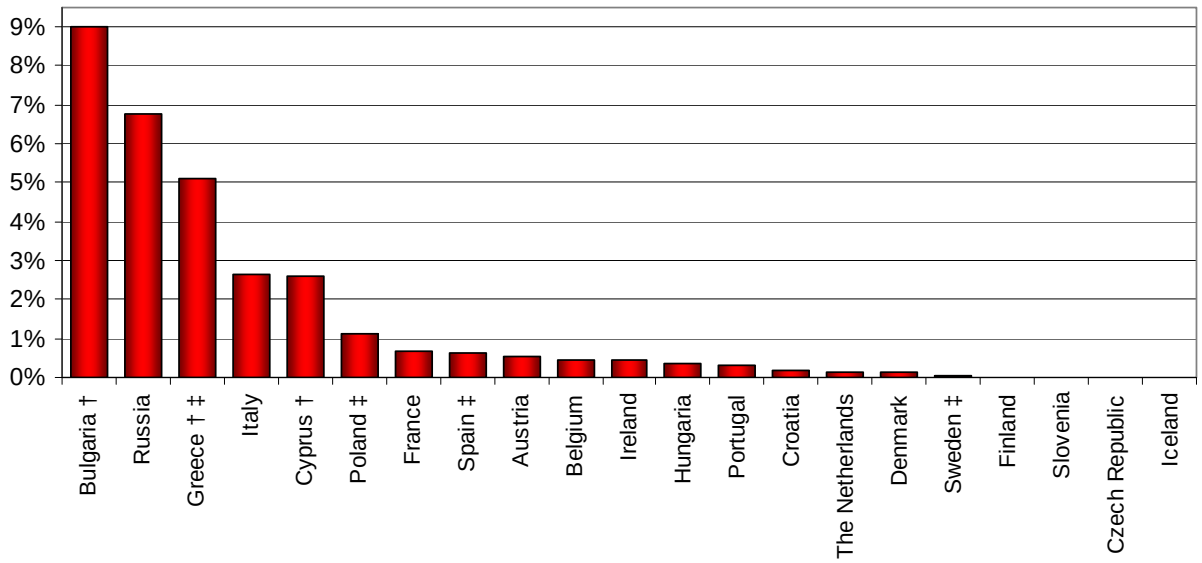


Figure 18: Distribution of outpatient use of the other J01 classes (J01B, J01G, J01R, J01X) during the study period (1999-2006)



The outpatient use of other J01 classes including amphenicols (J01B), aminoglycosides (J01G), combinations of antimicrobials (J01R) and others antimicrobials (J01X) varied from less than 0.01 DID in Slovenia to 3.0 DID in Lithuania (Figure 17). Fluoroquinolones (J01MA) represented almost the entire consumption within this class. The most used sub-class were others antimicrobials (J01X). The Scandinavian countries showed high level of use due to high consumption of methenamin. Belgium, Russian Federation and Lithuania showed high level of use as well, but mainly due to high consumption of nitrofurantoin (J01XE01) and nifurtoinol (J01XE02). Over the study period the level of use of this class did not changed (Figure 18).

Figure 19: Parenteral antibiotic use as a proportion of the total outpatient use in DID in 21 European countries in 2006



† = Total use; ‡ = 2005 use

Out of 21 European countries for which data on outpatient use by route of administration were available, outpatient parenteral antibiotic treatment represented more than 1 % of the total outpatient antibiotic use only in 6 countries (Figure 19). As for the total outpatient antibiotic use and the use of different antibiotic groups and substances, there is a striking variation in the proportions of parenteral antibiotic use in Europe. More in-depth data on outpatient antibiotic use are needed to explain this variation.

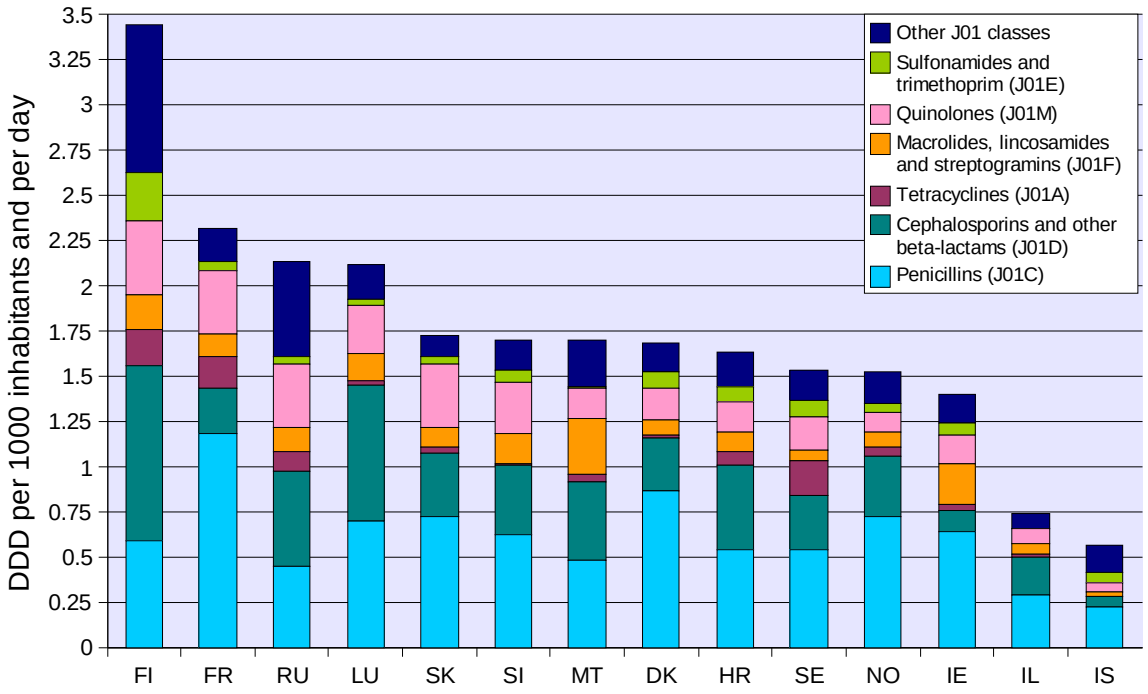
Hospital care

Of the 35 participating countries 14 were able to deliver data on antibiotic use in hospitals in 2006. Table 3 and Figure 20 present the hospital use of the major antibiotic groups according to the ATC classification (penicillins (J0IC), cephalosporins (J01D), macrolides (J01F), quinolones (J01M), tetracyclines (J01A), sulphonamides (J01E), and other antibiotics [concatenation of amphenicols (J01B), aminoglycosides (J01G), combinations of antibacterials (J01R) and other antibacterials (J01X)) within the hospital antibiotic use.

Table 3: Hospital use of antimicrobial for systemic use (ATC group J01) in 2006 in the participating countries

Country	Penicillins (J01C)	Cephalosporins and other beta-lactams (J01D)	Tetracyclines (J01A)	Macrolides (J01F)	Quinolones (J01M)	Sulfonamides and trimethoprim (J01E)	Other J01 classes	Total J01
Finland	0.59	0.97	0.20	0.19	0.41	0.26	0.82	3.45
France	1.18	0.25	0.17	0.13	0.35	0.05	0.19	2.32
Russian Federation	0.45	0.53	0.11	0.13	0.35	0.04	0.53	2.13
Luxembourg	0.70	0.75	0.03	0.15	0.27	0.03	0.19	2.11
Slovakia	0.72	0.36	0.03	0.11	0.35	0.04	0.11	1.72
Slovenia	0.63	0.38	0.01	0.16	0.28	0.07	0.17	1.70
Malta	0.49	0.43	0.05	0.31	0.17	0.02	0.25	1.70
Denmark	0.87	0.29	0.01	0.09	0.18	0.09	0.16	1.68
Croatia	0.54	0.47	0.07	0.11	0.17	0.08	0.19	1.63
Sweden	0.54	0.30	0.19	0.06	0.18	0.10	0.17	1.54
Norway	0.72	0.33	0.05	0.08	0.10	0.05	0.18	1.52
Ireland	0.64	0.12	0.03	0.23	0.16	0.06	0.16	1.40
Israel	0.29	0.21	0.02	0.05	0.09	0.00	0.08	0.74
Iceland	0.22	0.06	0.00	0.02	0.05	0.06	0.15	0.57

Figure 20: Hospital use of antimicrobials for systemic use (ATC group J01) in the participating countries in 2006



The proportion of penicillins use ranged from 17% in Finland to 52% in Denmark. Ten of 14 countries had a proportion of use of penicillins greater than one third. The proportion of cephalosporins use was high in Luxembourg (35%) but low in Ireland (8%). Tetracycline use was the highest in Sweden (9%). Macrolide use ranged between 18% in Malta and 3% in Sweden; and quinolone use between 12% in Slovak Republic and 7% in Norway. Sulfonamide use was the highest in the Russian Federation (11%) and Finland (8%). The use of other classes was very high in Sweden (36%) and more than 20% in the Russian Federation, Finland and Iceland.

Nevertheless the reliability of the estimation of national aggregates of hospital antibiotic consumption must be critically evaluated. All the reporting countries derive a reliable estimate for national hospital exposure to antibiotics from wholesale data or from detailed consumption registration in all hospitals. Moreover the validity of the hospital data is much more vulnerable for biases in ambulatory/hospital case mix. Specifically in Sweden and Finland, where some remote primary health care centres and nursing homes were included into the hospital data, proportional use of "other antibiotics" was 36% and 24% respectively, predominantly due to use of oral methenamine and nitrofurantoin.

Antimycotic use in Europe

Table 4 and Figure 21 present the outpatient antimycotic use in 2006 for 16 European countries expressed in DID and subdivided into the main used substances. Total outpatient antimycotic use varied with a factor 13 between the country with the highest (1.47 DID in Belgium) and lowest (0.11 DID in Norway) use. Itraconazole, fluconazole and ketoconazole represented more than 95% of total outpatient antimycotic use in all countries. If, in most of the countries itraconazole was the most used drug (more than 60% in Slovenia, Portugal and the Netherlands), its consumption was less homogenous among the reporting countries than fluconazole. Indeed, the relative use of fluconazole was smaller but represented at least more than 20% in all the countries. The relative use of ketoconazole was higher than 30% in the

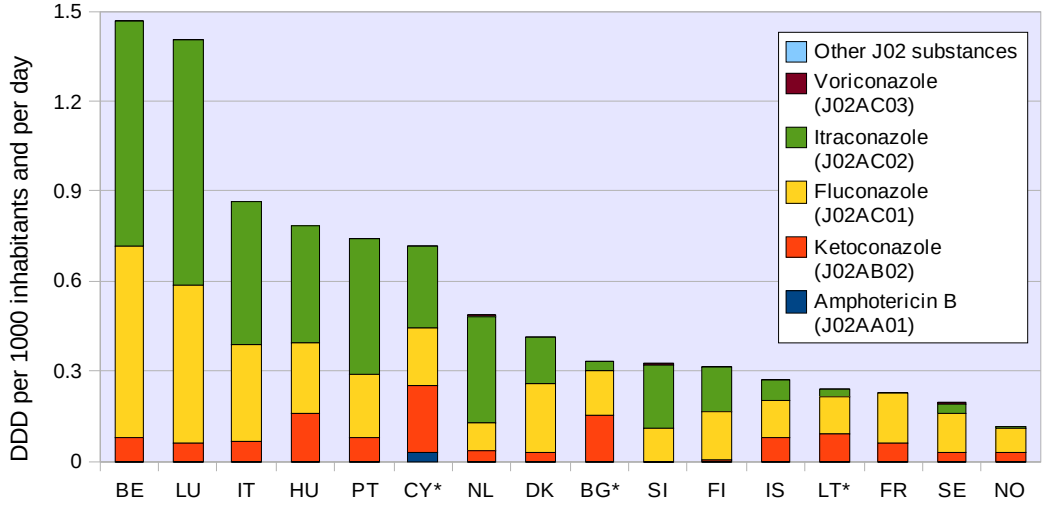
three countries which reported total use including hospital use. Cyprus was also reporting a high use of amphotericin B for the same reason. Belgium and Luxembourg had a particular but almost similar pattern of use of antimycotics with a high level of use of fluconazole and itraconazole compared to the others countries.

Table 4: Outpatient antimycotic (J02) use in 2006 subdvided into the main substances according to ATC classification

country	Amphotericin B (J02AA01)	Ketoconazole (J02AB02)	Fluconazole (J02AC01)	Itraconazole (J02AC02)	Voriconazole (J02AC03)	Other J02 substances	Total J02
Belgium	0.00	0.08	0.64	0.75	0.00	0.00	1.47
Luxembourg	0.00	0.06	0.53	0.82	0.00	0.00	1.40
Italy	0.00	0.07	0.32	0.48	0.00	0.00	0.87
Hungary	0.00	0.16	0.23	0.39	0.00	0.00	0.79
Portugal	0.00	0.08	0.21	0.45	0.00	0.00	0.74
Cyprus*	0.03	0.22	0.19	0.27	0.00	0.01	0.72
The Netherlands	0.00	0.04	0.09	0.35	0.01	0.00	0.49
Denmark	0.00	0.03	0.23	0.15	0.00	0.00	0.42
Bulgaria*	0.00	0.15	0.15	0.03	0.00	0.00	0.33
Slovenia	0.00	0.00	0.11	0.21	0.00	0.00	0.32
Finland	0.00	0.00	0.17	0.14	0.00	0.00	0.32
Iceland	0.00	0.08	0.12	0.07	0.00	0.00	0.27
Lithuania*	0.00	0.09	0.12	0.03	0.00	0.00	0.24
France	0.00	0.06	0.17	0.00	0.00	0.00	0.23
Sweden	0.00	0.03	0.13	0.03	0.01	0.00	0.19
Norway	0.00	0.03	0.08	0.00	0.00	0.00	0.11

* Bulgaria, Cyprus and Lithuania: total use, ie including the hospital sector

Figure 21: Outpatient antimycotic (J02) use in 2006 subdivided into the main substances according to ATC classification



* BG, CY and LT: total use, ie including the hospital sector

CHAPTER 4. ESAC DISSEMINATION ACTIVITIES

Papers published in peer reviewed journals

Richter SS, Heilmann KP, Dohrn CL, Beekmann SE, Riahi F, Garcia-de-Lomas J, Ferech M, Goossens H, Doern GV. *Increasing telithromycin resistance among Streptococcus pyogenes in Europe*. J Antimicrob Chemother 2008;61:603-1.

Coenen S, Ferech M, Haaijer-Ruskamp FM, Butler CC, Vander Stichele RH, Verheij TJM, Monnet DL, Little P, Goossens H and the ESAC Project Group. *European Surveillance of Antimicrobial Consumption (ESAC): Quality indicators for outpatient antibiotic use in Europe.* Qual Saf Health Care 2007; 16:440-5.

Goossens H, Coenen S, Ferech M, Stephens P en de ESAC projectgroep. *Ambulant antibioticagebruik in 2004: Vergelijking tussen Verenigde Staten en 27 Europese landen.* Huisarts Nu 2007; 36: 486-92.

Muller A, Coenen, S, Goossens H, Monnet D, and the ESAC project group. *European Surveillance of Antimicrobial Consumption (ESAC): outpatient antibiotic use in Europe 1998-2005.* Eurosurveillance 2007; 12(10) Oct 11.

Goossens H, Ferech M, Coenen S, Stephens P and the ESAC Project Group. *Comparison of outpatient systemic antibiotic use in 2004 between the United States and 27 European countries*. Clin Inf Dis 2007;44;1091-5.

Campos J, Ferech M, Lázaro E, de Abajo F, Oteo J, Stephens P, Goossens H. *Surveillance of Outpatient Antibiotic Consumption in Spain according to Sales Data and Reimbursement Data.* J Antimicrob Chemother. 2007; 60: 698-701.

Coenen S, Costers M, Goossens H. *Can mass media campaigns change antimicrobial prescribing? A regional evaluation study.* J Antimicrob Chemother 2007;60: 179-80.

Coenen S, Ferech M, Dvorakova K, Hendrickx E, Suetens C, Goossens H en de ESAC projectgroep. *European Surveillance of Antimicrobial Consumption (ESAC): Penicillinegebruik in de ambulante praktijk in Europa*. Huisarts Nu 2007;36:74-8.

Coenen S, Ferech M, Dvorakova K, Hendrickx E, Suetens C, Goossens H en de ESAC-projectgroep. *European Surveillance of Antimicrobial Consumption (ESAC). Cefalosporinegebruik in de ambulante praktijk in Europa.* Huisarts Nu 2007;36:134-8.

Coenen S, Ferech M, Malhotra-Kumar S, Hendrickx E, Suetens C, Goossens H en de ESAC projectgroep. *European Surveillance of Antimicrobial Consumption (ESAC): Gebruik van macroliden, lincosamiden en streptograminen (MLS) in de ambulante praktijk in Europa*. Huisarts Nu 2007;36: 185-9.

Coenen S, Ferech M, Malhotra-Kumar S, Dvorakova K, Hendrickx E, Suetens C, Goossens H en de ESAC projectgroep. *European Surveillance of Antimicrobial Consumption (ESAC): Chinolonengebruik in de ambulante praktijk in Europa.* Huisarts Nu 2007;36: 239-43.

Elseviers M.M, Ferech M, Vander Stichele RH, Goossens H and the ESAC project group. *Antibiotic use in ambulatory care in Europe (ESAC data 1997-2002): trends, regional differences and seasonal fluctuations.* Pharmacoepidemiology and drug safety 2007; 16: 115-23.

Abstracts accepted for oral presentation

Faranak Ansari, Herman Goossens, Matus Ferech, Arno Muller, Hassan Molana, and Peter Davey on behalf of the ESAC Hospital Care Subproject. *Hospital antibiotic prescribing in hospitals from 18 European countries from 2000 to 2005: longitudinal analysis with comparison of adjustment for changes in clinical activity using admissions or occupied bed days.* 18th ECCMID 19 April – 22 April 2008, Barcelona, Spain. Clinical Microbiology and Infection Supplement #O398.

Samuel Coenen, Arno Muller, Niels Adriaenssens, Vanessa Vankerckhoven, Erik Hendrickx, Herman Goossens and the ESAC Project Group. *European Surveillance of Antimicrobial Consumption (ESAC): Outpatient Parenteral Antibiotic Treatment in Europe.* 18th ECCMID 19 April – 22 April 2008, Barcelona, Spain. Clinical Microbiology and Infection Supplement #O400.

Samuel Coenen, Vanessa Vankerckhoven, Arno Muller, Erik Hendrickx, Niels Adriaenssens, Faranak Ansari, and Herman Goossens on behalf of the ESAC Project Group. *European Surveillance of Antimicrobial Consumption (ESAC): past, present and future.* GRIN Meeting October 2007, Maastricht, the Netherlands.

Abstracts accepted for poster presentation

Arno Muller, Samuel Coenen, Vanessa Vankerckhoven, Niels Adriaenssens, Tom Bajec, Faranak Ansari, Erik Hendrickx, Nico Drapier, Hilde De Smet, Herman Goossens and the ESAC Project Group. *European Surveillance of Antimicrobial Consumption (ESAC).* 18th ECCMID, 19 April – 22 April 2008, Barcelona, Spain. Clinical Microbiology and Infection Supplement.

Other publications

Herman Goossens on behalf of the ESAC Management Team. *The ESAC project will be funded for another 3 years*. GRACE News [Newsletter] October 2007.

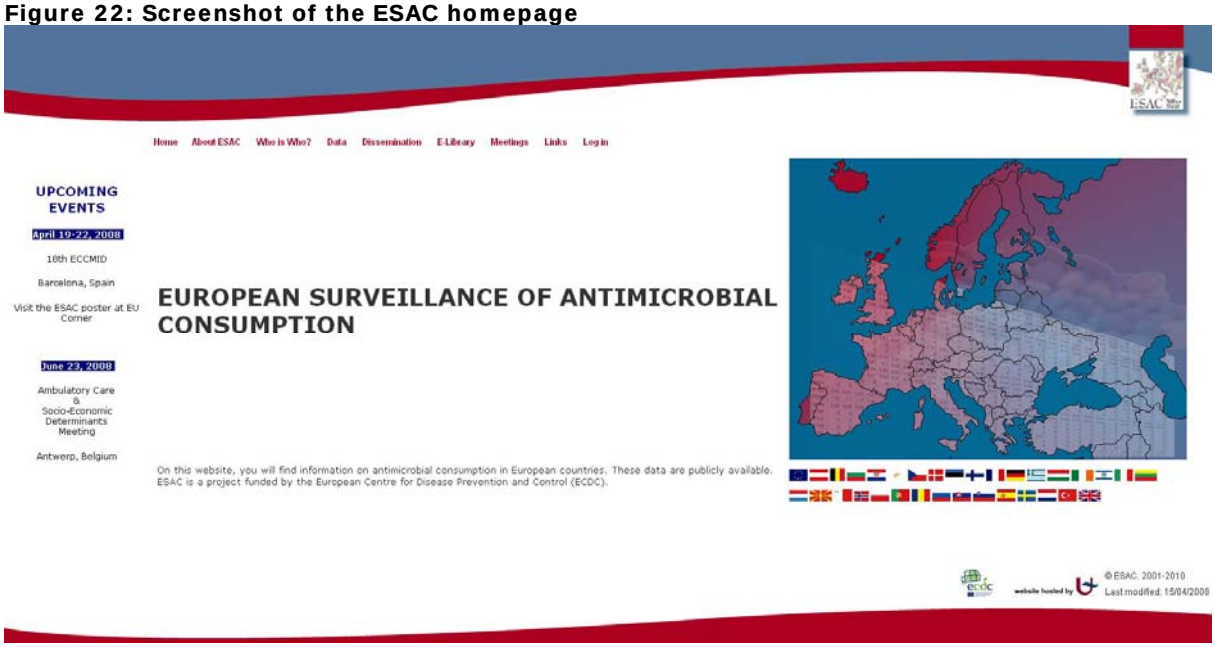
Website

A new ESAC website has been developed and is accessible through the following link: http://www.esac.ua.ac.be.

The ESAC website contains 3 parts:

- An area for general information about the ESAC project.
- An area for the dissemination of results and knowledge.
- A password-protected area for the internal management of ESAC.

Figure 22: Screenshot of the ESAC homepage



Interactive database

The interactive database was updated with 2006 data.

Figure 23: Screenshot of the ESAC interactive database

Newsletter

The first ESAC Newsletter was available as of February 2008. In this newsletter the ESAC Management Team was presented as well as the Lead National Representatives for each participanting country. It also gives an overview of the aims of the ESAC project and upcoming events. In the following editions, which will be available 3 times per year, the newly established National Networks of each of the collaborating countries will be presented as well as updates on the ESAC project.

A PDF version of the first ESAC Newsletter can be downloaded from the ESAC website (http://www.esac.ua.ac.be).

CHAPTER 5. CONCLUSIONS AND FUTURE OBJECTIVES

ESAC was launced in 2001 and funded for a period of 6 years by DG Sanco of the European Commission. Since September 2007, ESAC is funded by ECDC.
ESAC successfully collected 2006 consumption data on antimicrobials for systemic use (ATC group J01), antimycotics for systemic use (ATC group J02) and additional specific substances in 26 out of the 35 participating countries. These data have been instrumental for instance to evaluate the impact of awareness campaigns in many EU Member States, such as Belgium and France, and will be crucial to monitor the impact of the EU Antibiotic Awareness Day on November 18, 2008.
Additionally, the ESAC project will deepen the knowledge of antibiotic consumption by focusing on specific consumption groups and/or patterns (Nursing Homes, Hospital Care, and Ambulatory Care) in collaboration with those countries where the appropriate data are available.
Twenty-one European countries will participate to the ESAC Nursing Home (NH) subproject. The objectives of the project are to create a European NH-network to provide standardised data on antibiotic prescriptions, to evaluate total yearly antibiotic consumption and to explore institutional determinants of antibiotic use in these facilities. The NH-subproject has 2 components. The first component (September 2008) is a descriptive study of the characteristics (structural, functional) of high skilled NHs and the regulating mechanisms concerning antibiotic use and infection control in these facilities in European countries. The second component concerns the organisation of 2 consecutive Point Prevalence Surveys (PPS) on antibiotic use in at least 5 high skilled NHs per country, one in April 2009 and the second in October 2009. Each participating NH will complete an institutional questionnaire with denominator data and characteristics of their antibiotic policy. For each resident receiving antibiotics on the PPS-day, a resident questionnaire will be filled in collecting individual data on antibiotic treatment and risk factors.
Thirty-one European countries will participate to the ESAC Hospital Care (HC) subproject and the study will focus on antibacterials and antifungals. The aims are to establish a European network for standard data collection on hospitals antimicrobial use, to develop quality indicators of antimicrobial use in the hospital care sector, and to identify targets for intervention on improved antimicrobial prescribing. The HC subproject has 4 components. 1) Point Prevalence Survey (PPS) in 2008 in 50-60 hospitals, 2) PPS in 2009 in as many hospitals as possible. The aim of PPS 2008 and 2009 is to study the relationship between prescribed antimicrobials, dose, site of infection, and indication at patient level and will be performed during May-June. ESAC Web-PPS tool is developed for data entry and automated data analysis. 3) 4-year Longitudinal Survey (LS) in up to 50 hospitals from PPS 2008 and PPS 2009 hospitals. The aims are to validate time trends of hospital antimicrobial use with a set of clinical activity denominators and to compare the trends for specific drug subgroups with total antimicrobial use. ESAC-ABC calculator will be developed for data collection and analysis. 4) Basic hospital statistics. The aim is to define a standard dataset that should be considered in comparing antibiotic use. The ESAC Hospital Questionnaire is designed to collect information on hospital characteristics.
The Ambulatory Care (AC) subproject will closely interact with a subproject on Socio-Economic Determinants. In the Socio-Economic Determinants subproject, we will be studying the socio-economic health organisation specific for different regions in each country participating in this subproject. Data will be collected on general demographics, health status, income, density of physicians, etc. In the AC subproject we will substantially broaden our interpretation of the striking variation in antibiotic use between European countries in primary care. In addition to the data collection for the core database, more detailed data linking antibiotic use in ambulatory care to the patients' age and gender, the prescribers' speciality and the indication will be be collected. Such data should also be used to validate further indicators developed in ESAC-2 to assess the quality of antibiotic use in ambulatory care. Indicators that are equally relevant across countries in Europe, i.e. corrected for case-mix, resistance patterns and other contextual factors will be developed. The kick-off meeting for these two subprojects is planned on June 23.

ANNEX I: COUNTRY SHEETS

The country sheets presented in this section provide specific information on antimicrobial use for each of the reporting countries.

The country sheets are divided into four sections.

1) The first section presents information on the source and type of data reported by the participating countries as well as the population data used to report the antimicrobial consumption.
    a. Antimicrobial use data:
    Type of health care sector for which data are reported: ambulatory care / hospital care or total care.
    Type of consumption data: sales data or reimbursement data from health insurance systems.
    The coverage (in percentage) of the data: representativeness of the data reported in ESAC.
    Source of the consumption data: public or private.
    b. Population data:
    For comparison reasons, consumption data is reported in numbers of DDDs per 1000 inhabitants and per day (DID). ESAC uses the WHO population except when this population is not relevant, i.e. when using insurance data.
2) The second section presents the consumption of antimicrobials for systemic use (ATC class J01) split into 7 major classes based on the ATC classification. Several Tables and Figures are shown:
    a. A table presenting the data expressed in DDD per 1000 inhabitants per day (DID) for each of the health care sectors for which data are reported.
    b. For ambulatory care, two figures are shown:
        - A pie plot presenting the distribution of the relative consumption of the 7 classes
        - A bar plot presenting the trends of consumption of the 7 classes from 1998 to 2006
    c. For hospital care, one figure is shown:
        - A pie plot presenting the distribution of the relative consumption of the 7 classes
3) The third section presents the consumption of the major antimycotics for systemic use (ATC class J02). Data are presented in two ways:
    a. A table presenting the data expressed in DDD per 1000 inhabitants per day (DID) for each of the health care sectors for which data are reported.
    b. A figure presenting the distribution of the relative consumption of each of the major antimycotics for systemic use for each of the health care sectors for which data are reported.
4) The fourth section presents a comment on the antimicrobial consumption in order to facilitate interpretation. The National Networks provided general comments about the antimicrobial use in their respective countries whereas the Management Team added, when required, technical comments about the presentation of the data. The comments made by the National Networks and those made by the Management Team are preceeded respectively by National Networks and Management Team.

Reported data split by health care sectors for each of the participating countries for the year 2006

Country	Ambulatory care	Hospital care	Total care
Austria	✓		
Belgium	✓	✓	
Bulgaria			✓
Croatia	✓	✓	
Cyprus			✓
Czech Republic	✓		
Denmark	✓	✓	
Estonia			
Finland	✓	✓	
Former Yugoslavian Republic of Macedonia*			
France	✓	✓	
Germany			
Greece			✓
Hungary	✓		
Iceland	✓		
Ireland	✓	✓	
Israel	✓	✓	
Italy	✓		
Latvia			
Lithuania			✓
Luxembourg	✓	✓	
Malta		✓	
Norway	✓	✓	
Poland			
Portugal	✓		
Romania			
Russian Federation	✓	✓	
Slovakia	✓	✓	
Slovenia	✓	✓	
Spain	✓		
Sweden	✓	✓	
Switzerland			
The Netherlands	✓		
Turkey			
United Kingdom			

* Former Yugoslavian Republic of Macedonia was not yet part of the ESAC group in 2006.

Austria

Health care sector	Data type	Coverage	Data source
Ambulatory care	Reimbursement	100%	Health Insurance Company

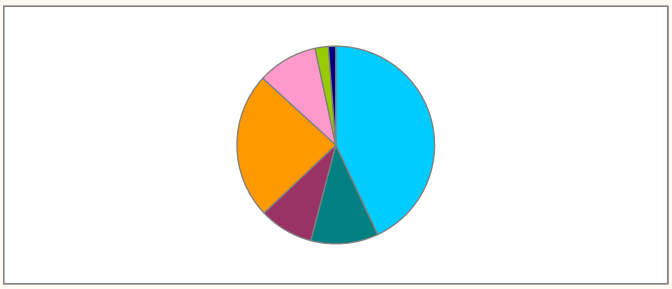
Population	Data source
8,205,000	WHO

Antimicrobials for systemic use (J01)

Use of antimicrobials for systemic use expressed in DDD/1000 inh./day in 2006

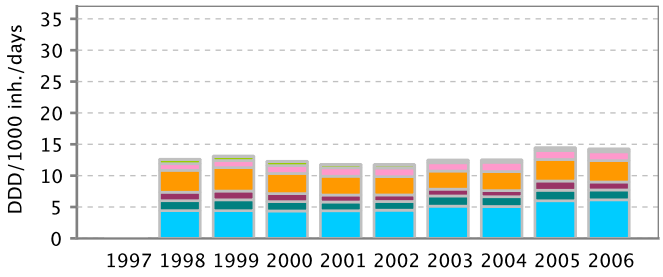
J01 classes	Ambulatory care
Beta-lactam antibacterials, penicillins (J01C)	6.15
Other beta-lactam antibacterials (J01D)	1.57
Tetracyclines (J01A)	1.26
Macrolides, lincosamides and streptogramins (J01F)	3.41
Quinolone antibacterials (J01M)	1.41
Sulfonamides and trimethoprim (J01E)	0.31
Other J01 classes	0.17
Total J01 classes	***14.28***

Distribution of J01 classes in ambulatory care sector



Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Trends of use of J01 in ambulatory care sector



Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Comments

National Network — Antibiotic consumption in ambulatory care increased from 2002 onwards. While tetracyclines, sulfonamides/trimethoprim and macrolides/lincosamides/streptogramins are less prescribed, the use of penicillin combinations and fluoroquinolones is increasing.
A very small number of drugs for which the price is below the reimbursement fee were excluded from the data collection. We do not expect an impact on the data quality since the list of affected drugs has not changed over the years. Between 2005 and 2007 a pilot project on the collection of hospital consumption data was performed in Austria. A total of 15 hospitals have provided pharmacy dispensing data for the period 2004 to 2006. The surveillance activities in hospital care as well as ambulatory care will be intensified in the upcoming years.

Belgium

Health care sector	Data type	Coverage	Data source
Ambulatory care	Reimbursement	90%	Health Insurance Company

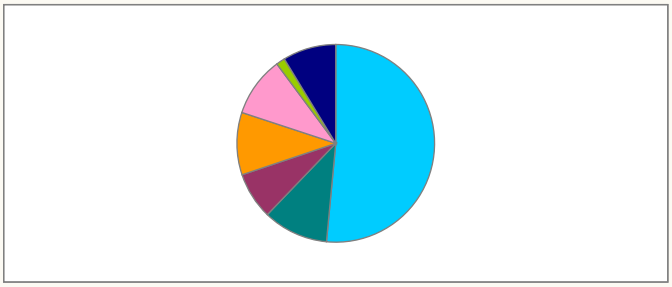
Population	Data source
10,437,000	WHO

Antimicrobials for systemic use (J01)

Use of antimicrobials for systemic use expressed in DDD/1000 inh./day in 2006

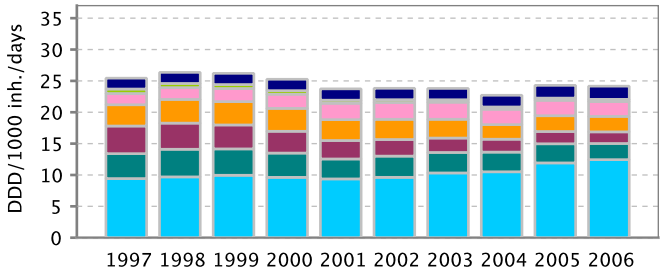
J01 classes	Ambulatory care
Beta-lactam antibacterials, penicillins (J01C)	12.44
Other beta-lactam antibacterials (J01D)	2.58
Tetracyclines (J01A)	1.85
Macrolides, lincosamides and streptogramins (J01F)	2.46
Quinolone antibacterials (J01M)	2.36
Sulfonamides and trimethoprim (J01E)	0.35
Other J01 classes	2.10
Total J01 classes	***24.16***

Distribution of J01 classes in ambulatory care sector



Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Trends of use of J01 in ambulatory care sector

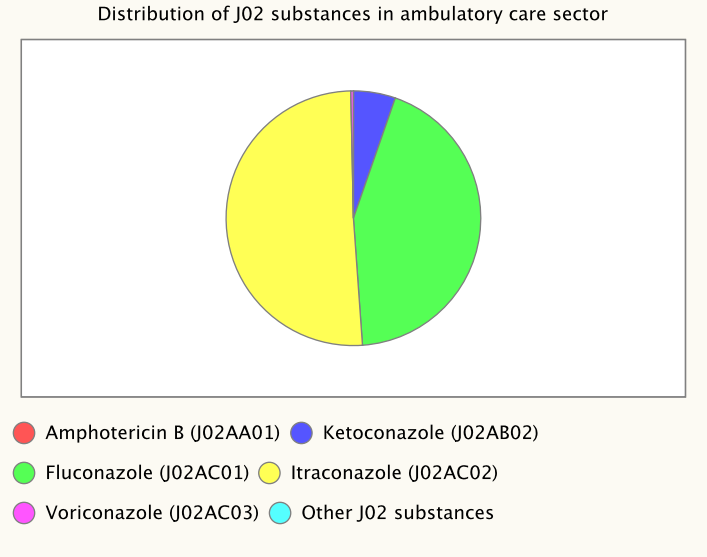


Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Antimycotics for systemic use (J02)

Use of antimycotics for systemic use expressed in DDD/1000 inh./day in 2006

J02 substances	Ambulatory care
Amphotericin B (J02AA01)	<0.01
Ketoconazole (J02AB02)	0.08
Fluconazole (J02AC01)	0.64
Itraconazole (J02AC02)	0.75
Voriconazole (J02AC03)	<0.01
Other J02 substances	0.00
Total J02 substances	***1.47***



Comments

National Network — When expressed in DDDs per 1000 inhabitants per day (DID) use of antibiotics in ambulatory care in Belgium is traditionally among the highest in Europe. Antibiotic use in DID however does not describe completely the prescribing behaviour of ambulatory care physicians in Belgium. E.g. it was noted that during the observation period, the number of DDDs per package increased. As a consequence, expressing antibiotic use in packages – a proxy for prescriptions – per 1000 inhabitants per day shows an average annual decrease of 6.2% since the start of the Belgian public campaigns in the 2000-2001 winter season (www.red-antibiotica.org & www.antibioticsinfo.be). In DID J01 use in 2006 remained nearly constant in ambulatory care when compared to 2005 and in both 2005 and 2006 use was higher than during the period 2001-2003. For 2004, the lower use is most probably explained by the unusual low 2004 incidences of respiratory infections as observed by the Scientific Institute of Public Health, National Influenza Centre, Belgium (www.iph.fgov.be/flu). Concerning shifts between antibiotic classes in ambulatory care, there is an increase in penicillin use, a continuing decrease of tetracycline and cephalosporin use, a stabilisation of macrolides, lincosamides and streptogramins as well as sulfonamides and trimethoprim use and a small decrease in fluoroquinolone use. The increase of penicillin use is nearly entirely explained by a higher utilisation of amoxicillin (J01CA04), most probably as a consequence of guidelines issued by the Belgian Antibiotic Coordination Committee (www.bapcoc.be) and Domus Medica (www.domusmedica.be), the publication of an antibiotic guide for ambulatory care by BAPCOC, newsletters and individual antibiotic prescribing feedback to ambulatory care physicians by the National Board of Quality Promotion (www.inami.fgov.be/care/nl/doctors/promotion-quality/feedbacks/feedback-antibiotics/index.htm) during previous years.

Bulgaria

Health care sector	Data type	Coverage	Data source
Total care	Sales	100%	Medicines Agency

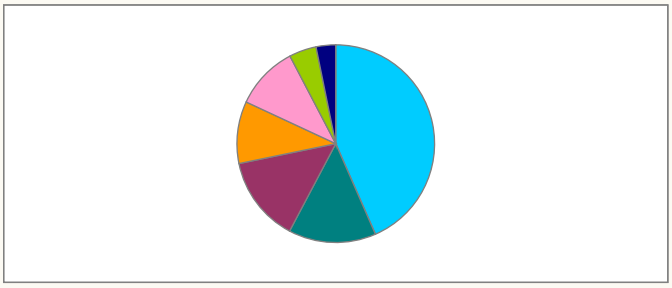
Population	Data source
7,671,000	WHO

Antimicrobials for systemic use (J01)

Use of antimicrobials for systemic use expressed in DDD/1000 inh./day in 2006

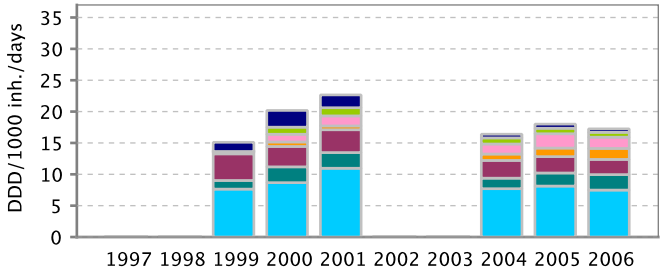
J01 classes	Total care
Beta-lactam antibacterials, penicillins (J01C)	7.49
Other beta-lactam antibacterials (J01D)	2.47
Tetracyclines (J01A)	2.42
Macrolides, lincosamides and streptogramins (J01F)	1.75
Quinolone antibacterials (J01M)	1.79
Sulfonamides and trimethoprim (J01E)	0.77
Other J01 classes	0.55
Total J01 classes	***17.24***

Distribution of J01 classes in total care sector



Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Trends of use of J01 in total care sector

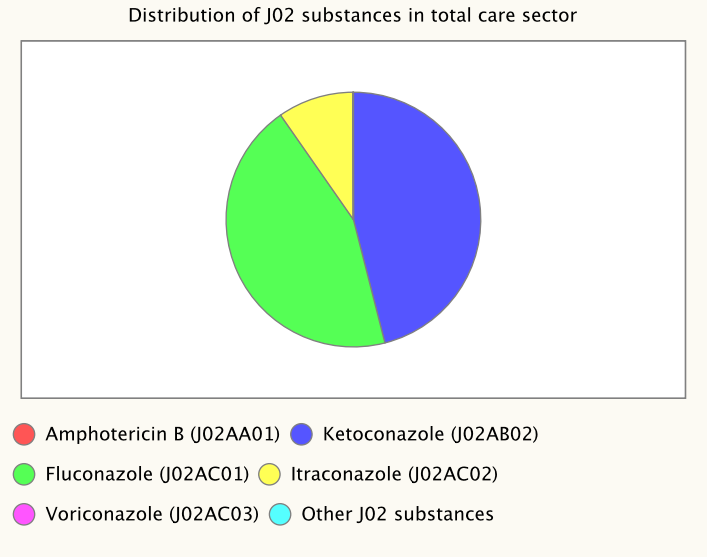


Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Antimycotics for systemic use (J02)

Use of antimycotics for systemic use expressed in DDD/1000 inh./day in 2006

J02 substances	Total care
Amphotericin B (J02AA01)	0.00
Ketoconazole (J02AB02)	0.15
Fluconazole (J02AC01)	0.15
Itraconazole (J02AC02)	0.03
Voriconazole (J02AC03)	<0.01
Other J02 substances	<0.01
Total J02 substances	***0.33***



Croatia

Health care sector	Data type	Coverage	Data source
Ambulatory care	Sales	>90%	Marketing Research Company
Hospital care	Sales	>90%	Marketing Research Company

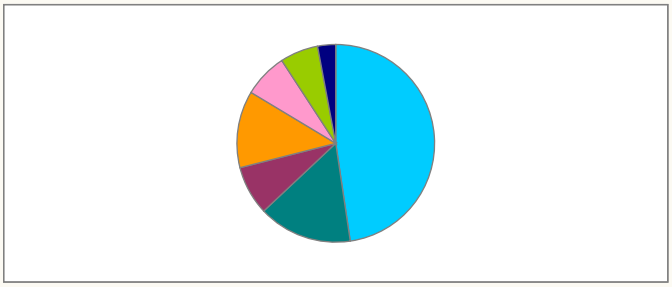
Population	Data source
4,556,000	WHO

Antimicrobials for systemic use (J01)

Use of antimicrobials for systemic use expressed in DDD/1000 inh./day in 2006

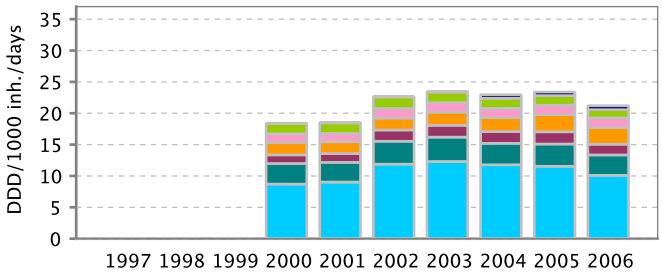
J01 classes	Ambulatory care	Hospital care
Beta-lactam antibacterials, penicillins (J01C)	10.10	0.54
Other beta-lactam antibacterials (J01D)	3.25	0.47
Tetracyclines (J01A)	1.70	0.07
Macrolides, lincosamides and streptogramins (J01F)	2.67	0.11
Quinolone antibacterials (J01M)	1.53	0.17
Sulfonamides and trimethoprim (J01E)	1.32	0.08
Other J01 classes	0.63	0.19
Total J01 classes	***21.20***	***1.63***

Distribution of J01 classes in ambulatory care sector



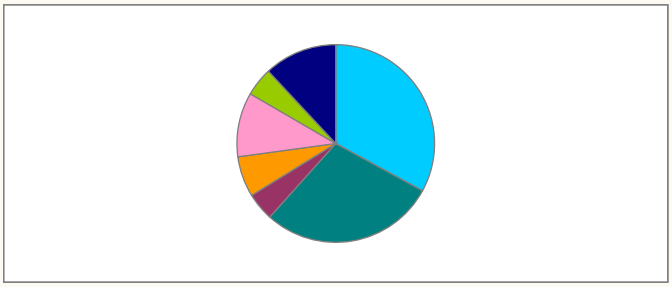
Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Trends of use of J01 in ambulatory care sector



Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Distribution of J01 classes in hospital care sector



Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Cyprus

Health care sector	Data type	Coverage	Data source
Total care	Sales	100%	Medicines Agency

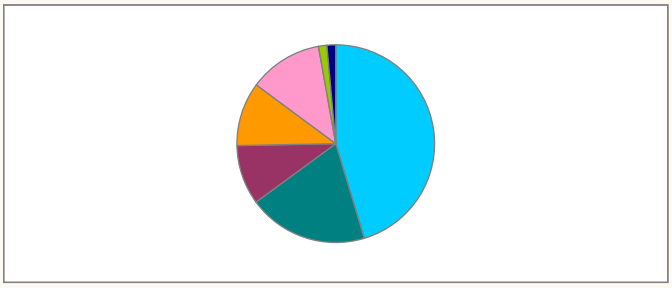
Population	Data source
778,700	National Institute for Statistics

Antimicrobials for systemic use (J01)

Use of antimicrobials for systemic use expressed in DDD/1000 inh./day in 2006

J01 classes	Total care
Beta-lactam antibacterials, penicillins (J01C)	14.46
Other beta-lactam antibacterials (J01D)	6.25
Tetracyclines (J01A)	3.11
Macrolides, lincosamides and streptogramins (J01F)	3.33
Quinolone antibacterials (J01M)	3.85
Sulfonamides and trimethoprim (J01E)	0.44
Other J01 classes	0.46
Total J01 classes	***31.89***

Distribution of J01 classes in total care sector



Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

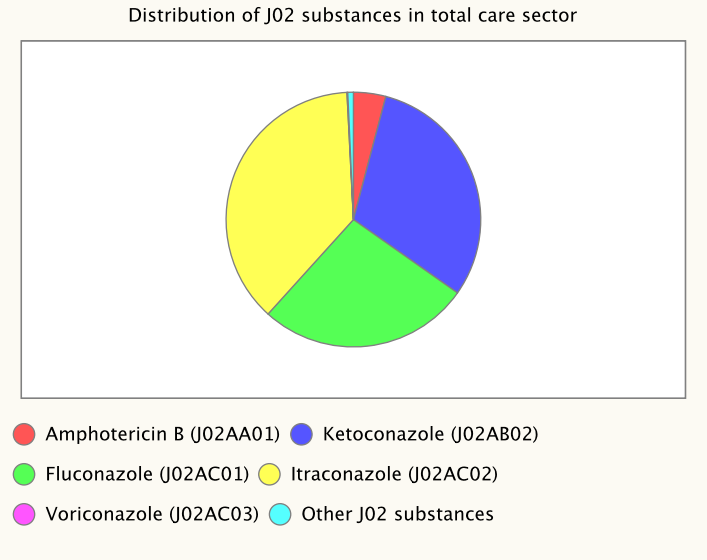
Trends of use of J01 in total care sector

Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Antimycotics for systemic use (J02)

Use of antimycotics for systemic use expressed in DDD/1000 inh./day in 2006

J02 substances	Total care
Amphotericin B (J02AA01)	0.03
Ketoconazole (J02AB02)	0.22
Fluconazole (J02AC01)	0.19
Itraconazole (J02AC02)	0.27
Voriconazole (J02AC03)	<0.01
Other J02 substances	<0.01
Total J02 substances	***0.72***



Comments

National Network — Cyprus has recently joined the ESAC project and the antibiotic consumption of 2006 is the first available data for Cyprus reported by ESAC. Data are collected by Pharmaceutical Services, Ministry of Health and include the consumption in both private and public sectors, and cover 100% of the total antibiotic use. The data for private sector cover sales in private pharmacies whereas data for public sector cover distribution from central pharmaceuticals stores to governmental pharmacies. Approximately 75% of total antibiotic use takes place in private sector where ambulatory care predominates. This can be attributed to the greater access to antibiotics in terms of number of products in private sector compared to public sector where a limited number of antibiotics is available. The most often prescribed antibiotic group are beta-lactam antibacterials (J01C, J01D) which represent 65% of total antibiotic use. Surprisingly, our data show relatively high antibiotic consumption in comparison with other countries.

Czech Republic

Health care sector	Data type	Coverage	Data source
Ambulatory care	Reimbursement	100%	Health Insurance Company

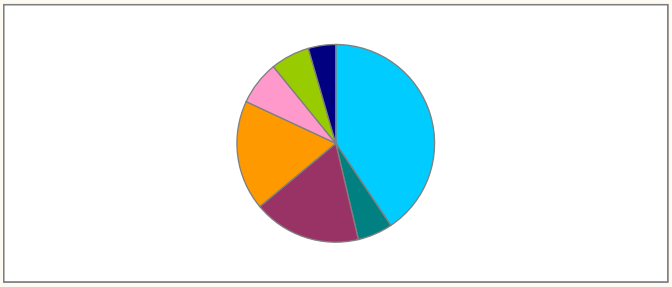
Population	Data source
10,209,000	WHO

Antimicrobials for systemic use (J01)

Use of antimicrobials for systemic use expressed in DDD/1000 inh./day in 2006

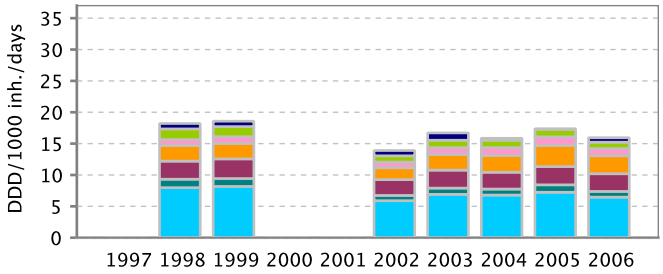
J01 classes	Ambulatory care
Beta-lactam antibacterials, penicillins (J01C)	6.47
Other beta-lactam antibacterials (J01D)	0.91
Tetracyclines (J01A)	2.81
Macrolides, lincosamides and streptogramins (J01F)	2.87
Quinolone antibacterials (J01M)	1.15
Sulfonamides and trimethoprim (J01E)	1.02
Other J01 classes	0.71
Total J01 classes	***15.94***

Distribution of J01 classes in ambulatory care sector



Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Trends of use of J01 in ambulatory care sector



Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Denmark

Health care sector	Data type	Coverage	Data source
Ambulatory care	Sales	100%	Medicines Agency
Hospital care	Sales	100%	Medicines Agency

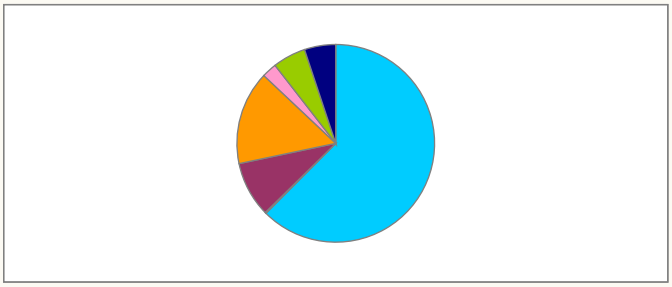
Population	Data source
5,446,000	WHO

Antimicrobials for systemic use (J01)

Use of antimicrobials for systemic use expressed in DDD/1000 inh./day in 2006

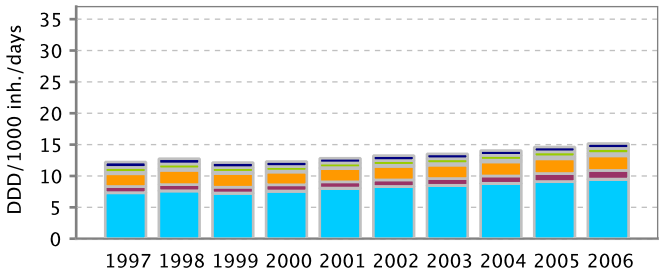
J01 classes	Ambulatory care	Hospital care
Beta-lactam antibacterials, penicillins (J01C)	9.48	0.87
Other beta-lactam antibacterials (J01D)	0.03	0.29
Tetracyclines (J01A)	1.37	0.01
Macrolides, lincosamides and streptogramins (J01F)	2.32	0.09
Quinolone antibacterials (J01M)	0.37	0.18
Sulfonamides and trimethoprim (J01E)	0.82	0.09
Other J01 classes	0.78	0.16
Total J01 classes	***15.17***	***1.68***

Distribution of J01 classes in ambulatory care sector



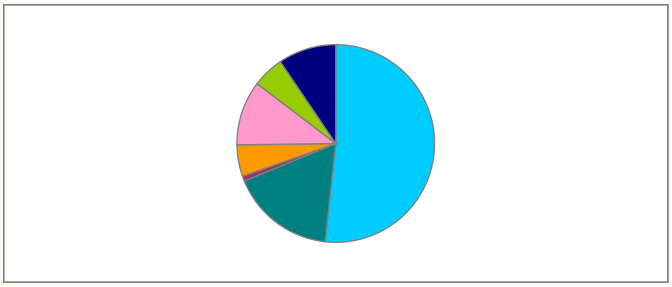
Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Trends of use of J01 in ambulatory care sector



Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Distribution of J01 classes in hospital care sector



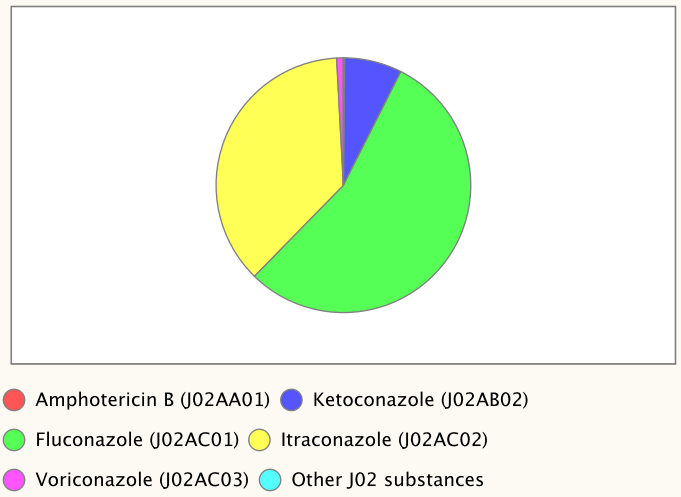
Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Antimycotics for systemic use (J02)

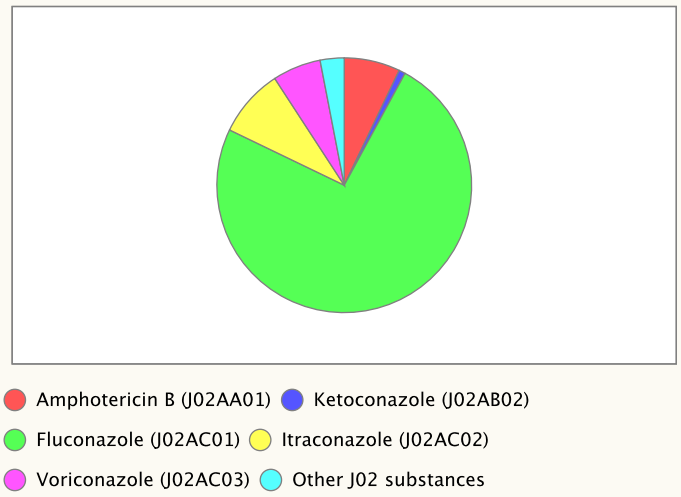
Use of antimycotics for systemic use expressed in DDD/1000 inh./day in 2006

J02 substances	Ambulatory care	Hospital care
Amphotericin B (J02AA01)	<0.01	0.01
Ketoconazole (J02AB02)	0.03	<0.01
Fluconazole (J02AC01)	0.23	0.11
Itraconazole (J02AC02)	0.15	0.01
Voriconazole (J02AC03)	<0.01	<0.01
Other J02 substances	<0.01	<0.01
Total J02 substances	***0.42***	***0.15***

Distribution of J02 substances in ambulatory care sector



Distribution of J02 substances in hospital care sector



Comments

National Network — In Denmark, all antimicrobials for human use are prescription-only medicines and are sold by pharmacies in defined packages. Data on Danish drug use is obtained from the Danish Medicines Agency (DMA). The DMA has the legal responsibility for monitoring the consumption of all human medicinal products.
In ambulatory care, the overall sales of antibacterial agents have increased slowly over the last ten years but are still characterised by the use of narrow-spectrum antibacterials. The percentage of DDDs prescribed in the ambulatory care has remained stable at 90%. In ambulatory care in 2006, a significantly higher proportion of women received antibiotics (35.8%) compared to the proportion of men (26.1%). People of both gender aged > 70 years received 1.6 times more antibiotics than people < 70 years of age.
The use of antibacterials in hospitals has increased. This could be explained by an increase in the number of antibacterial treatments, by an increase in the daily dosage or by an increase in the frequency of combination therapies prescribed in hospitals.

Finland

Health care sector	Data type	Coverage	Data source
Ambulatory care	Sales	100%	Medicines Agency
Hospital care	Sales	100%	Medicines Agency

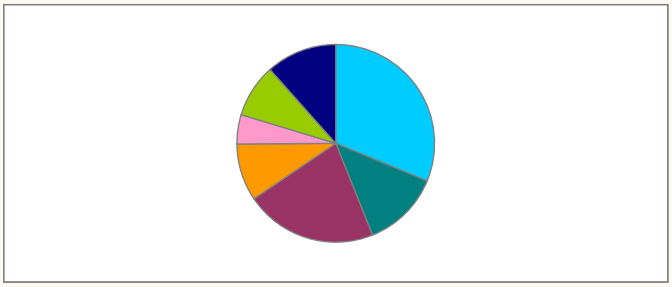
Population	Data source
5,262,000	WHO

Antimicrobials for systemic use (J01)

Use of antimicrobials for systemic use expressed in DDD/1000 inh./day in 2006

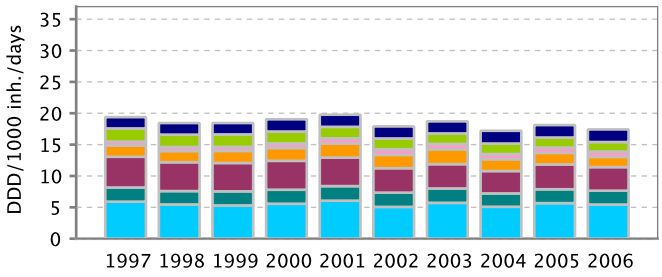
J01 classes	Ambulatory care	Hospital care
Beta-lactam antibacterials, penicillins (J01C)	5.44	0.59
Other beta-lactam antibacterials (J01D)	2.21	0.97
Tetracyclines (J01A)	3.76	0.20
Macrolides, lincosamides and streptogramins (J01F)	1.63	0.19
Quinolone antibacterials (J01M)	0.83	0.41
Sulfonamides and trimethoprim (J01E)	1.52	0.26
Other J01 classes	2.02	0.82
Total J01 classes	***17.42***	***3.45***

Distribution of J01 classes in ambulatory care sector



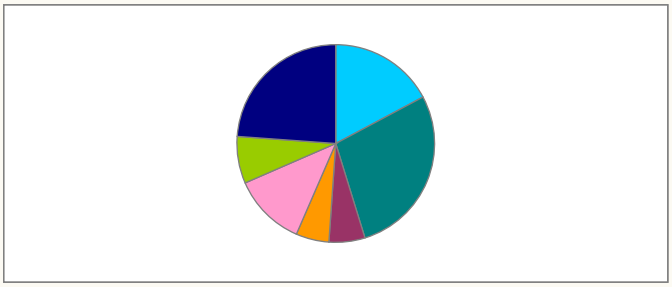
Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Trends of use of J01 in ambulatory care sector



Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Distribution of J01 classes in hospital care sector



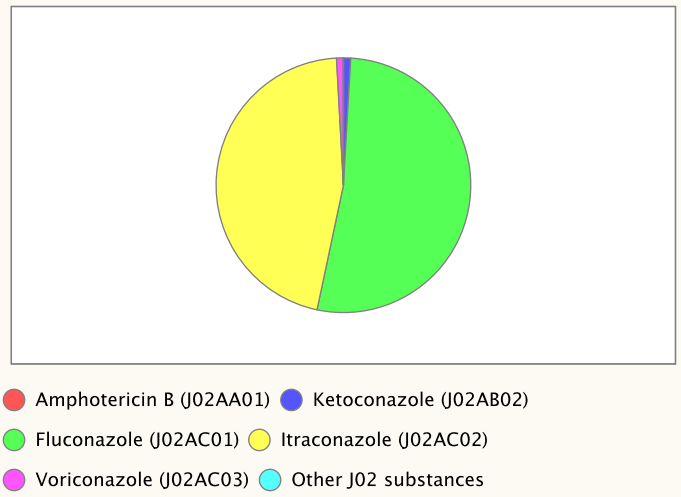
Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Antimycotics for systemic use (J02)

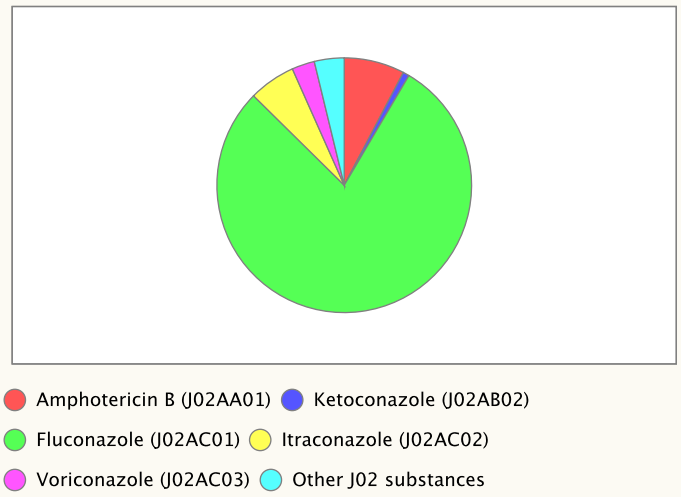
Use of antimycotics for systemic use expressed in DDD/1000 inh./day in 2006

J02 substances	Ambulatory care	Hospital care
Amphotericin B (J02AA01)	<0.01	<0.01
Ketoconazole (J02AB02)	<0.01	<0.01
Fluconazole (J02AC01)	0.17	0.08
Itraconazole (J02AC02)	0.14	<0.01
Voriconazole (J02AC03)	<0.01	<0.01
Other J02 substances	<0.01	<0.01
Total J02 substances	***0.32***	***0.10***

Distribution of J02 substances in ambulatory care sector



Distribution of J02 substances in hospital care sector



Comments

National Network — In Finland, other antimicrobials group (J01X) covers nitrofurantoin as well as methenamine hippurate. Nitrofurantoin is still among the three first choice drugs in the treatment of urinary tract infections.

France

Health care sector	Data type	Coverage	Data source
Ambulatory care	Sales	100%	Medicines Agency
Hospital care	Sales	100%	Medicines Agency

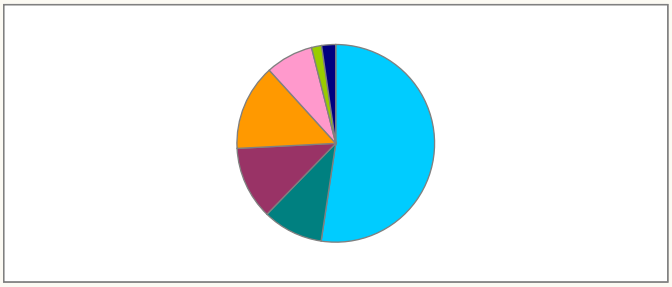
Population	Data source
63,195,457	National Institute for Statistics

Antimicrobials for systemic use (J01)

Use of antimicrobials for systemic use expressed in DDD/1000 inh./day in 2006

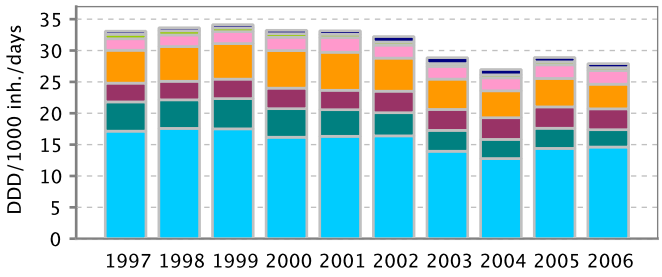
J01 classes	Ambulatory care	Hospital care
Beta-lactam antibacterials, penicillins (J01C)	14.61	1.18
Other beta-lactam antibacterials (J01D)	2.76	0.25
Tetracyclines (J01A)	3.33	0.17
Macrolides, lincosamides and streptogramins (J01F)	3.93	0.13
Quinolone antibacterials (J01M)	2.18	0.35
Sulfonamides and trimethoprim (J01E)	0.46	0.05
Other J01 classes	0.64	0.19
Total J01 classes	***27.91***	***2.32***

Distribution of J01 classes in ambulatory care sector



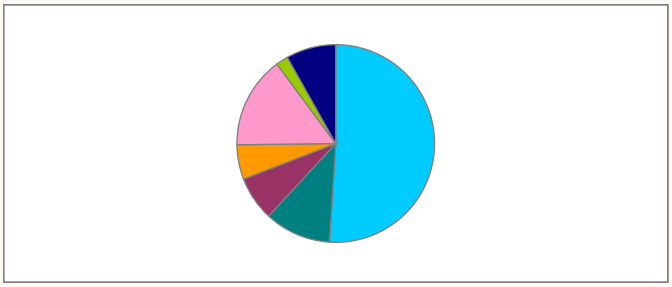
Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Trends of use of J01 in ambulatory care sector



Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Distribution of J01 classes in hospital care sector



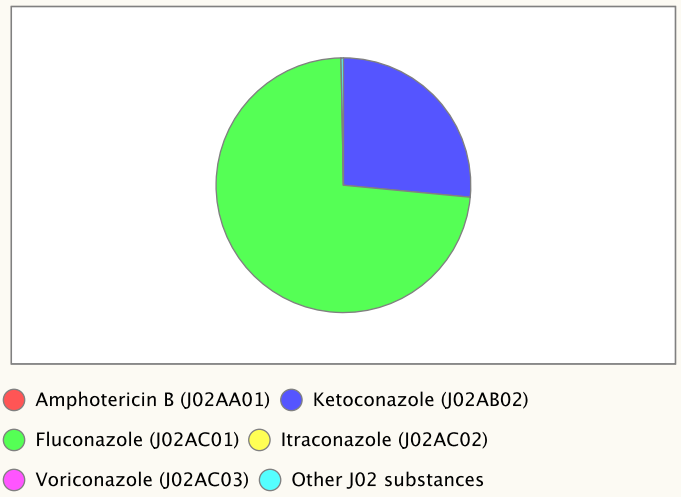
Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Antimycotics for systemic use (J02)

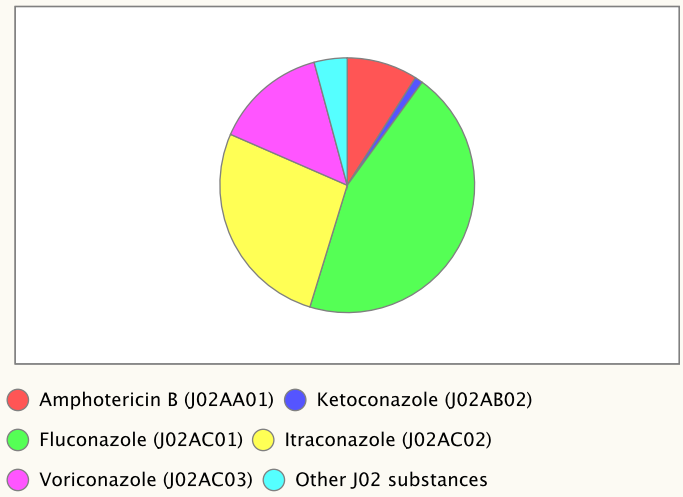
Use of antimycotics for systemic use expressed in DDD/1000 inh./day in 2006

J02 substances	Ambulatory care	Hospital care
Amphotericin B (J02AA01)	0.00	0.01
Ketoconazole (J02AB02)	0.06	<0.01
Fluconazole (J02AC01)	0.17	0.05
Itraconazole (J02AC02)	0.00	0.03
Voriconazole (J02AC03)	0.00	0.02
Other J02 substances	<0.01	<0.01
Total J02 substances	***0.23***	***0.11***

Distribution of J02 substances in ambulatory care sector



Distribution of J02 substances in hospital care sector



Comments

National Network — In ambulatory care, the consumption dropped by 3.6% in comparison to 2005 but remained nevertheless higher than in 2004. This decrease was expected and follows the trend observed during the previous years, except for 2005 which was a very atypical year, especially for economic reasons (reform of the discount system for the generics drugs sold to pharmacists). We can however point out a slight increase of penicillins: + 1.6% and a significant drop of cephalosporins: - 13.8%. We can reasonably presume that a part of cephalosporin consumption was transferred to penicillins but we don't have data yet relating to the transfer of prescriptions which would corroborate this hypothesis. Amongst the other classes, we can note the substantial drop of the macrolides: their consumption decreased with 13.8%.

In hospital care, the consumption decreased significantly: -11.1% and hit a ten-year low (data are available since 1997), even in taking into account the change of DDD for amoxicillin/clavulanic acid (J01CR02) in 2005. For all the main classes, the consumption dropped. Different factors can explain this decrease but one of the most important is likely the tripartite outline agreement between the Ministry of Health, the Health insurance system and the hospitals' representative unions. The target is a reduction of 10% in three years. Additionally, local agreements were made in order to promote a better use and "fair prescription" of antibiotics as well as to adapt national targets to local particularities. Of course, even though these agreements were formalised during the last two years, consciousness-raising campaigns started previously in the hospitals. Moreover we have to take into account the decrease in number of hospitalisation days. This decrease is indeed minor (<1% per year) but it exerts in the long run a deflationary effect.

Greece

Health care sector	Data type	Coverage	Data source
Total care	Sales	100%	Medicines Agency

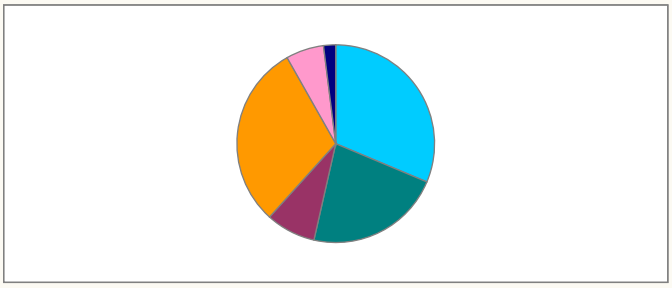
Population	Data source
11,148,533	WHO

Antimicrobials for systemic use (J01)

Use of antimicrobials for systemic use expressed in DDD/1000 inh./day in 2006

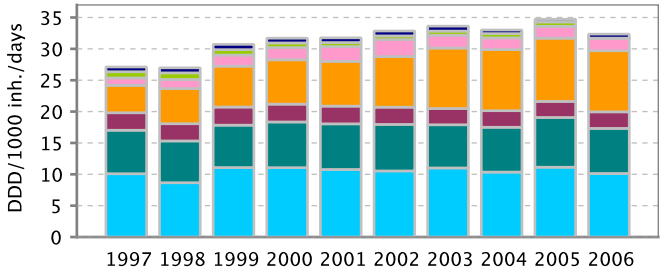
J01 classes	Total care
Beta-lactam antibacterials, penicillins (J01C)	10.13
Other beta-lactam antibacterials (J01D)	7.19
Tetracyclines (J01A)	2.63
Macrolides, lincosamides and streptogramins (J01F)	9.75
Quinolone antibacterials (J01M)	2.01
Sulfonamides and trimethoprim (J01E)	
Other J01 classes	0.64
Total J01 classes	***32.35***

Distribution of J01 classes in total care sector



Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Trends of use of J01 in total care sector



Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Comments

Management Team — Until 2003, Greece provided data for ambulatory care sector and hospital care sector separately. Since 2004 onwards, only total care data were provided. All data are therefore presented as total care data. In 2006, no data for ATC class “Sulfonamides and trimethoprim” (J01E) were delivered.

National Network — The 2006 antibiotic consumption data are total consumption data (not discriminating between ambulatory and hospital data). Data for Greece have been were provided on a yearly basis. They include over-the-counter (without prescription) sales and parallel exports. After a steadily increasing course during the last years, in 2006 a decline in total consumption was noted mainly due to a marked decrease in amoxicillin/clavulanic acid and cefuroxime axetil consumption. This can be attributed to the efforts at community level to decrease antibiotic prescribing for upper respiratory tract infections. These efforts will become more systematic in the next year with public campaigns, gallops and educational efforts (aiming also at prescribers and pharmacists) in the context of the activities of the Greek Intersectoral Mechanism (and Task Force) for combating antimicrobial resistance. We also hope that the parallel exports data that will become available will further clarify the high macrolide consumption in our country.

Hungary

Health care sector	Data type	Coverage	Data source
Ambulatory care	Reimbursement	100%	Health Insurance Company

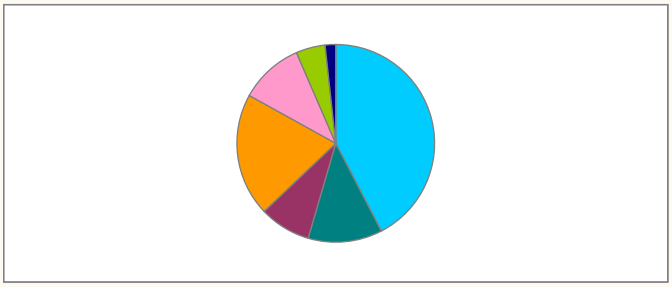
Population	Data source
10,071,000	WHO

Antimicrobials for systemic use (J01)

Use of antimicrobials for systemic use expressed in DDD/1000 inh./day in 2006

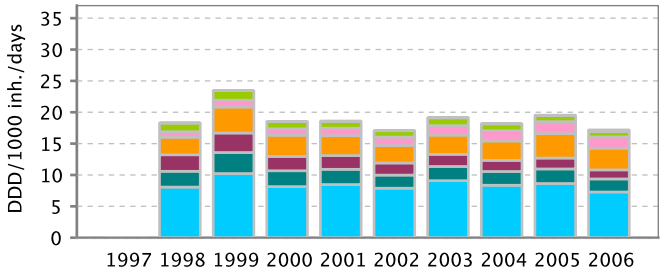
J01 classes	Ambulatory care
Beta-lactam antibacterials, penicillins (J01C)	7.28
Other beta-lactam antibacterials (J01D)	2.09
Tetracyclines (J01A)	1.44
Macrolides, lincosamides and streptogramins (J01F)	3.46
Quinolone antibacterials (J01M)	1.80
Sulfonamides and trimethoprim (J01E)	0.82
Other J01 classes	0.30
Total J01 classes	***17.19***

Distribution of J01 classes in ambulatory care sector



Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Trends of use of J01 in ambulatory care sector

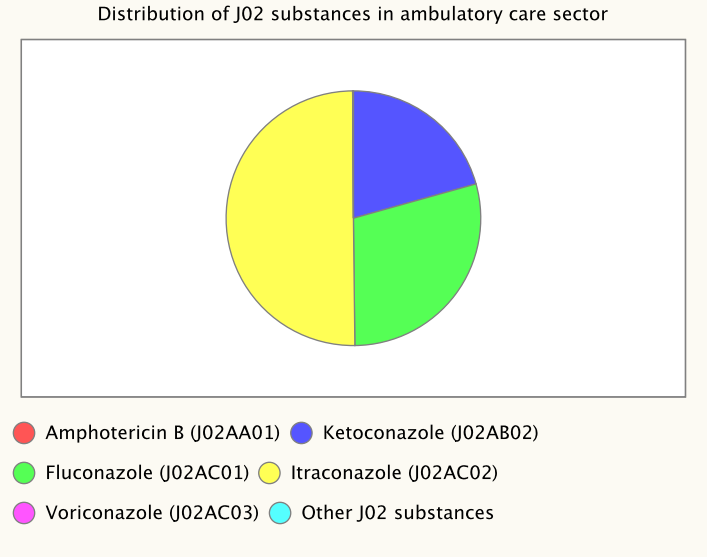


Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Antimycotics for systemic use (J02)

Use of antimycotics for systemic use expressed in DDD/1000 inh./day in 2006

J02 substances	Ambulatory care
Amphotericin B (J02AA01)	0.00
Ketoconazole (J02AB02)	0.16
Fluconazole (J02AC01)	0.23
Itraconazole (J02AC02)	0.39
Voriconazole (J02AC03)	<0.01
Other J02 substances	0.00
Total J02 substances	***0.79***



Comments

National Network — In Hungary, the level of antibiotic consumption remains in the average of the distribution of the ESAC participants. Based on specific national surveys, the hospital consumption represents only 6% of the total consumption. In 2007, due to a national reform, the numbers of active hospital beds have been considerably reduced (about 30%); the effect of this reduction might have an impact on the hospital consumption figures in the next years. Audits in ambulatory care on antibiotic prescriptions proved that about 7.5% of the patient received antibiotics when visiting their family practitioners and that nearly 100% of the prescription is for only two main diagnosis: respiratory tract and urinary tract infections. Beta-lactams with inhibitors were prescribed in 28% of the total number of prescriptions, macrolides in 24% and cephalosporins in 16%. From the hospital audit, 23% of the patients received an antibiotic prescription and the most frequent indication was perioperative antibiotic prophylaxis followed by respiratory tract and urinary tract infections. One third the antibiotics prescribed for the patients were beta-lactam with inhibitors followed by cephalosporins and quinolones.

Iceland

Health care sector	Data type	Coverage	Data source
Ambulatory care	Sales	100%	Ministry of Health

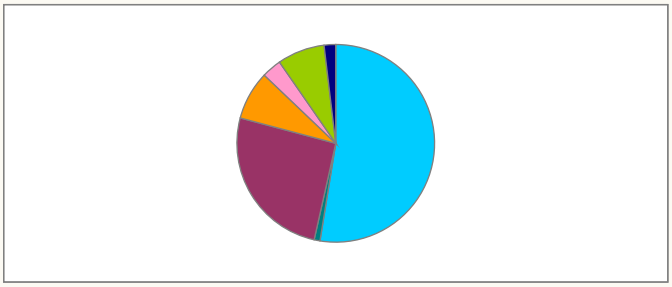
Population	Data source
304,334	WHO

Antimicrobials for systemic use (J01)

Use of antimicrobials for systemic use expressed in DDD/1000 inh./day in 2006

J01 classes	Ambulatory care
Beta-lactam antibacterials, penicillins (J01C)	10.51
Other beta-lactam antibacterials (J01D)	0.19
Tetracyclines (J01A)	5.13
Macrolides, lincosamides and streptogramins (J01F)	1.60
Quinolone antibacterials (J01M)	0.65
Sulfonamides and trimethoprim (J01E)	1.55
Other J01 classes	0.38
Total J01 classes	***20.01***

Distribution of J01 classes in ambulatory care sector



Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Trends of use of J01 in ambulatory care sector

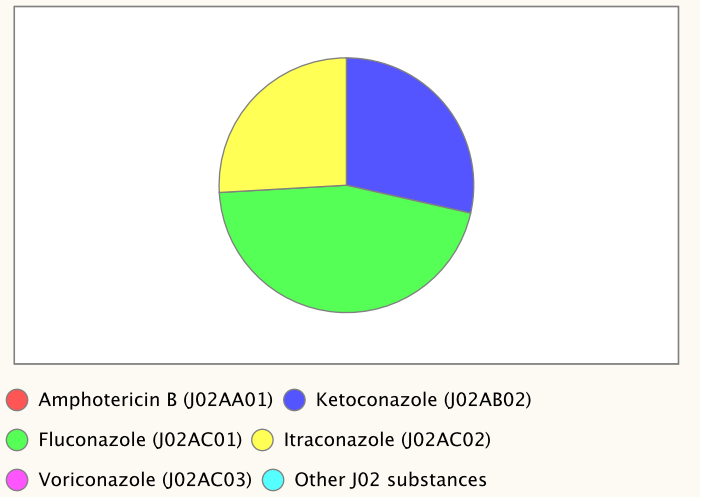
Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Antimycotics for systemic use (J02)

Use of antimycotics for systemic use expressed in DDD/1000 inh./day in 2006

J02 substances	Ambulatory care
Amphotericin B (J02AA01)	0.00
Ketoconazole (J02AB02)	0.08
Fluconazole (J02AC01)	0.12
Itraconazole (J02AC02)	0.07
Voriconazole (J02AC03)	0.00
Other J02 substances	0.00
Total J02 substances	***0.27***

Distribution of J02 substances in ambulatory care sector



Ireland

Health care sector	Data type	Coverage	Data source
Ambulatory care	Sales	100%	Marketing Research Company
Hospital care	Sales	100%	Marketing Research Company

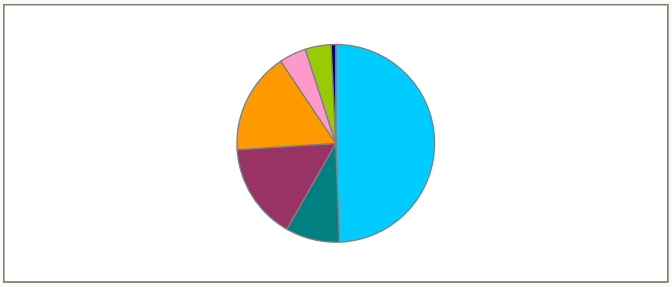
Population	Data source
4,239,848	Other

Antimicrobials for systemic use (J01)

Use of antimicrobials for systemic use expressed in DDD/1000 inh./day in 2006

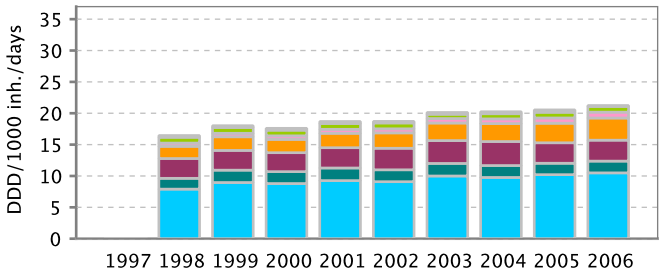
J01 classes	Ambulatory care	Hospital care
Beta-lactam antibacterials, penicillins (J01C)	10.50	0.64
Other beta-lactam antibacterials (J01D)	1.87	0.12
Tetracyclines (J01A)	3.34	0.03
Macrolides, lincosamides and streptogramins (J01F)	3.53	0.23
Quinolone antibacterials (J01M)	0.94	0.16
Sulfonamides and trimethoprim (J01E)	0.90	0.06
Other J01 classes	0.16	0.16
Total J01 classes	***21.23***	***1.40***

Distribution of J01 classes in ambulatory care sector



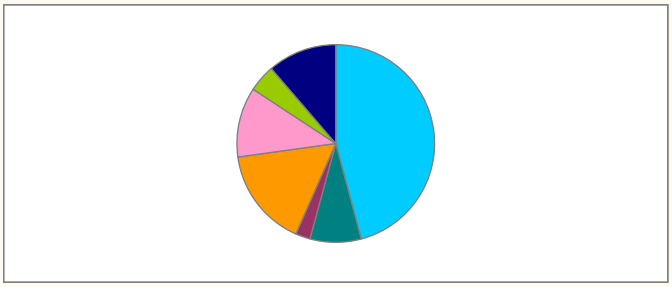
Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Trends of use of J01 in ambulatory care sector



Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Distribution of J01 classes in hospital care sector



Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Comments

National Network — Ambulatory care data are derived from sales data from the pharmacy wholesale market in Ireland and are thought to be an accurate measure of national antibiotic consumption. Seasonal peaks in antimicrobial consumption in Ireland have been shown to closely match peaks in respiratory viral activity. The continued increase in antimicrobial consumption in ambulatory care has led to the development of an education programme and prescribing guidelines for General Practitioners, which are due to be rolled out nationally, along with a public education campaign, in 2008.
Hospital care data are derived from downloads from hospital pharmacy software systems, and began with a voluntary sample of hospitals in 2004. All publicly-funded acute hospitals were required to provide data for 2006, though not all hospital pharmacies have a software system that allows such a download. The data for 2006 represents 72% of publicly funded acute hospital beds, the data have been extrapolated to 100% in the present report. The Irish Health Services Executive sanctioned the appointment of additional antibiotic liaison hospital pharmacists in 2006/7, and national hospital antibiotic stewardship programmes are planned for 2008.

Israel

Health care sector	Data type	Coverage	Data source
Ambulatory care	Sales	55%	Health Insurance Company
Hospital care	Sales	55%	Health Insurance Company

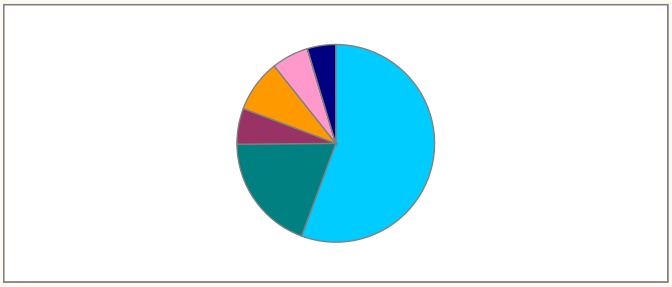
Population	Data source
3,748,000	Insurance company

Antimicrobials for systemic use (J01)

Use of antimicrobials for systemic use expressed in DDD/1000 inh./day in 2006

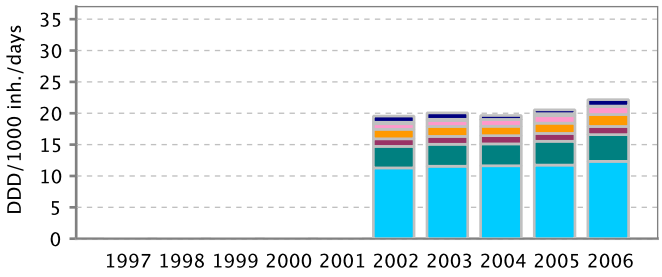
J01 classes	Ambulatory care	Hospital care
Beta-lactam antibacterials, penicillins (J01C)	12.33	0.29
Other beta-lactam antibacterials (J01D)	4.26	0.21
Tetracyclines (J01A)	1.30	0.02
Macrolides, lincosamides and streptogramins (J01F)	1.90	0.05
Quinolone antibacterials (J01M)	1.34	0.09
Sulfonamides and trimethoprim (J01E)	<0.01	<0.01
Other J01 classes	1.03	0.08
Total J01 classes	***22.17***	***0.74***

Distribution of J01 classes in ambulatory care sector



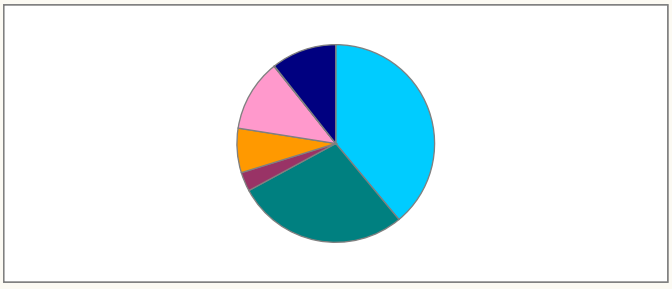
Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Trends of use of J01 in ambulatory care sector



Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Distribution of J01 classes in hospital care sector



Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Comments

National Network — Looking at the data changes in antibiotic consumption during 2002-2006, we can see a small increase in consumption in the ambulatory care sector and a concomitant decrease in the hospital care sector. In the ambulatory care sector the increase is more pronounced for beta-lactams, macrolides and quinolones, whereas in the hospital care sector the consumption of these classes is stable. A possible and logic explanation could be the lack of control on antimicrobial prescribing in the ambulatory care sector, while in the hospitals infectious diseases units keep tight control on antimicrobial prescription.

Italy

Health care sector	Data type	Coverage	Data source
Ambulatory care	Reimbursement	100%	Medicines Agency

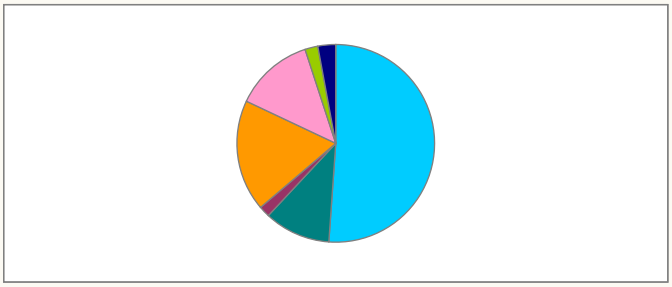
Population	Data source
58,140,000	WHO

Antimicrobials for systemic use (J01)

Use of antimicrobials for systemic use expressed in DDD/1000 inh./day in 2006

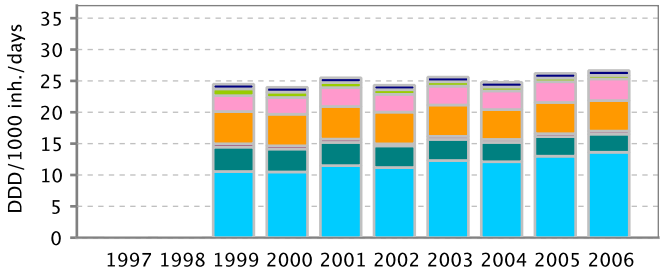
J01 classes	Ambulatory care
Beta-lactam antibacterials, penicillins (J01C)	13.63
Other beta-lactam antibacterials (J01D)	2.89
Tetracyclines (J01A)	0.49
Macrolides, lincosamides and streptogramins (J01F)	4.86
Quinolone antibacterials (J01M)	3.46
Sulfonamides and trimethoprim (J01E)	0.56
Other J01 classes	0.78
Total J01 classes	***26.66***

Distribution of J01 classes in ambulatory care sector



Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Trends of use of J01 in ambulatory care sector

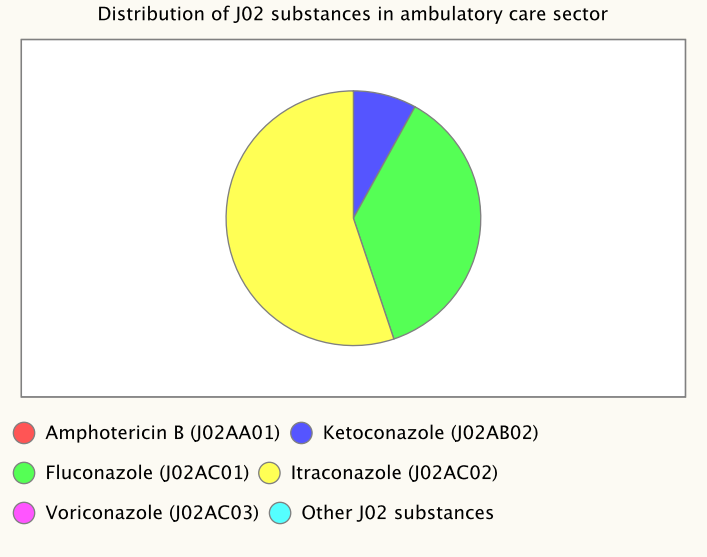


Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Antimycotics for systemic use (J02)

Use of antimycotics for systemic use expressed in DDD/1000 inh./day in 2006

J02 substances	Ambulatory care
Amphotericin B (J02AA01)	0.00
Ketoconazole (J02AB02)	0.07
Fluconazole (J02AC01)	0.32
Itraconazole (J02AC02)	0.48
Voriconazole (J02AC03)	0.00
Other J02 substances	0.00
Total J02 substances	***0.87***



Comments

National Network — Data are collected by The National Agency on Medicines (AIFA), and cover ambulatory care consumption. From 2004 to 2006, there has been an increasing trend in the use of ambulatory care antibiotics (J01), reaching 27 DDD per 1000 inhabitants per day (DID). Italy remains one of the European countries with the highest use of antimicrobials, and is ranking third in the EU.
Penicillins represents the most frequently prescribed antibiotics in Italy and has now in 2006 accounted for over 50% of the total antibiotic use. Their use was almost stable in years 1999-2002, then increased and reached 14 DID in 2006. The use of quinolones also showed a slight increase from 2005 to 2006. It is thus necessary to implement nation-wide actions to promote antimicrobial prudent use.

Lithuania

Health care sector	Data type	Coverage	Data source
Total care	Sales	100%	Medicines Agency

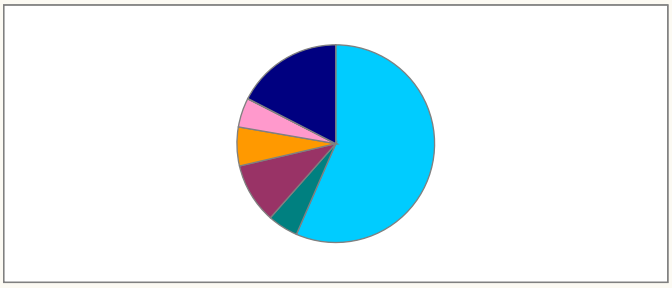
Population	Data source
3,417,000	WHO

Antimicrobials for systemic use (J01)

Use of antimicrobials for systemic use expressed in DDD/1000 inh./day in 2006

J01 classes	Total care
Beta-lactam antibacterials, penicillins (J01C)	9.86
Other beta-lactam antibacterials (J01D)	0.87
Tetracyclines (J01A)	1.72
Macrolides, lincosamides and streptogramins (J01F)	1.11
Quinolone antibacterials (J01M)	0.83
Sulfonamides and trimethoprim (J01E)	0.01
Other J01 classes	3.04
Total J01 classes	***17.44***

Distribution of J01 classes in total care sector



Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

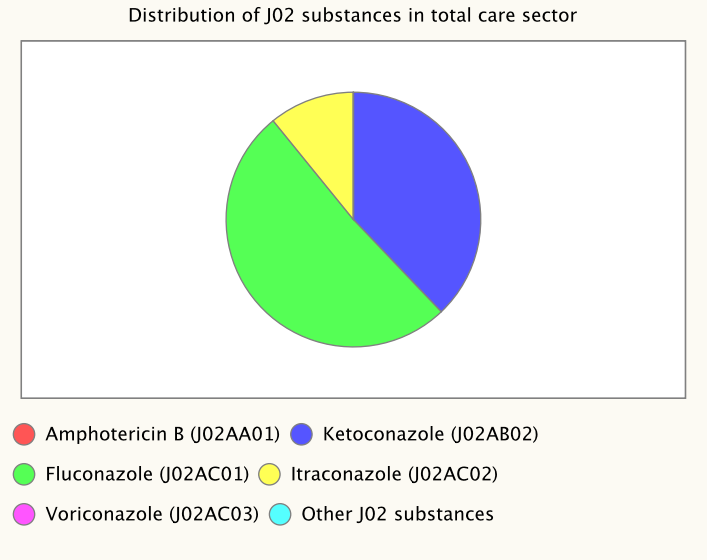
Trends of use of J01 in total care sector

Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Antimycotics for systemic use (J02)

Use of antimycotics for systemic use expressed in DDD/1000 inh./day in 2006

J02 substances	Total care
Amphotericin B (J02AA01)	0.00
Ketoconazole (J02AB02)	0.09
Fluconazole (J02AC01)	0.12
Itraconazole (J02AC02)	0.03
Voriconazole (J02AC03)	<0.01
Other J02 substances	0.00
Total J02 substances	***0.24***



Comments

National Network — Data on Lithuanian drug use are collected by the State Medicines Control Agency and are available since 2004. There is a special legislation, which obliges wholesalers to collect and provide the data of their drug sales combining both sectors - community and hospital sectors. During the past years the quality of database has significantly improved and now covers 100 % of the total sales of antimicrobials as well as other drugs. Due to the limitation of this legislation, it was not possible to separate the data into different sectors. Although legislation will only be modified this year (2008), separate data were available as of 2007. Thus 2006 data on antibiotic consumption could be delivered to ESAC.

In 2006, penicillins (J01C) comprised 67%, tetracyclines (J01A) 8%, macrolides, lincosamides and streptogramins (J01F) – 5%, other beta-lactam antibacterials (J01M) and quinolones (J01D) – 4% of total use of J01 class antibacterials for systemic use. So the first choice of antibacterials for systemic use remains beta-lactams, followed by tetracyclines with relatively high consumption levels.

The trends of use of systemic antimycotics are similar to other countries – the most used antimycotic was fluconazole (50%), followed by ketoconazole (38%) and itraconazole (13%).

Luxembourg

Health care sector	Data type	Coverage	Data source
Ambulatory care	Reimbursement	>95%	Health Insurance Company
Hospital care	Reimbursement	100%	Community Pharmacists

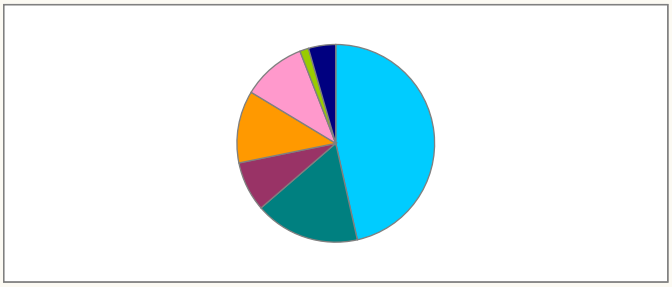
Population	Data source
471,000	WHO

Antimicrobials for systemic use (J01)

Use of antimicrobials for systemic use expressed in DDD/1000 inh./day in 2006

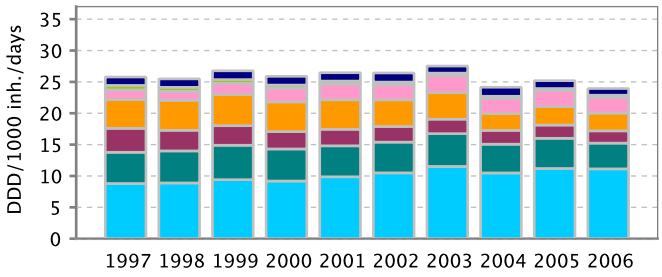
J01 classes	Ambulatory care	Hospital care
Beta-lactam antibacterials, penicillins (J01C)	11.13	0.70
Other beta-lactam antibacterials (J01D)	4.11	0.75
Tetracyclines (J01A)	1.95	0.03
Macrolides, lincosamides and streptogramins (J01F)	2.83	0.15
Quinolone antibacterials (J01M)	2.51	0.27
Sulfonamides and trimethoprim (J01E)	0.35	0.03
Other J01 classes	1.07	0.19
Total J01 classes	***23.94***	***2.11***

Distribution of J01 classes in ambulatory care sector



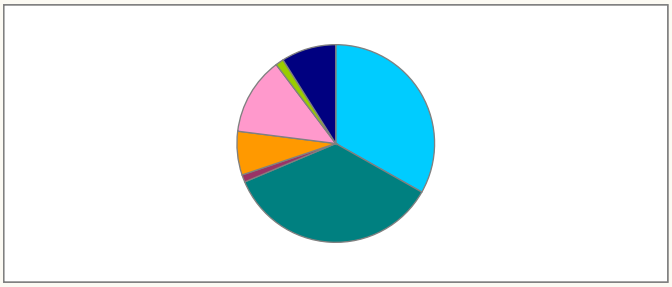
Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Trends of use of J01 in ambulatory care sector



Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Distribution of J01 classes in hospital care sector



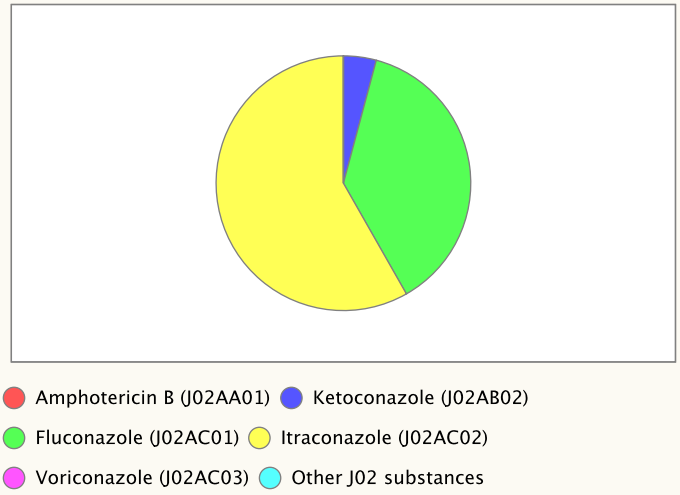
Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Antimycotics for systemic use (J02)

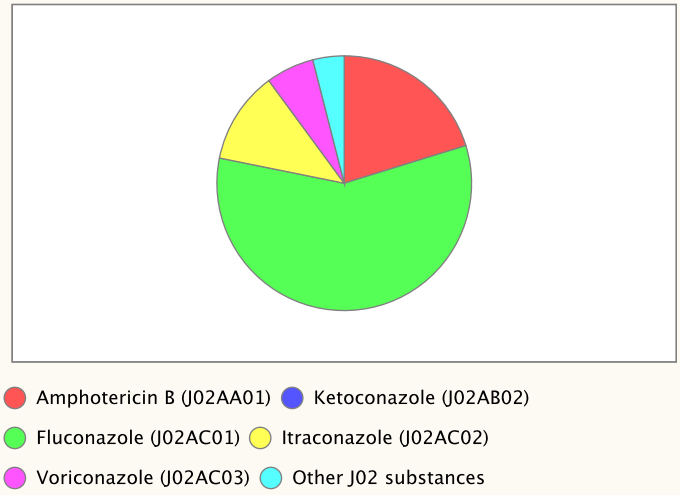
Use of antimycotics for systemic use expressed in DDD/1000 inh./day in 2006

J02 substances	Ambulatory care	Hospital care
Amphotericin B (J02AA01)	<0.01	0.03
Ketoconazole (J02AB02)	0.06	0.00
Fluconazole (J02AC01)	0.53	0.09
Itraconazole (J02AC02)	0.82	0.02
Voriconazole (J02AC03)		<0.01
Other J02 substances	<0.01	<0.01
Total J02 substances	***1.40***	***0.16***

Distribution of J02 substances in ambulatory care sector



Distribution of J02 substances in hospital care sector



Comments

National Network — Use of antimicrobial agents (J01) in ambulatory care in Luxembourg expressed in DDDs per 1000 inhabitants per day (DID) is very high and has always been above the European average during the last decade. In 2006, the consumption of the entire group J01 dropped by 4,5 % in comparison with 2005 and reached the level of the year 2004, where lower use was mainly explained by the low incidences of influenza like illness as observed by our national 'Influenza Surveillance Sentinel' system. In 2006 we note mainly a decrease of the group of cephalosporines (J01D) and a continuing decrease of the group of tetracyclines (J01A), whereas the main group of beta-lactam antibacterials, penicillins (J01C) is stable just as the group of fluoroquinolones (J01M). Use of antimicrobial agents (J01) in hospital care has been monitored since 1997. In 2006, hospital consumption did not continue to increase as previously but has been stabilised in comparison with 2005. Hospital care accounts for 8,1% of the total antibiotic consumption. Individual-level pharmacy data based on reimbursement allowed us to determine that 45,1% of the population has been exposed to at least one antibiotic treatment in 2006 in outpatient care. It has been determined that use of antibiotics in children and adolescents (0-19 years) was very high (50%). National campaigns to educate on the correct use of antibiotics have been initiated in 2004 and guidelines concerning antibiotherapy in general practice have been issued by a subgroup of the Scientific Committee (www.conseil-scientifique.com) in 2006.

Malta

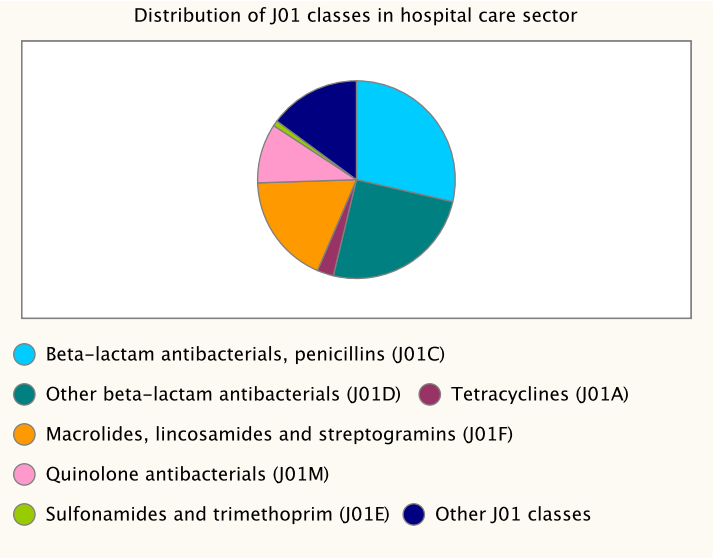
Health care sector	Data type	Coverage	Data source
Hospital care	Sales	93%	Ministry of Health

Population	Data source
403,000	WHO

Antimicrobials for systemic use (J01)

Use of antimicrobials for systemic use expressed in DDD/1000 inh./day in 2006

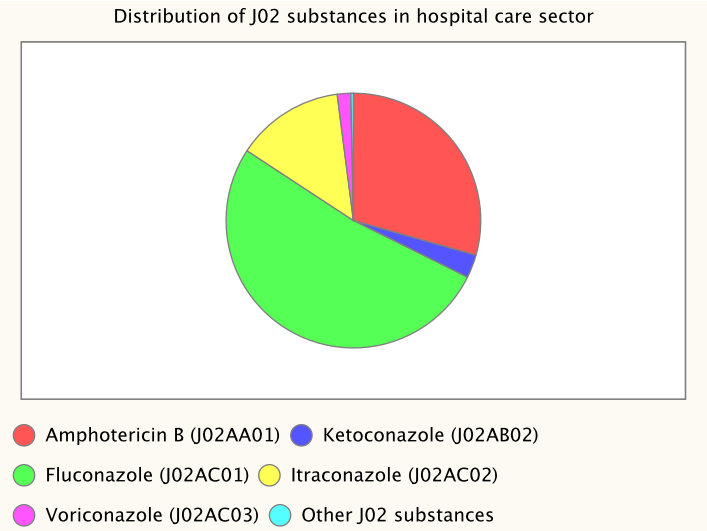
J01 classes	Hospital care
Beta-lactam antibacterials, penicillins (J01C)	0.49
Other beta-lactam antibacterials (J01D)	0.43
Tetracyclines (J01A)	0.05
Macrolides, lincosamides and streptogramins (J01F)	0.31
Quinolone antibacterials (J01M)	0.17
Sulfonamides and trimethoprim (J01E)	0.02
Other J01 classes	0.25
Total J01 classes	***1.70***



Antimycotics for systemic use (J02)

Use of antimycotics for systemic use expressed in DDD/1000 inh./day in 2006

J02 substances	Hospital care
Amphotericin B (J02AA01)	<0.01
Ketoconazole (J02AB02)	<0.01
Fluconazole (J02AC01)	0.01
Itraconazole (J02AC02)	<0.01
Voriconazole (J02AC03)	<0.01
Other J02 substances	<0.01
Total J02 substances	***0.03***



Netherlands

Health care sector	Data type	Coverage	Data source
Ambulatory care	Sales	90%	Community Pharmacists

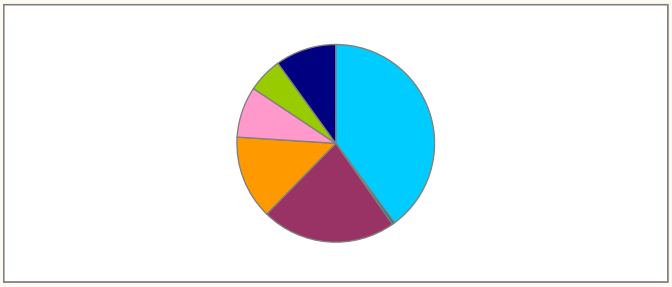
Population	Data source
14,900,000	Insurance system

Antimicrobials for systemic use (J01)

Use of antimicrobials for systemic use expressed in DDD/1000 inh./day in 2006

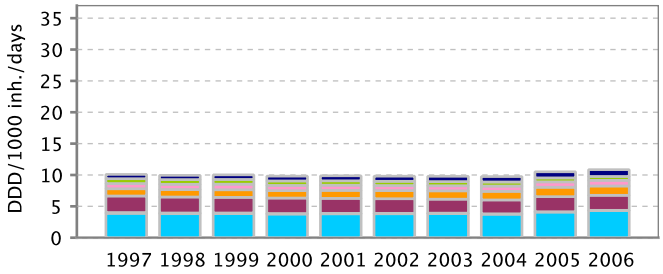
J01 classes	Ambulatory care
Beta-lactam antibacterials, penicillins (J01C)	4.32
Other beta-lactam antibacterials (J01D)	0.05
Tetracyclines (J01A)	2.39
Macrolides, lincosamides and streptogramins (J01F)	1.49
Quinolone antibacterials (J01M)	0.91
Sulfonamides and trimethoprim (J01E)	0.62
Other J01 classes	1.08
Total J01 classes	***10.85***

Distribution of J01 classes in ambulatory care sector



Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Trends of use of J01 in ambulatory care sector

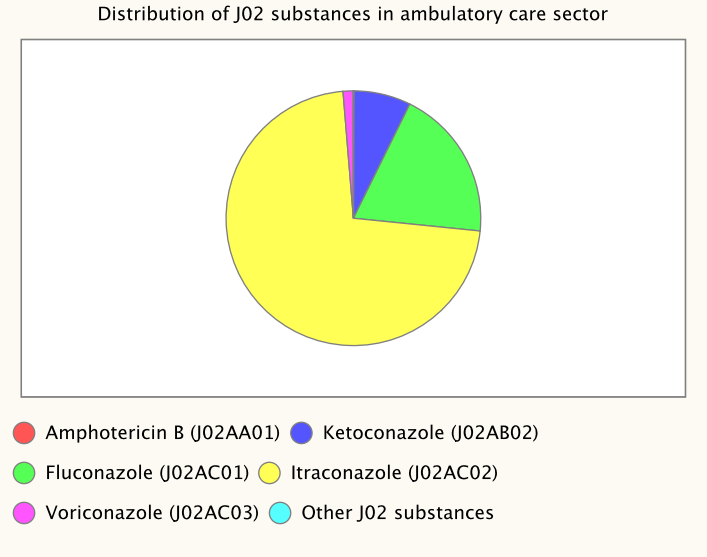


Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Antimycotics for systemic use (J02)

Use of antimycotics for systemic use expressed in DDD/1000 inh./day in 2006

J02 substances	Ambulatory care
Amphotericin B (J02AA01)	<0.01
Ketoconazole (J02AB02)	0.04
Fluconazole (J02AC01)	0.09
Itraconazole (J02AC02)	0.35
Voriconazole (J02AC03)	<0.01
Other J02 substances	<0.01
Total J02 substances	***0.49***



Comments

National Network — Data on use of antibiotics in primary health care in the Netherlands are yearly published in the SWAB/RIVM NethMap report. Over the past ten years the overall use of antibiotics for systemic use in primary health care remained almost constant at 10 DDD per 1000 inhabitants per day (DID). However, a slight increase in use was observed in 2005 and 2006. Tetracyclines (mainly doxycycline) represented 21% of total use. Other frequently used antibiotics were penicillins with extended spectrum (mainly amoxicillin), combinations of penicillins with beta-lactamase inhibitors (essentially amoxicillin/clavulanic acid) and macrolides, each representing 18%, 15% and 14% of the total use respectively. In the past ten years subtle shifts in the use patterns of the various classes of antibiotics were observed. The overall use of the fluoroquinoles remained almost constant whereas the increased use of ciprofloxacin seems to be offset by a decrease in ofloxacin and norfloxacin. Also within the class of the macrolides a shift was seen from erythromycin to the newer macrolides as clarithromycin and azithromycin. The remarkable increase in nitrofurantoin (from 0.59 to 1.00 DID) may be the result of the National guidelines of the Dutch College of General practioners (NHG) that have been changed over the years with regard to the pharmaco-therapy of urinary tract infections.

Norway

Health care sector	Data type	Coverage	Data source
Ambulatory care	Sales	100%	National Institute
Hospital care	Sales	100%	National hospital network

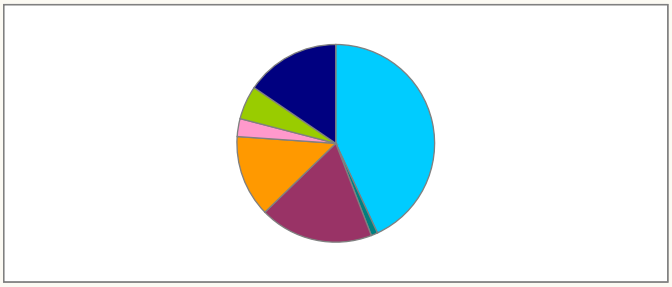
Population	Data source
4,643,000	WHO

Antimicrobials for systemic use (J01)

Use of antimicrobials for systemic use expressed in DDD/1000 inh./day in 2006

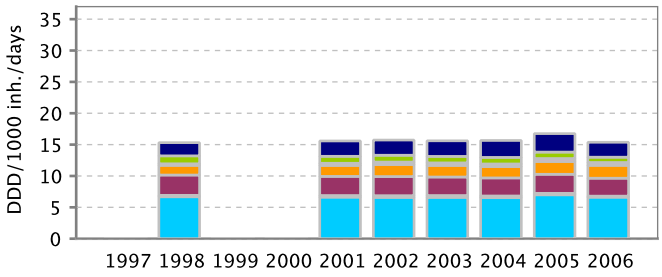
J01 classes	Ambulatory care	Hospital care
Beta-lactam antibacterials, penicillins (J01C)	6.62	0.72
Other beta-lactam antibacterials (J01D)	0.16	0.33
Tetracyclines (J01A)	2.86	0.05
Macrolides, lincosamides and streptogramins (J01F)	2.06	0.08
Quinolone antibacterials (J01M)	0.45	0.10
Sulfonamides and trimethoprim (J01E)	0.85	0.05
Other J01 classes	2.38	0.18
Total J01 classes	***15.37***	***1.52***

Distribution of J01 classes in ambulatory care sector



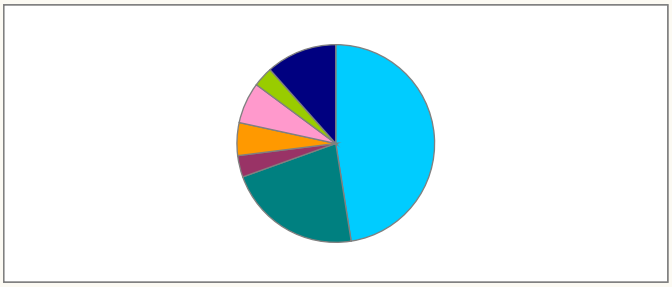
Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Trends of use of J01 in ambulatory care sector



Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Distribution of J01 classes in hospital care sector

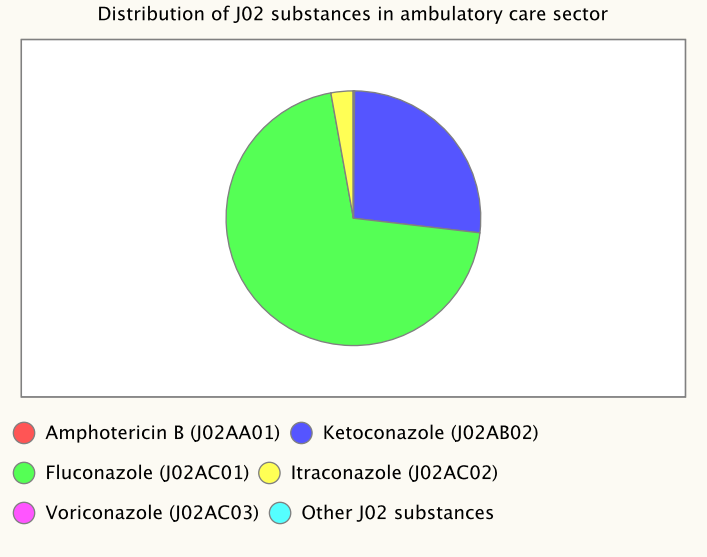


Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Antimycotics for systemic use (J02)

Use of antimycotics for systemic use expressed in DDD/1000 inh./day in 2006

J02 substances	Ambulatory care
Amphotericin B (J02AA01)	<0.01
Ketoconazole (J02AB02)	0.03
Fluconazole (J02AC01)	0.08
Itraconazole (J02AC02)	<0.01
Voriconazole (J02AC03)	0.00
Other J02 substances	<0.01
Total J02 substances	***0.11***



Comments

National Network — The overall sales of antibacterials for systemic use in Norway in ambulatory care have been stable for many years and are characterised by the use of narrow-spectrum antibacterials. The high sales of ATC class “other J01 classes” is due to high sales of methenamine, a urinary tract antiseptic. The increase observed from 2004 to 2005 is mainly due to higher sales of penicillins and to increased use of methenamine. The use in 2006 has decreased compared to 2005. This is due to a new method for data collection and the data are now purified with regard to the use in outpatients. Data are retrieved from the Norwegian prescription database (NorPD) collecting data on all prescriptions for individuals in Norway.
The use of antibacterials in hospitals has increased. This is could be explained by increased clinical activity, use of higher doses and patients being treated more intensively. Also for hospital care a new method for data harvesting is used, automatic collection from all hospital pharmacies to a common database. For overall use, there has been a slow, but steady shift towards use of more broad-spectrum antibacterials in Norway. This is of concern and deserves close surveillance.

Portugal

Health care sector	Data type	Coverage	Data source
Ambulatory care	Sales	>75%	Ministry of Health

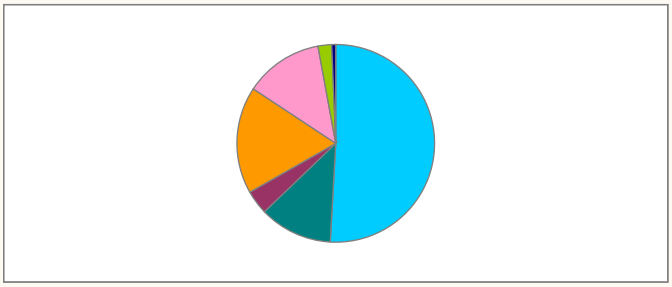
Population	Data source
8,048,626	Insurance system

Antimicrobials for systemic use (J01)

Use of antimicrobials for systemic use expressed in DDD/1000 inh./day in 2006

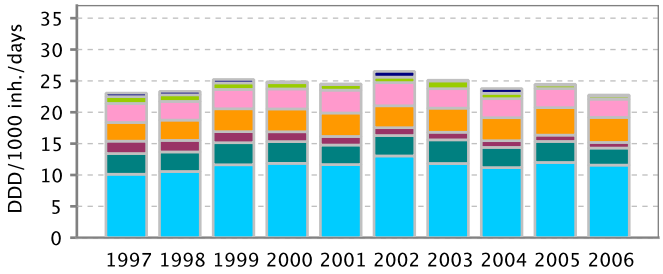
J01 classes	Ambulatory care
Beta-lactam antibacterials, penicillins (J01C)	11.58
Other beta-lactam antibacterials (J01D)	2.72
Tetracyclines (J01A)	0.90
Macrolides, lincosamides and streptogramins (J01F)	3.98
Quinolone antibacterials (J01M)	2.92
Sulfonamides and trimethoprim (J01E)	0.51
Other J01 classes	0.15
Total J01 classes	***22.75***

Distribution of J01 classes in ambulatory care sector



Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Trends of use of J01 in ambulatory care sector

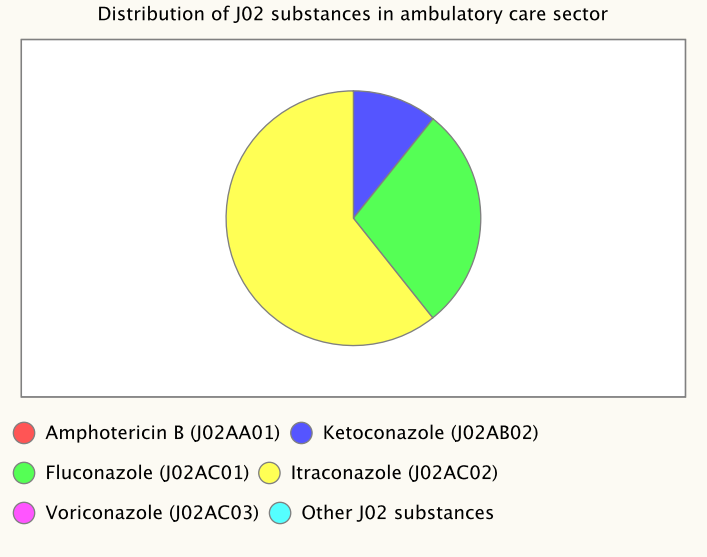


Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Antimycotics for systemic use (J02)

Use of antimycotics for systemic use expressed in DDD/1000 inh./day in 2006

J02 substances	Ambulatory care
Amphotericin B (J02AA01)	0.00
Ketoconazole (J02AB02)	0.08
Fluconazole (J02AC01)	0.21
Itraconazole (J02AC02)	0.45
Voriconazole (J02AC03)	0.00
Other J02 substances	
Total J02 substances	***0.74***



Comments

National Network — In ambulatory care, the consumption of antimicrobials in 2006 dropped by 7.4% in comparison to 2005. This decrease follows the trend observed since 2002. The most used antibiotics were penicillins (51%) and macrolides, lincodamides and streptogramins (17%).
The Portuguese National Health Plan (2004-2010) includes a National Program on Prevention of Antimicrobial Resistance, which contemplates the development of guidelines on clinical practice, a national policy of antimicrobial utilisation and a system of antimicrobial consumption and resistance surveillance. In 2006/2007 a private laboratory (in collaboration with the Ministry of Health) organised a national campaign in order to promote a more correct antibiotic use. This campaign targeted patients, general physicians and pharmacies.

Russian Federation

Health care sector	Data type	Coverage	Data source
Ambulatory care	Sales	100%	Marketing Research Company
Hospital care	Sales	100%	Marketing Research Company

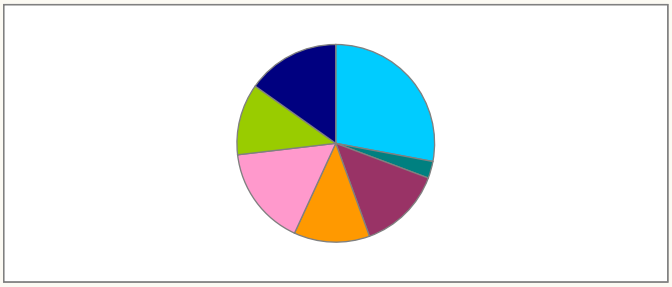
Population	Data source
142,536,992	WHO

Antimicrobials for systemic use (J01)

Use of antimicrobials for systemic use expressed in DDD/1000 inh./day in 2006

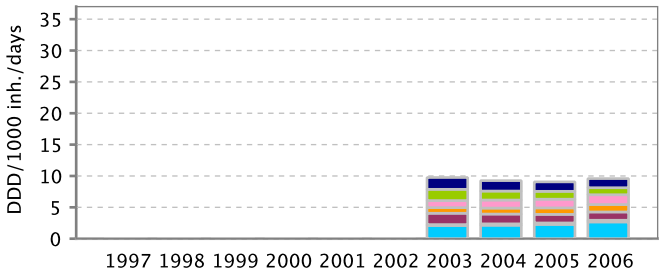
J01 classes	Ambulatory care	Hospital care
Beta-lactam antibacterials, penicillins (J01C)	2.68	0.45
Other beta-lactam antibacterials (J01D)	0.26	0.53
Tetracyclines (J01A)	1.32	0.11
Macrolides, lincosamides and streptogramins (J01F)	1.19	0.13
Quinolone antibacterials (J01M)	1.56	0.35
Sulfonamides and trimethoprim (J01E)	1.12	0.04
Other J01 classes	1.45	0.53
Total J01 classes	***9.58***	***2.13***

Distribution of J01 classes in ambulatory care sector



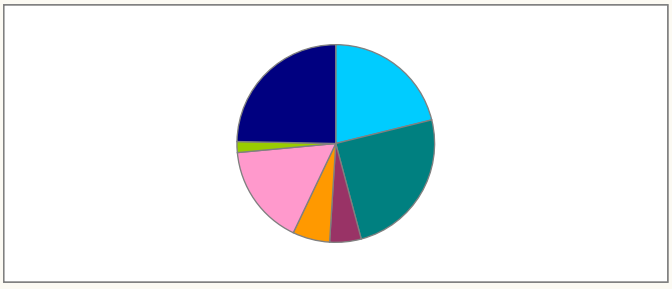
Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Trends of use of J01 in ambulatory care sector



Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Distribution of J01 classes in hospital care sector



Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Slovakia

Health care sector	Data type	Coverage	Data source
Ambulatory care	Sales	100%	Medicines Agency
Hospital care	Sales	100%	Medicines Agency

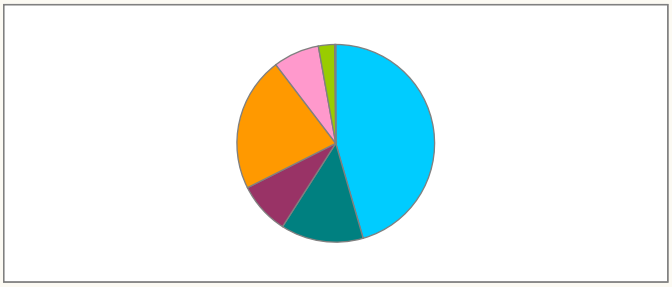
Population	Data source
5,401,000	WHO

Antimicrobials for systemic use (J01)

Use of antimicrobials for systemic use expressed in DDD/1000 inh./day in 2006

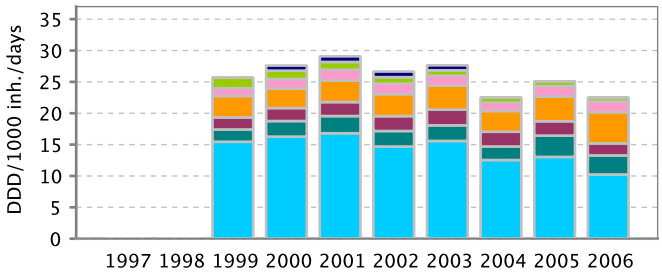
J01 classes	Ambulatory care	Hospital care
Beta-lactam antibacterials, penicillins (J01C)	10.24	0.72
Other beta-lactam antibacterials (J01D)	3.04	0.36
Tetracyclines (J01A)	1.92	0.03
Macrolides, lincosamides and streptogramins (J01F)	4.96	0.11
Quinolone antibacterials (J01M)	1.70	0.35
Sulfonamides and trimethoprim (J01E)	0.60	0.04
Other J01 classes	0.04	0.11
Total J01 classes	***22.49***	***1.72***

Distribution of J01 classes in ambulatory care sector



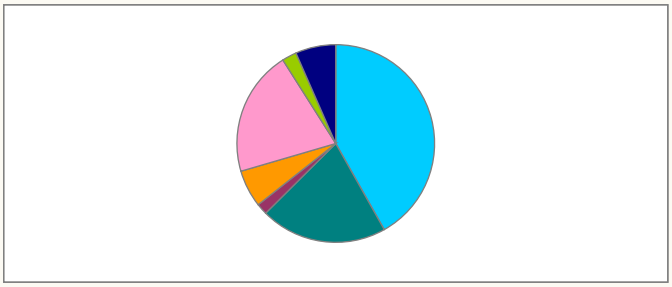
Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Trends of use of J01 in ambulatory care sector



Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Distribution of J01 classes in hospital care sector



Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Comments

National Network — In Slovakia, data provided by wholesalers, who are legally obliged to provide the information to the State Institute for Drug Control, were the basis for antibiotic consumption analysis. The data on antibiotic consumption were collected in accordance with the ATC classification and the DDD measurement unit.
There is an ongoing reform of the health care system, which has a visible influence on the antibiotic policy. Significant changes in the reimbursement system can be linked to changes in antibiotic consumption. High levels of antibiotic consumption can be seen in Slovakia. However, change in antibiotic policy helps to decrease these levels during the last years.

Slovenia

Health care sector	Data type	Coverage	Data source
Ambulatory care	Sales	100%	National Institute
Hospital care	Sales	100%	National hospital network

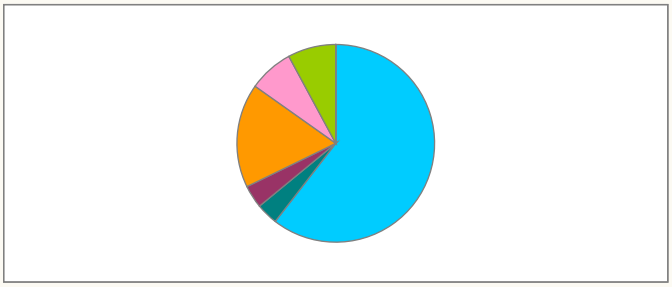
Population	Data source
2,008,516	WHO

Antimicrobials for systemic use (J01)

Use of antimicrobials for systemic use expressed in DDD/1000 inh./day in 2006

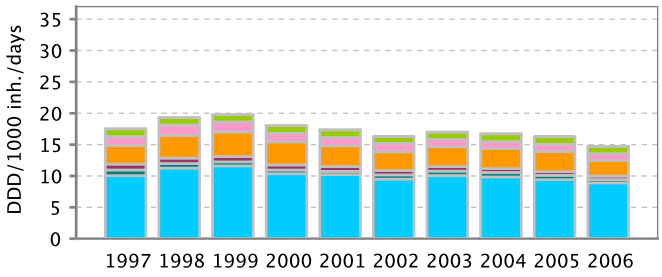
J01 classes	Ambulatory care	Hospital care
Beta-lactam antibacterials, penicillins (J01C)	8.90	0.63
Other beta-lactam antibacterials (J01D)	0.52	0.38
Tetracyclines (J01A)	0.55	<0.01
Macrolides, lincosamides and streptogramins (J01F)	2.50	0.16
Quinolone antibacterials (J01M)	1.08	0.28
Sulfonamides and trimethoprim (J01E)	1.16	0.07
Other J01 classes	<0.01	0.17
Total J01 classes	***14.71***	***1.70***

Distribution of J01 classes in ambulatory care sector



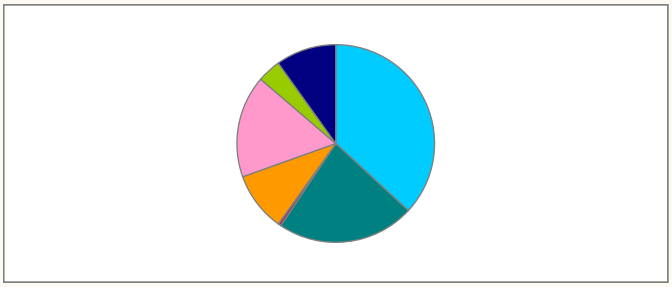
Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Trends of use of J01 in ambulatory care sector



Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Distribution of J01 classes in hospital care sector



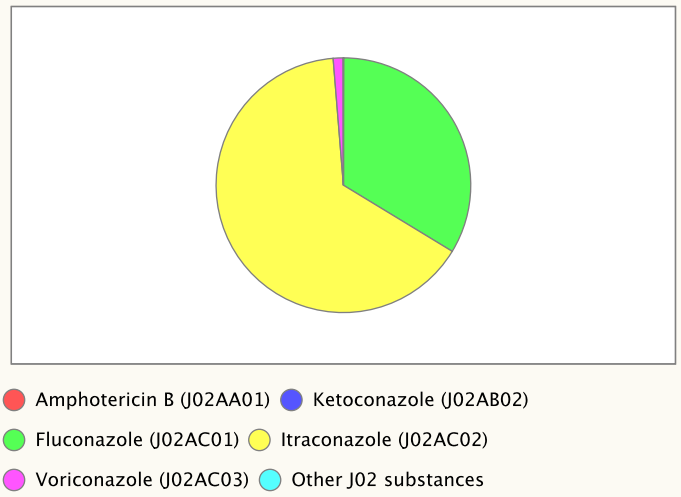
Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Antimycotics for systemic use (J02)

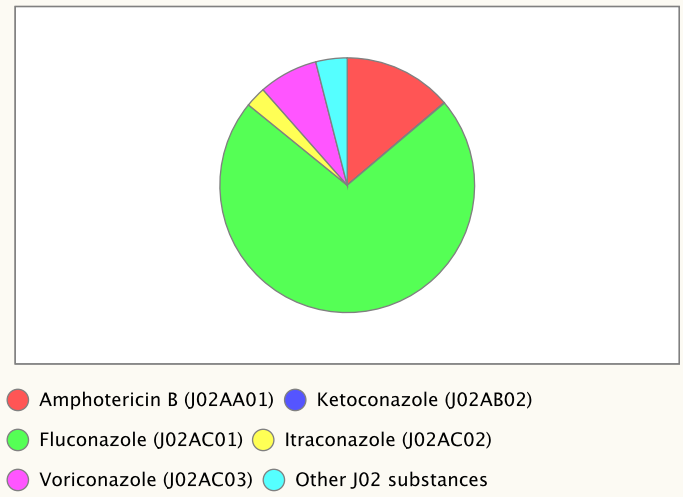
Use of antimycotics for systemic use expressed in DDD/1000 inh./day in 2006

J02 substances	Ambulatory care	Hospital care
Amphotericin B (J02AA01)	0.00	0.01
Ketoconazole (J02AB02)	<0.01	<0.01
Fluconazole (J02AC01)	0.11	0.06
Itraconazole (J02AC02)	0.21	<0.01
Voriconazole (J02AC03)	<0.01	<0.01
Other J02 substances	<0.01	<0.01
Total J02 substances	***0.32***	***0.08***

Distribution of J02 substances in ambulatory care sector



Distribution of J02 substances in hospital care sector



Comments

National Network — In the analysis we included all prescriptions for antibiotics for outpatients. From 1999 to 2006 Slovenia reduced the antibiotic consumption in outpatients by 26%. The consumption of restricted antibiotics was reduced more than non-restricted (35% vs 23%). We found a positive correlation between antibiotic consumption and the education of the lay public and a negative correlation between the number of diagnostic tests (C-reactive protein, Streptococcal antigen detection test) and consumption (Čižman M, et al. J Antimicrob Chemother 2005; 55: 758-63). Slovenia has 29 hospitals, including one teaching hospital – University Medical Center (UMC) Ljubljana, and 11 general hospitals. In November 2007, one general hospital became the second UMC in Slovenia. In addition there are 14 specialised hospitals which provide orthopaedic (1), pulmonary (2), gynaecological (2), psychiatric (5), nursing (1), rehabilitation (2) and oncology (1) care and 3 hospitals which provide diagnostic or surgical procedures. All but three hospitals are state owned. In the analysis we included all hospitals. The consumption of antibiotics in hospitals is stable.

Spain

Health care sector	Data type	Coverage	Data source
Ambulatory care	Reimbursement	100%	Health Insurance Company

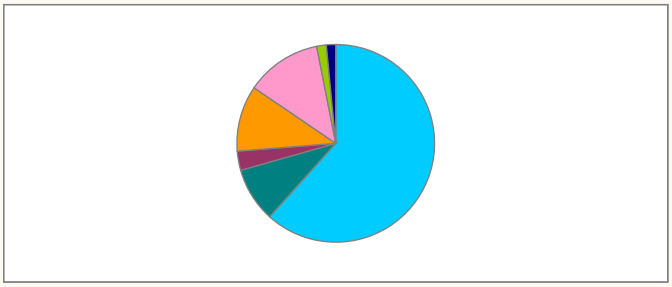
Population	Data source
44,708,964	National Institute for Statistics

Antimicrobials for systemic use (J01)

Use of antimicrobials for systemic use expressed in DDD/1000 inh./day in 2006

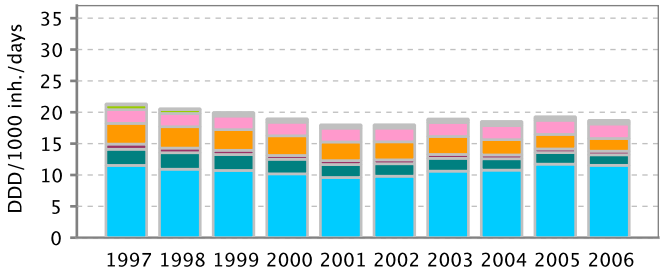
J01 classes	Ambulatory care
Beta-lactam antibacterials, penicillins (J01C)	11.54
Other beta-lactam antibacterials (J01D)	1.67
Tetracyclines (J01A)	0.59
Macrolides, lincosamides and streptogramins (J01F)	2.01
Quinolone antibacterials (J01M)	2.32
Sulfonamides and trimethoprim (J01E)	0.29
Other J01 classes	0.29
Total J01 classes	***18.71***

Distribution of J01 classes in ambulatory care sector



Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Trends of use of J01 in ambulatory care sector



Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Comments

National Network — Since 1997 there has been a downward trend in the overall use of antibiotics in Spain until 2003 when a slight increase was detected. The pattern of use continues to be essentially the same, with broad-spectrum penicillins accounting for 61% of the overall use in 2006. The ratio amoxicillin/amoxicillin-clavulanic acid was maintained at > 1 up to 2001 when an inversion occurred, reaching its lowest value in 2005 and 2006 (0.57). The increase in use of amoxicillin-clavulanic acid expressed in DDD per 1000 inhabitants per day (DID) was mostly due to the progressive increase of share of high-strength presentations, while the number of packages sold did not substantially change. To note, the use of cephalosporins and macrolides continued to decrease reaching in 2006 their historical minimum, while the use of quinolones, as a group appeared to be rather stable since 1997. In the 2006 and 2007 the Ministry of Health launched two widely publicised campaigns on the rational use of antibiotics (TV, radio, newspapers), the impact of which is still under scrutiny.

Sweden

Health care sector	Data type	Coverage	Data source
Ambulatory care	Sales	100%	Community Pharmacists
Hospital care	Sales	100%	Community Pharmacists

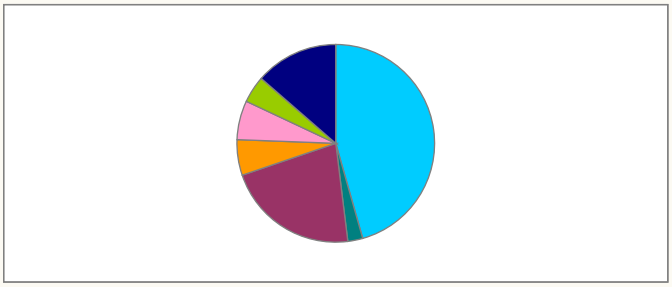
Population	Data source
9,070,000	WHO

Antimicrobials for systemic use (J01)

Use of antimicrobials for systemic use expressed in DDD/1000 inh./day in 2006

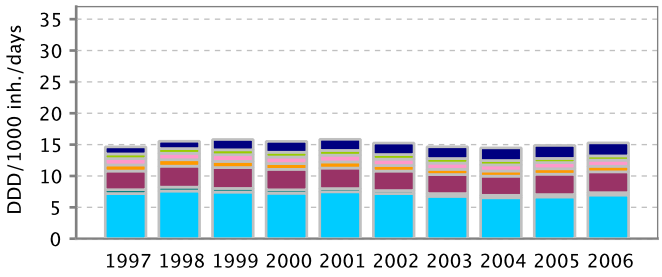
J01 classes	Ambulatory care	Hospital care
Beta-lactam antibacterials, penicillins (J01C)	6.97	0.54
Other beta-lactam antibacterials (J01D)	0.37	0.30
Tetracyclines (J01A)	3.32	0.19
Macrolides, lincosamides and streptogramins (J01F)	0.89	0.06
Quinolone antibacterials (J01M)	0.98	0.18
Sulfonamides and trimethoprim (J01E)	0.67	0.10
Other J01 classes	2.08	0.17
Total J01 classes	***15.28***	***1.54***

Distribution of J01 classes in ambulatory care sector



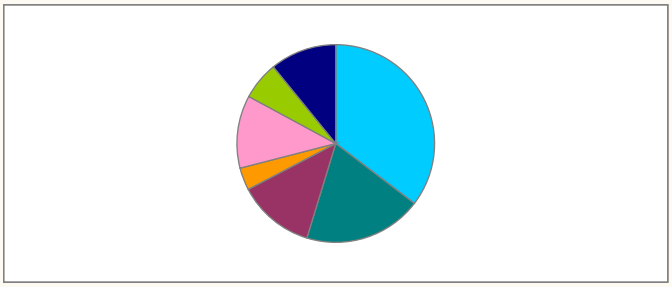
Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Trends of use of J01 in ambulatory care sector



Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Distribution of J01 classes in hospital care sector



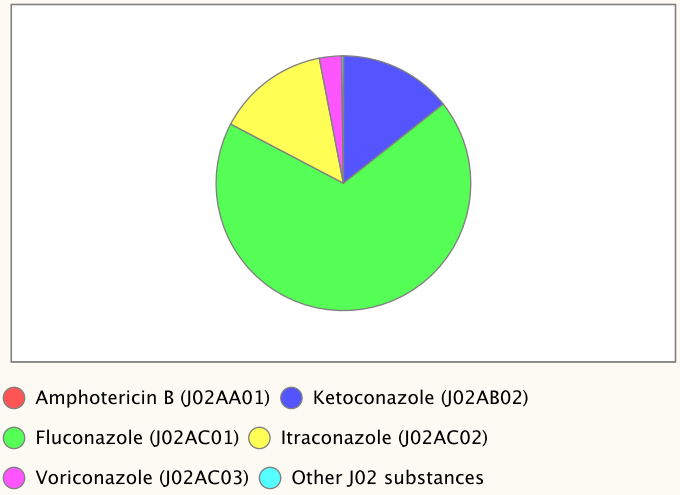
Beta-lactam antibacterials, penicillins (J01C)
Other beta-lactam antibacterials (J01D)
Tetracyclines (J01A)
Macrolides, lincosamides and streptogramins (J01F)
Quinolone antibacterials (J01M)
Sulfonamides and trimethoprim (J01E)
Other J01 classes

Antimycotics for systemic use (J02)

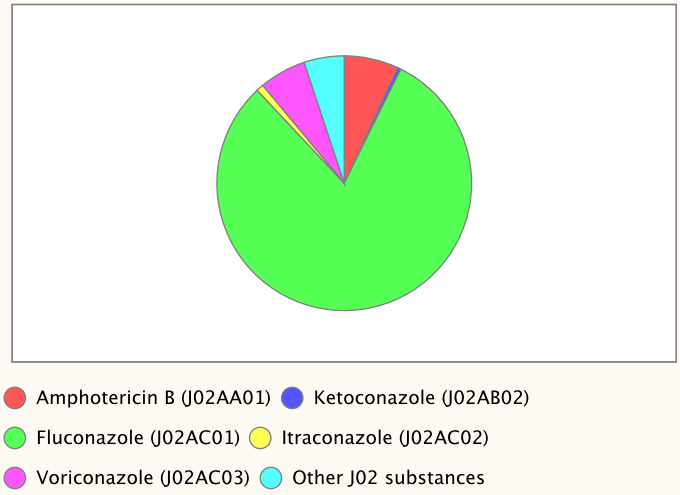
Use of antimycotics for systemic use expressed in DDD/1000 inh./day in 2006

J02 substances	Ambulatory care	Hospital care
Amphotericin B (J02AA01)	<0.01	<0.01
Ketoconazole (J02AB02)	0.03	<0.01
Fluconazole (J02AC01)	0.13	0.04
Itraconazole (J02AC02)	0.03	<0.01
Voriconazole (J02AC03)	<0.01	<0.01
Other J02 substances	<0.01	<0.01
Total J02 substances	***0.19***	***0.05***

Distribution of J02 substances in ambulatory care sector



Distribution of J02 substances in hospital care sector



Comments

National Network — Data on Swedish drug use is collected by the National Corporation of Swedish Pharmacies. The data include sales in both ambulatory and hospital care and covers 100% of the total Swedish sales of antimicrobials.
There was a decrease in the use of antibiotics in Sweden until 2004 when the trend shifted slightly upwards. Approximately 90% of the total Swedish antibiotic use takes place in ambulatory care.
Compared to other European countries, Sweden has a relatively high use of methenamine, an antibacterial and not an antibiotic. This makes the total use of antibiotics seem larger than it actually is. In ambulatory care in 2006, methenamine use represents 87% of the group “Other J01 classes”, in hospital care 49%, constituting 1.8 and 0.1 DDD per 1000 inhabitants per year of the total J01 consumption in ambulatory and hospital care respectively.
Since July 2005, the Swedish National Board of Health and Welfare supplies an individually based register on all drugs prescribed in out-patient care. Data from this register show that in 2006, 25% of the Swedish population were given at least one course of antibiotics in out-patient care. Use of antibiotics was most common among people older than 80 years (38%) and children aged 0 – 6 years (35%).