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SURVEILLANCE REPORT

Surveillance of antimicrobial consumption in Europe

2013-2014

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This report of the European Centre for Disease Prevention and Control (ECDC) was coordinated by Klaus Weist.

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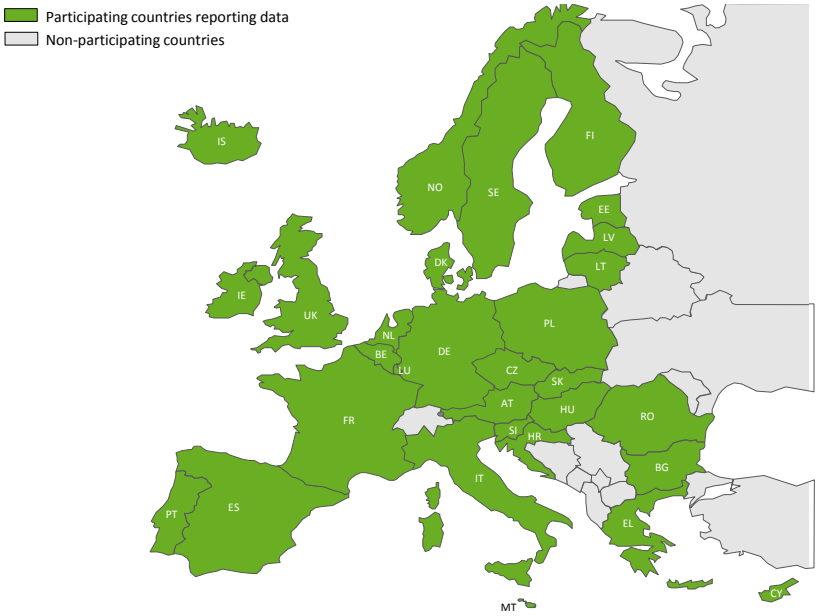
Abbreviations

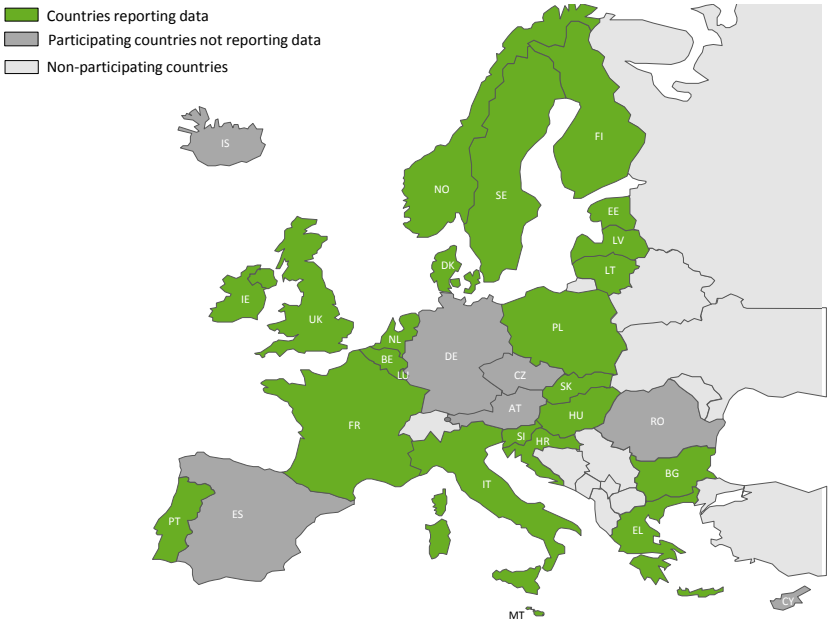
ARPEC project	Antibiotic Resistance and Prescribing in European Children project
ATC	Anatomical Therapeutic Chemical classification
CHMP	Committee on Medicinal Products for Human Use (at EMA)
DAA	Direct-acting antiviral
DDD	Defined daily dose
DNCC	Disease Network Coordination Committee
EARS-Net	European Antimicrobial Resistance Surveillance Network
ECDC	European Centre for Disease Prevention and Control
EEA	European Economic Area
EMA	European Medicines Agency
ESAC-Net	European Surveillance of Antimicrobial Consumption Network
ESAC project	European Surveillance of Antimicrobial Consumption project
ESVAC	European Surveillance of Veterinary Antimicrobial Consumption
EU	European Union
Eurostat	Statistical Office of the European Union
HAI-Net	Healthcare-associated Infections Surveillance Network
HCV	Hepatitis C virus
TESSy	The European Surveillance System (at ECDC)
WHO	World Health Organization

EU/EEA countries participating in ESAC-Net, 2014

Figure 1. Community antimicrobial consumption: EU/EEA countries reporting for 2014



Hospital sector antimicrobial consumption: EU/EEA countries reporting for 2014



AT	Austria	EL	Greece	IT	Italy	PT	Portugal
BE	Belgium	ES	Spain	LT	Lithuania	RO*	Romania
BG	Bulgaria	FI	Finland	LU	Luxembourg	SE	Sweden
CY*	Cyprus	FR	France	LV	Latvia	SI	Slovenia
CZ	Czech Republic	HR	Croatia	MT	Malta	SK	Slovakia
DE	Germany	HU	Hungary	NL	Netherlands	UK	United Kingdom
DK	Denmark	IE	Ireland	NO	Norway		
EE	Estonia	IS	Iceland	PL	Poland		

*: Cyprus and Romania provided total care data (i.e. community and hospital sector combined)

National institutions/organisations participating in ESAC-Net

Country	National institutes/organisations	Website
Austria	Ministry of Health	www.bmg.gv.at/
Belgium	Public Health, Food Chain Safety and Environment Scientific Institute of Public Health University of Antwerp (Laboratory of Medical Microbiology) National Institute for Health and Disability Insurance (INAMI-RIZIV)	www.health.belgium.be www.wiv-isp.be www.ua.ac.be www.inami.fgov.be/fr/Pages/default.aspx
Bulgaria	National Centre of Infectious and Parasitic Diseases Alexander University Hospital, Medical University	www.ncipd.org
Croatia	Croatian Academy of Medical Sciences Interdisciplinary Section for Antibiotic Resistance Control (ISKRA), Ministry of Health	www.Iskra.bfm.hr
Cyprus	Directorate of Medical and Public Health Services Pharmaceutical Services	www.moh.gov.cy
Czech Republic	Charles University, Faculty of Pharmacy	www.faf.cuni.cz
Denmark	Statens Serum Institut	www.ssi.dk
Estonia	Health Board State Agency of Medicines	www.terviseamet.ee www.ravimiamet.ee
Finland	National Institute for Health and Welfare	www.thl.fi
France	National Institute for Public Health Surveillance Agency for the Safety of Health Products	invs.santepubliquefrance.fr www.ansm.sante.fr/
Germany	Robert Koch Institute Wissenschaftliches Institut der AOK (WIdO)	www.rki.de www.wido.de
Greece	Hellenic Centre for Disease Control and Prevention National Organization for Medicines	www.keelpno.gr www.eof.gr
Hungary	National Centre for Epidemiology University of Szeged	www.oek.hu www.u-szeged.hu
Iceland	Centre of Health Security and Communicable Disease Control	www.landlaeknir.is/ www.lyfjastofnun.is/
Ireland	Health Protection Surveillance Centre	www.hpsc.ie
Italy	Ministry of Health National Institute of Health Italian Medicines Agency	www.salute.gov.it/ www.simi.iss.it www.agenziafarmaco.gov.it
Latvia	The Centre for Disease Prevention and Control (CDPC) of Latvia State Agency of Medicines of Latvia	www.spkc.gov.lv www.zva.gov.lv
Lithuania	Institute of Hygiene	www.hi.lt
Luxembourg	Ministry of Health	www.ms.public.lu/fr/index.html
Malta	National Antibiotic Committee	www.nac.gov.mt
Netherlands	National Institute for Public Health and the Environment Dutch working group on antibiotic policy	www.rivm.nl www.swab.nl
Norway	Norwegian Institute of Public Health	www.fhi.no
Poland	Ministry of Health National Institute of Public Health National Medicines Institute	www.mz.gov.pl www.pzh.gov.pl http://www.nil.gov.pl/
Portugal	National Authority of Medicines and Health Products	www.infarmed.pt
Romania	National Institute of Public Health	www.insp.gov.ro.
Slovakia	Comenius University	www.uniba.sk
Slovenia	National Institute of Public Health University Medical Centre Ljubljana	www.nijz.si www.kclj.si
Spain	National Centres of Microbiology and Epidemiology Spanish Agency of Medicines and Medical Devices (AEMPS) University Hospital Son Espases University Hospital of Bellvitge	www.aemps.gob.es/ www.hospitalsonespases.es/ www.bellvitgehospital.cat
Sweden	Public Health Agency of Sweden	www.folkhalsomyndigheten.se/
United Kingdom	Public Health England Health Protection Scotland Public Health Agency University of Dundee University Hospital of South Manchester Public Health Wales The British Society for Antimicrobial Chemotherapy	www.hpa.org.uk www.hps.scot.nhs.uk www.dundee.ac.uk www.uhsm.nhs.uk www.wales.nhs.uk www.bsac.org.uk

Summary

This is the fourth annual report of the European Surveillance of Antimicrobial Consumption Network (ESAC-Net) published by ECDC. The report is based on antimicrobial consumption data from the community (primary care sector) and the hospital sector reported to ECDC for the years 2013 and 2014 by 28 EU Member States and two EEA (European Economic Area)/non-EU countries (Iceland and Norway).

Key findings

In the community - i.e. outside hospitals - consumption of antibacterials for systemic use (Anatomical Therapeutic Chemical (ATC) group J01) was reported by 30 countries in 2014. The population-weighted EU/EEA mean consumption was 21.9 DDD per 1 000 inhabitants per day. An analysis of EU/EEA data from the last five years did not reveal any significant trend in the mean overall consumption. Consumption varied by a factor of 3.3 between the highest consumption (35.1 defined daily doses (DDD) per 1 000 inhabitants per day in Greece) and the lowest (10.6 DDD per 1 000 inhabitants per day in the Netherlands).

The most commonly used subgroups of antibacterials were combinations of penicillins including beta-lactamase inhibitors (ATC group J01CR) and penicillins with extended spectrum (ATC group J01CA), followed by macrolides (ATC group J01FA) and tetracyclines (ATC group J01AA). The largest increase in consumption of antibacterials for systemic use in the community since 2013 was seen in Greece, where consumption rose from 32.2 DDD per 1 000 inhabitants per day in 2013 to 35.1 DDD per 1 000 inhabitants per day in 2014.

A trend analysis, based on the total consumption of antibacterials for systemic use during the period 2010–2014 in 23 ESAC-Net participating countries, showed a significant decreasing trend in consumption for two countries: Cyprus and Sweden. A significant increasing trend over the five-year period was observed only for the United Kingdom.

In 2014, the 12 consensus-based quality indicators of the former ESAC project in relation to consumption of antibacterials for systemic use (ATC group J01) in the community [1, 2] showed a distinct variation across Europe. Significant and divergent trends were observed for the two quality indicators measuring consumption of beta-lactamase-sensitive penicillins and combinations of penicillins including beta-lactamase inhibitors:

- Consumption of beta-lactamase-sensitive penicillins (ATC group J01CE), expressed as a percentage of the total consumption of antibacterials for systemic use (ATC group J01), varied from <0.1% in Italy to 24.7% in Sweden and 26.9 % in Denmark. A trend analysis revealed a significant decrease in 14 countries (Austria, Bulgaria, Croatia, Denmark, Estonia, Hungary, Ireland, Italy, Lithuania, Luxembourg, the Netherlands, Norway, Portugal and Romania) for this indicator between 2010 and 2014.
- Conversely, 14 countries (Austria, Bulgaria, Croatia, Denmark, Estonia, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Luxembourg and Norway) saw a significant increasing trend in their consumption of combinations of penicillins including beta-lactamase inhibitors (ATC group J01CR).

Another quality indicator, the ratio of consumption of broad-spectrum penicillins/cephalosporins/macrolides to narrow-spectrum penicillins/cephalosporins/macrolides [1, 2], also showed significant variation, from 0.4 in Sweden and Norway to 636 in Greece.

With regard to antibacterials for systemic use (ATC group J01) that are administered orally, ESAC-Net also reports consumption as the number of packages per 1 000 inhabitants per day. In 2014, on average 3.0 packages of these antibacterials were consumed per 1 000 inhabitants per day. Consumption ranged from 1.0 package per 1 000 inhabitants per day (Sweden) to 4.6 packages per 1 000 inhabitants per day (France). A few countries (Belgium, Bulgaria, Croatia, Denmark, Iceland, Lithuania and Spain) changed ranks by three or more places when consumption was expressed in packages instead of DDD per 1 000 inhabitants per day. Although there was no significant trend in the mean overall consumption expressed in packages, in five countries (Denmark, Luxembourg, Slovenia, Spain, and Sweden) a significant decrease was observed.

In 2014, 27 countries reported data on consumption of antimycotics and antifungals for systemic use (ATC groups J02 & D01B) in the community. Consumption varied by a factor of 8.8 between the highest consumption (3.2 DDD per 1 000 inhabitants per day in Belgium) and the lowest (0.36 DDD per 1 000 inhabitants per day in Croatia). Terbinafine, fluconazole and itraconazole accounted for 92% of the total antimycotic and antifungal consumption in the community in all countries. Terbinafine consumption alone accounted for more than 50% of the total systemic antimycotic and antifungal consumption in 19 (70%) countries. In 2014, ketoconazole consumption decreased in all countries in the community and the hospital sector compared to 2013 (see Chapters 3.2 and 4.3) following a recommendation by the European Medicines Agency (EMA)'s Committee on Medicinal Products for Human Use (CHMP) in 2013 to suspend marketing authorisations of oral ketoconazole-containing medicines throughout the EU for safety reasons.

In the hospital sector, consumption of antibacterials for systemic use (ATC group J01) was reported by 23 countries in 2014. The population-weighted EU/EEA mean consumption was 2.0 DDD per 1 000 inhabitants per day and no

significant trends in the mean consumption were apparent for the last five years. Hospital consumption varied from 1.0 DDD per 1 000 inhabitants per day in the Netherlands to 2.6 in Finland. The most frequently used subgroup in the hospital sector was penicillins (ATC group J01C), followed by other beta-lactam antibacterials including cephalosporins (ATC group J01D) and by quinolones (ATC group J01M). A trend analysis, performed on data relating to consumption of antibacterials for systemic use during the period 2010–2014 for 17 countries, showed a significant increasing trend for Denmark and a significant decreasing trend for Belgium.

Consumption of carbapenems and polymyxins for the treatment of serious infections caused by multidrug-resistant gram-negative organisms is low compared to the overall consumption of antibiotics, but a significant increasing trend has been reported in several countries.

In 2014, 21 countries reported data on consumption of antimycotics and antifungals for systemic use (ATC groups J02 & D01B) in the hospital sector, ranging from 0.03 DDD per 1 000 inhabitants per day in Lithuania to 0.24 DDD per 1 000 inhabitants per day in Ireland. Overall, amphotericin B and fluconazole accounted for 69% of the total antimycotic and antifungal consumption in the hospital sector for participating countries. Fluconazole consumption alone accounted for more than 50% of the total systemic antimycotic and antifungal consumption in 17 (81%) of these countries.

In 2014, data on total consumption of antivirals for systemic use (ATC group J05), presented for both the community and the hospital sector as aggregated numbers, were available from 26 countries. Consumption varied by a factor of 32 between the highest (5.19 DDD per 1 000 inhabitants per day in Portugal) and the lowest consumption (0.16 DDD per 1 000 inhabitants per day in Croatia). Based on indications for treatment with antivirals in ATC group J05, as suggested by the former ESAC project [3], most antivirals reported were 'HIV/AIDS antivirals' followed by 'herpes antivirals'. Bulgaria, Hungary and Poland showed a different pattern, with the highest consumption being of other antivirals (ATC groups J05AC, J05AD, J05AX). In 2014, new direct-acting antivirals (DAA) (i.e. daclatasvir, simeprevir and sofosbuvir) to treat HCV infections were licensed for use in Europe, and half of the countries reporting antiviral consumption data reported consumption of DAAs for the first time.

Conclusions

The results presented in this report document trends in antimicrobial consumption across Europe. The 2014 EU/EEA population-weighted mean consumption of antibacterials for systemic use (ATC group J01) in the community was at the same level as in 2013. For both 2013 and 2014, there was no decrease in consumption trends during the five preceding years at EU level. Only two countries showed a significant decreasing trend during the period 2010–2014. Greece had the largest increase of all EU/EEA countries between 2013 and 2014, despite a remarkable decrease between during the period 2010–2013 (linked to the implementation of an electronic prescription system, which probably captured consumption data over time and awareness activities for the public and prescribers more accurately). The decreasing trend in community antibiotic consumption expressed in packages per 1 000 inhabitants per day in one quarter of countries reporting this indicator probably reflects a decrease in antibiotic prescriptions between 2010 and 2014, although this should be confirmed with national data from other sources. The fact that a decrease in the number of packages was not followed by a decrease in the number of DDDs could be explained by the packages containing on average a greater number of DDDs over time.

For the hospital sector, the 2014 EU/EEA population-weighted mean consumption of antibacterials for systemic use (ATC group J01), as well the corresponding national figures, were similar to those for previous years and no significant trend was observed at EU level for the period 2010–2014. Although the total antibiotic consumption remained the same, increasing trends in broad-spectrum antibiotic consumption, such as carbapenems and polymyxins, in several countries show that the pattern of use is changing.

When analysing the data at ATC subgroup levels, significant, but divergent, trends were observed in both the community and the hospital sector, highlighting an increase in consumption of some groups of antibacterials at the expense of others. For instance, a significant increase was observed in the ratio of broad-spectrum penicillins/cephalosporins/macrolides to narrow-spectrum penicillins/cephalosporins/macrolides consumed in the community between 2010 and 2014 in two thirds of the countries. It is difficult to identify the factors and reasons behind these changes without additional data on prescriptions and the antimicrobial resistance patterns of the pathogens treated. However, the inclusion of the number of packages per 1000 inhabitants per day may provide a basis for estimating the number of prescriptions [4]. Combining the additional indicator based on packages with the indicator of DDD per 1 000 inhabitants per day may make it possible to assess the impact of interventions such as national awareness campaigns. Detailed information on national programmes and campaigns encouraging the prudent use of antimicrobials is needed to fully understand the trends observed.

In 2014, Poland started reporting data for the hospital sector. ESAC-Net aims to obtain hospital sector data from all network members. A number of countries are currently not able to provide separate hospital consumption data at national level as defined in the reporting protocol. The number of countries reporting antimicrobial consumption data for the hospital sector should be increased. Therefore ESAC-Net is currently piloting an EU-wide protocol with 2014 and 2015 consumption data for collecting data locally at the hospital level including additional denominators for hospital consumption. The new protocol is expected to provide countries with better baseline data for the

design of interventions at national, regional and local level (e.g. antimicrobial stewardship programmes to optimise and reduce the consumption of antimicrobials.)

Broadly accepted standards and metrics reflecting responsible antibiotic use have not been defined until now. The development of evidence-based and consensually validated quantity metrics to evaluate antibiotic use, both for hospital and community settings, is one of the objectives of the project 'Driving re-investment in Research & Development (R&D) and responsible antibiotic use (DRIVE-AB)', a public–private consortium funded by the EU Innovative Medicines Initiative (IMI). The results have recently been made publicly available.

When interpreting the results of inter-country comparisons presented in this report it should be remembered that the following factors may have an impact: there are differences in national data sources and in the availability of national registries of all antimicrobials available on the market in each country; reporting practices may vary from year to year, and certain countries only reported their total consumption while most of the others reported community and hospital consumption.

ESAC-Net will continue to provide independent reference information on antimicrobial consumption in the community and the hospital sector in the EU/EEA. These surveillance data may facilitate the adoption of national targets by Member States and reinforce best practices for the use of antimicrobials.

ECDC also provides public access to ESAC-Net data at the fourth level of the ATC classification through an interactive database [5]. Similarly, country overview sheets summarising national antimicrobial consumption data are provided online.

1. Introduction

The use and overuse of antimicrobials is one of the main factors responsible for the development and spread of antimicrobial resistance. The problem of antimicrobial resistance is recognised as a serious threat to public health, notably because of the emergence and spread of highly-resistant bacteria, and because there are very few novel antimicrobial agents in the research and development pipeline. Both WHO and the EU Commission have recently launched action plans to prevent and control antimicrobial resistance [6, 7]. European countries are increasingly implementing, or planning to implement actions to control antimicrobial resistance in the community through the rational use of antimicrobials. Such actions include awareness campaigns on the prudent use of antibiotics. Surveillance of antimicrobial consumption in Europe, and in particular the consumption of antibacterials, provides important baseline data and serves as an important source of information for healthcare professionals and policymakers monitoring progress towards a more prudent use of antibiotics.

This report is based on antimicrobial consumption data from the community (primary care sector) and the hospital sector reported to ECDC for the years 2013 and 2014 by 28 EU Member States and two EEA (non-EU) countries (Iceland and Norway).

The report includes data for three major categories of antimicrobials:

- antibacterials for systemic use (ATC group J01);
- antimycotics and antifungals for systemic use (ATC groups J02 & D01B);
- antivirals for systemic use (ATC group J05).

A few antibiotics which were previously not shown but are part of the ESAC-Net metadata have been included in the ESAC-Net report for the first time. These are oral vancomycin (A07AA09, from the ATC group ‘intestinal anti-infective’), oral and rectal metronidazole (P01AB01, from the ATC group ‘nitroimidazole derivatives’) and rifampicin (J04AB02, from the ATC group ‘drugs for treatment of tuberculosis’). These antibiotics are classified under ATC codes other than ATC group J01 due to the fact that they have a different indication, route of administration and metabolism.

The largest proportion of antimicrobial consumption by humans takes place in the community (i.e. outside of hospitals.) Each sector of the healthcare system, i.e. the community and hospital sectors, typically care for different types of patients. Thus, the typical patterns of antimicrobial consumption differ among these sectors. Consequently, results of antimicrobial consumption for the ATC groups J01, J02 & D01B and the three newly reported antimicrobials A07AA09, P01AB01, J04AB02 are presented separately for the two sectors in this report.

However, consumption of antivirals for systemic use (ATC group J05) is reported for both sectors grouped together. This is because in several countries, certain antiviral classes can only be dispensed in a hospital, while in other countries such antivirals are mainly dispensed in community pharmacies.

Two quantitative indicators are used to report antimicrobial consumption, the number of DDD per 1 000 inhabitants per day, and the number of packages per 1 000 inhabitants per day.

The former ESAC project developed 12 quality indicators for antimicrobial consumption in the community based on a consensus of European antimicrobial surveillance experts [2]. It was concluded that these indicators could be used to better describe antimicrobial consumption and to assess changes in national antibiotic prescribing patterns in Europe. The indicators reported are the consumption expressed in DDD per 1 000 inhabitants per day for ATC group J01 and as a percentage of the total consumption of antibacterials for systemic use (ATC group J01) corresponding to various subgroups: the ratio of the consumption of broad-spectrum and narrow-spectrum antibacterials (as defined by Coenen, et al [2]); and seasonal variations of the total consumption of antibacterials for systemic use. When comparing the results from different countries for the 12 quality indicators, low values of the indicators suggest better quality, with the best quality being within the first quartile (p0–p25). Values within the second quartile (i.e. p25–p50) suggest better quality than values of indicators in the third quartile, etc. The only indicator evaluated inversely is that describing the percentage of the total consumption of antibacterials for systemic use (ATC group J01), corresponding to the subgroup of beta-lactamase-sensitive penicillins. In other words, high values of the indicator suggest better quality, with the best quality being within the fourth quartile (p75–p100). This report presents the results of the quality indicators for 2014 consumption data.

European Surveillance of Antimicrobial Consumption Network (ESAC-Net)

ESAC-Net is the continuation of the former ESAC project (managed by the University of Antwerp until June 2011) and is a network of national surveillance systems providing independent reference data on antimicrobial consumption in Europe, reported by 30 EU/EEA countries. It collects and analyses data from the community (primary care) and the hospital sector.

The former ESAC project included point prevalence surveys of antimicrobial use conducted in 2008 and 2009 in acute care hospitals and in nursing homes across EU/EEA countries. These point prevalence surveys are now included as part of the activities of the Healthcare-associated Infections Surveillance Network (HAI-Net) at ECDC, and data from European acute care hospitals in 2011–2012 were provided through the ECDC point prevalence survey of healthcare-associated infections and antimicrobial use. Data from long-term care facilities are collected by the ECDC-funded project 'Healthcare-associated Infections and Antimicrobial Use in European Long-Term Care Facilities (HALT-2)'.

The objectives of ESAC-Net are:

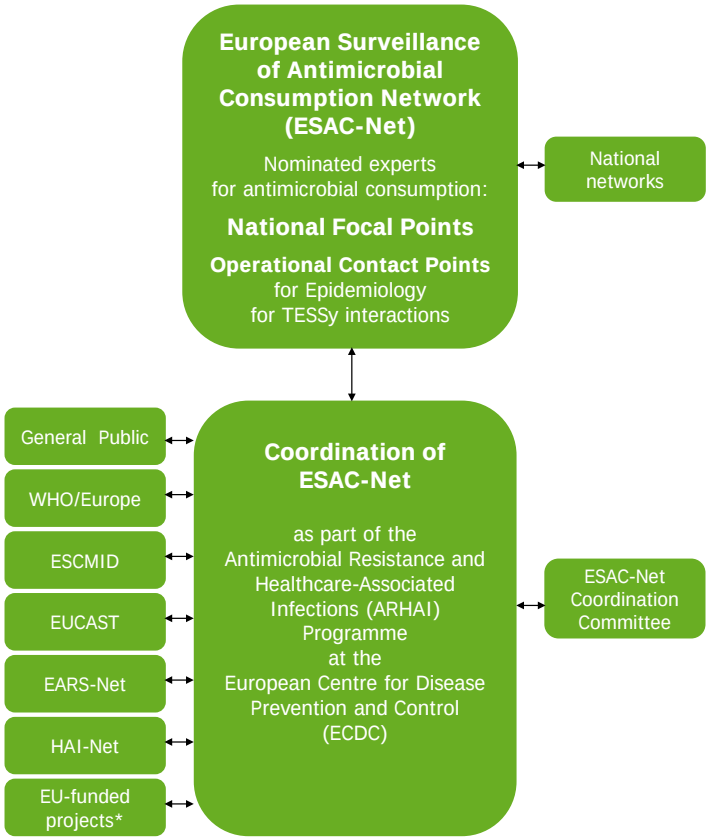
- to provide continuous surveillance of antimicrobial consumption in the European Union;
- to work towards comparable surveillance methods in the community and in the hospital sector;
- to analyse inter-country differences and provide regular feedback to participating Member States;
- to provide public access to information on antimicrobial consumption via the ESAC-Net interactive database [5].

To maintain and facilitate data reporting, ECDC ensures:

- validation of community (primary care) and hospital sector data;
- analysis of the trends in antimicrobial consumption overall and in the different ATC groups;
- public access to information on antimicrobial consumption in Europe through an interactive database;
- timely information and feedback to EU/EEA countries on indicators of antimicrobial consumption. These indicators provide a basis for monitoring the progress of EU/EEA countries towards prudent use of antimicrobials.

Figure 1.1 illustrates how the network was organised in 2014. National experts in antimicrobial consumption were nominated by each country as the National Focal Points for antimicrobial consumption; Operational Contact Points for epidemiology (Antimicrobial Consumption); or Operational Contact Points for TESSy interactions and became network participants. The network is coordinated by ECDC and is supported by a Disease Network Coordination Committee (DNCC). The DNCC is composed of network member representatives from the countries participating in ESAC-Net that were elected by the National Focal Points for antimicrobial consumption (one vote per country). In addition, representatives from the Antimicrobial Consumption Network of WHO-Europe, WHO Headquarters, the European Surveillance of Veterinary Antimicrobial Consumption (ESVAC) and the Antibiotic Resistance and Prescribing in European Children (ARPEC) project participate as observers (once approved by the DNCC.) The DNCC discusses technical, epidemiological and other scientific aspects of antimicrobial consumption surveillance and makes suggestions to ECDC on how to further develop ESAC-Net and improve its operation. Observers do not participate in the voting on DNCC decisions.

Figure 1.1 Organisation of ESAC-Net (2014)



** EU-funded projects on antimicrobial consumption - e.g. ARPEC and ESVAC.*

2 Technical notes

2.1 Terminology and definitions

The term 'antimicrobial consumption' is used in this report whereas 'antimicrobial use' is applied to data from the point prevalence surveys in acute-care hospitals and in long-term-care facilities where data on the actual application of antimicrobials are retrieved from patient charts. These two ECDC point prevalence surveys are part of surveillance activities under HAI-Net.

The term 'community' is used to designate the sector providing mainly primary care (general practitioner, specialists) outside of hospitals. The terms 'ambulatory care' and 'outpatient sector' were not used as these could be misconstrued as referring to patient care in hospitals or other healthcare facilities.

Antimicrobial consumption is expressed as the number of DDD per 1 000 inhabitants per day. In addition to this measurement unit, the number of packages per 1 000 inhabitants per day is also used, provided that the country collects and reports data at package level. Since the ATC/DDD system cannot take into account changes in package content, information on the sales of packages is deemed to improve the understanding and interpretation of differences in the levels and trends in consumption observed within and between countries.

Antimicrobials are grouped according to the Anatomical Therapeutic Chemical (ATC) classification. The respective 2014 and 2015 versions of the ATC/DDD index from the WHO Collaborating Centre for Drug Statistics Methodology (Oslo, Norway) were applied for the 2013 and 2014 data calls. The latest ATC/DDD index is available at www.whocc.no/atc_ddd_index and contains all valid ATC codes and corresponding DDD. Changes between different ATC/DDD indexes (e.g. between a current year and previous years) can also be found there. The three major groups of antimicrobials considered in this report (ATC groups J01, J02 & D01B, J05) are often referred to by their ATC codes rather than the name of the group or the active ingredients.

The group of 'antibacterials for systemic use' (ATC group J01) is often referred to by the public as 'antibiotics'. However, the term 'antibiotics' defines substances produced by one microorganism and specifically inhibiting the growth of others and also includes agents such as topical antibacterials and antifungals for which data are not collected by ESAC-Net. Throughout this report, the term 'antibacterials for systemic use' has been used to refer to this group of antimicrobials.

In addition to the ATC classification, for two groups of antibacterials for systemic use (i.e. macrolides and quinolones, and for antivirals) further sub-classifications were used that are not supported by the ATC classification. These were introduced by the ESAC project [3, 8, 9] and updated for new ATC codes and changes published by the WHO Collaborating Centre for Drug Statistics Methodology (Annex 1).

2.2 Data collection and reporting for 2013-2014

Data on antimicrobial consumption were collected for the community (primary care sector) and for the hospital sector, and for some countries aggregated data for both sectors were combined (total care), according to the respective reporting protocols. The latest ESAC-Net reporting protocol is always published on ECDC's website [10].

The calls for 2013 and 2014 surveillance data started in March 2014 and 2015, respectively. The data calls were open until 30 June of the respective years. After uploading, each country approved its own data and the results were made available on the ECDC website.

There are two options for reporting ESAC-Net data to ECDC:

- The preferred standard option - i.e. reporting of national antimicrobial consumption data at the medicinal product level and expressed as a number of packages sold. For this option, a valid national register of available antimicrobials is required (national registry data).
- A 'light' version - i.e. when national registry data are not available, reporting of aggregated numbers of DDD from national antimicrobial consumption data at the ATC substance level.

In addition, ESAC-Net encouraged participants to report data on the above variables by age group, gender and type of prescriber as well as to report data by quarter rather than annually.

2.3 Data validation and analysis

The ESAC-Net data validation process consists of three steps:

- During upload of the national data, a first quality check of the data is performed by The European Surveillance System (TESSy) using its in-built validation rules for the ESAC-Net metadata [10]. Following the data upload, each country approves its own data.

- As a second step, each country checks its own data for consistency by comparing data displayed in TESSy online reports with data from national sources.
- ESAC-Net experts and TESSy data managers perform a final data validation. This final step includes testing for outliers in terms of volume or pattern (e.g. comparison with data for the last five years). When an inconsistency is detected, TESSy data managers or the ESAC-Net coordinator contacts the country for clarification, and where applicable, data are corrected and re-uploaded.

Data analysis for this ESAC-Net report 2013–2014 included data uploaded to TESSy as of 2 October 2015 and finally an update of 2014 antimicrobial consumption data by one country (Greece) from October 2016.

Indicators for reporting antimicrobial consumption

For the community data, two indicators are used to report antimicrobial consumption:

- the number of DDD per 1 000 inhabitants per day;
- the number of packages per 1 000 inhabitants per day.

For the hospital sector, and for the few countries that only have total care data (combined antimicrobial consumption data from the community and the hospital sector) available, one indicator is used:

- the number of DDD per 1 000 inhabitants per day.

Retrospective changes

Member States can at any time upload or re-upload data to TESSy - e.g. to make corrections.

The following countries re-uploaded data for the indicated periods, which may result in differences between data published in this report and data in the 2012 ESAC-Net report:

- Croatia: uploaded national data for both sectors for the period 2000–2004, re-uploaded historical ESAC project data for both sectors for the period 2007–2009 and re-uploaded national data for both sectors for 2010–2011;
- Hungary: re-uploaded data for 2011–2012;
- Luxembourg: re-uploaded data for the period 2006–2013;
- Spain: re-uploaded community consumption data for 2012.

In addition to ESAC-Net reports, data up to the fourth ATC group level (including all historical data since 1997) are made publically available via the interactive ESAC-Net database [5], where country overview sheets summarising the national results are also provided. The database always shows the latest version of the ESAC-Net data - i.e. it includes any data that have been added or re-uploaded by a country after production of the report.

Eurostat population data are regularly updated. Retroactive updates can affect the calculated antimicrobial consumption for those countries which use Eurostat data as population denominator for the antimicrobial consumption indicators.

Therefore, data shown in this report may differ slightly from the data available in the ESAC-Net interactive database.

EU/EEA consumption

Consumption displayed with the label 'EU/EEA mean' is based on the data from all ESAC-Net participating countries reported for a particular year and selected ATC group or subgroup. All EU/EEA means are population-weighted and calculated by multiplying DDD or packages per 1 000 inhabitants per day of each country with its corresponding Eurostat population and dividing the product by the total population of participating EU/EEA countries.

Trend analysis

National trends in the consumption of antibacterials for systemic use (ATC group J01, including subgroups up to group level 4), and antimycotics and antifungals for systemic use (ATC groups J02 & D01B) were assessed for the community and the hospital sector over the preceding five years (2010–2014). A linear regression was applied (p-value considered for statistical significance: <0.05) with the dependent variable being antimicrobial consumption in DDD per 1 000 inhabitants per day, and the explanatory variable being the year. Countries were excluded if they (a) had one or more years of missing data (Romania and Slovakia for community data; Lithuania, Greece, Poland, Slovakia and the United Kingdom for hospital sector data), (b) reported different types of data (sales or reimbursement) for different years (Poland and Portugal for community data), or (c) reported a mixture of community and total care data during the period of analysis (Greece, Iceland, Lithuania and Slovakia for community data; Greece for hospital sector data) (see Chapters 3.1.2–3.1.8, 3.2, 3.3, 4.1 and 4.3).

Map scales

For all maps shown in the report, countries that did not report any consumption were considered separately from the countries that reported consumption data. The latter were divided into five categories specified as the five equidistant intervals between the minimum (excluding zero) and maximum values for 2014 data. This method displays the countries based on their position in the range of values and better highlights clusters and outliers.

2.4 Data sources

In 2014, data were collated from 28 EU Member States and two EEA countries (Iceland and Norway). The data sources for ESAC-Net are national sales and reimbursement data, including information from national drug registries. Data were collected at the product level for antibacterials for systemic use (ATC group J01), antimycotics and antifungals for systemic use (ATC groups J02 & D01B), antimycobacterials (ATC group J04), and antivirals for systemic use (ATC group J05). In addition, data on a few other antimicrobials outside of ATC group J were also collected (see Chapter 1).

Population data from Eurostat, or from national statistical reports, are used for the denominator. When consumption data do not cover the whole population, countries must provide information on the population covered by the reported data.

Table 2.1 provides an overview by country of the healthcare sectors from which the data were provided, data type (origin of data), population coverage, and the category of antimicrobial (four categories) for which the data are being reported. Twenty-eight countries reported data from the community. Twenty-three of these countries separately uploaded data from the hospital sector. Cyprus and Romania were only able to report data from both sectors combined (total care).

For the community (primary care sector), antimicrobial consumption data were obtained from the Ministry of Health or the national medicines agencies by half of the countries. Nine countries reported reimbursement data while the remaining countries reported sales data. Three countries reported both sales and reimbursement data. For most countries, the data coverage was reported as being 100%. Germany and the Netherlands reported data that covered 85–98% of the population. Most countries provided data on all antimicrobial categories under surveillance by ESAC-Net. Ireland, Spain and the United Kingdom only reported data on antibacterials for systemic use (ATC group J01).

For the hospital sector, 52% of the countries obtained antimicrobial consumption data from the Ministry of Health or national medicines agencies. Ireland, the Netherlands, Norway and Slovenia obtained data from national hospital networks. Most countries reported sales data, but Belgium, Croatia, Italy, Luxembourg and Slovenia only reported reimbursement data, while four countries reported both reimbursement and sales data. The data coverage was 100% with the exception of Luxembourg, the Netherlands and Portugal, which reported population coverage between 78 and 90%. All countries, except Ireland, the Netherlands, Slovakia and the United Kingdom, provided data on all categories under surveillance in ESAC-Net.

For 2014, 18 countries (60% of those reporting data for the community) chose the preferred standard option of reporting complete national registry data for the community or for both healthcare sectors combined (total care). For the hospital sector, 13 countries (56% of those reporting data for the hospital sector) used this standard option.

Compared with 2013, one country changed the type of data reported: France reported only sales instead of reimbursement and sales data for the community for 2014. All countries except for Iceland, Romania and the United Kingdom used the same data providers for 2014 as for 2013 data. Iceland changed the data provider from the Medicine Agency to community pharmacists, and the United Kingdom from the Ministry of Health to other data providers.

Fifteen countries provided a data coverage compatible with Eurostat data (preferred) and did not need to provide national population data to ESAC-Net. The remaining countries provided their own population data.

Comment

ESAC-Net strives towards having all network participants use the ESAC-Net standard option for reporting antimicrobial consumption data (i.e. at the medicinal product level and with a valid national register of available antimicrobials). This ensures that reporting in DDD is harmonised through the use of a standardised calculation procedure in TESSy. In addition, the standard option of ESAC-Net allows for a better validation and further analysis of data than the 'light' option (reporting aggregated DDD). For 2014, one third of the countries reporting community and hospital sector data, and one of two countries reporting total care data, used this standard option.

Analyses of antimicrobial consumption trends rely on countries consistently reporting data of the same type and from the same provider. This is the case for most of the countries. Cyprus and Romania (both countries reported total care data) reported sales data instead of reimbursement data for the community in 2014, and thus improved reporting as the data now include antimicrobials that may have been dispensed without a prescription or other non-reimbursed antibiotic courses. Trends for these countries and healthcare sectors should therefore be interpreted with caution. The availability in four countries of reimbursement data in addition to sales data enabled additional quality checks of the data to be made.

Reimbursement data do not include antimicrobials obtained without a prescription and other non-reimbursed courses, thus underestimating antimicrobial consumption in the community in those countries where over-the-counter dispensation of antimicrobials is known to occur [12]. Where appropriate, this limitation is mentioned in the footnotes of tables and figures in this report.

For the hospital sector, the types of healthcare settings that are included differ across European countries. For example, data from Finland, the country with the second highest consumption of antibacterials for systemic use (ATC group J01) in the hospital sector in 2014, include consumption from nursing homes and remote primary healthcare centres. For this reason, antimicrobial consumption from the hospital sector in Finland cannot be compared with that of other countries.

Table 2.1 Data sources used for surveillance of antimicrobial consumption, by country, 2014

Country	Sector	Consumption							Population data source
		Data provider	Data type	Data coverage (%) (population under surveillance)	Antibacterials for systemic use (ATC group J01)*	Antimycotics and antifungals for systemic use (ATC groups J02 & D01B)	Antimycobacterials (ATC group J04)	Antivirals for systemic use (ATC group J05)	
Austria	C	Health insurance company	Reimbursement	100	Y	Y	Y	Y	Eurostat
Belgium	C	Health insurance company	Reimbursement	100	Y	Y	Y	Y	Eurostat
	H	Health insurance company	Reimbursement	100	Y	Y	Y	Y	Eurostat
Bulgaria	C	Market research company	Sales	100	Y	Y	Y	Y	National Statistics Agency
	H	Market research company	Sales	100	Y	Y	Y	Y	National Statistics Agency
Croatia	C	Health insurance company	Reimbursement	100	Y	Y	Y	Y	National Statistics Agency
	H	Ministry of Health	Reimbursement	100	Y	Y	Y	Y	National Statistics Agency
Cyprus	T	Ministry of Health	Sales	100	Y	Y	Y	Y	Eurostat
Czech Republic	C	Ministry of Health	Reimbursement	100	Y	Y	Y	Y	National Statistics Agency
Denmark	C	Ministry of Health	Sales	100	Y	Y	Y	Y	Eurostat
	H	Ministry of Health	Sales	100	Y	Y	Y	Y	Eurostat
Estonia	C	Medicines Agency	Sales	100	Y	Y	Y	Y	Eurostat
	H	Medicines Agency	Sales	100	Y	Y	Y	Y	Eurostat
Finland	C	Medicines Agency	Sales	100	Y	Y	Y	Y	Eurostat
	H	Medicines Agency	Sales	100	Y	Y	Y	Y	Eurostat
France	C	Medicines Agency	Sales	100	Y	Y	Y	Y	National Statistics Agency
	H	Medicines Agency	Sales	100	Y	Y	Y	Y	National Statistics Agency
Germany	C	Health insurance company	Reimbursement	85	Y	Y	Y	Y	National Statistics Agency
Greece	C	Medicines Agency	Sales	100	Y	Y	Y	Y	Eurostat
	H	Medicines Agency	Sales	100	Y	Y	Y	Y	Eurostat
Hungary	C	Medicines Agency	Sales	100	Y	Y	Y	Y	Eurostat
	H	Medicines Agency	Sales	100	Y	Y	Y	Y	Eurostat
Iceland	C	Community pharmacists	Sales	100	Y	Y	Y	Y	National Statistics Agency
Ireland	C	Market research company	Sales	100	Y	N	N	N	Eurostat
	H	Hospital network	Sales/reimbursement	100	Y	Y	N	N	Eurostat
Italy	C	Medicines Agency	Sales/reimbursement	100	Y	Y	Y	Y	Ministry of Health
	H	Medicines Agency	Reimbursement	100	Y	Y	Y	Y	Ministry of Health
Latvia	C	Medicines Agency	Sales	100	Y	Y	Y	Y	Eurostat
	H	Medicines Agency	Sales	100	Y	Y	Y	Y	Eurostat
Lithuania	C	Medicines Agency	Sales	100	Y	Y	Y	Y	Eurostat
	H	Medicines Agency	Sales	100	Y	Y	Y	Y	Eurostat
Luxembourg	C	Health insurance company	Reimbursement	100	Y	Y	Y	Y	Other
	H	Health insurance company	Reimbursement	90	Y	Y	Y	Y	Other
Malta	C	Ministry of Health	Sales	100	Y	Y	Y	Y	Ministry of Health
	H	Ministry of Health	Sales	100	Y	Y	Y	Y	Ministry of Health
Netherlands	C	Community pharmacists	Sales	92	Y	Y	Y	Y	Other
	H	Hospital network	Sales	78	Y	N	N	N	National Statistics Agency
Norway	C	Other	Sales/reimbursement	100	Y	Y	Y	Y	National Statistics Agency
	H	Hospital network	Sales/reimbursement	100	Y	Y	Y	Y	Other
Poland	C	Market research company	Sales	100	Y	Y	Y	Y	Eurostat
	H	Market research company	Sales	100	Y	Y	Y	Y	Eurostat
Portugal	C	Ministry of Health	Sales	100	Y	Y	Y	Y	National Statistics Agency
	H	Ministry of Health	Sales/reimbursement	80	Y	Y	Y	Y	National Statistics Agency
Romania	T	Market research company	Sales	100	Y	Y	N	Y	Eurostat
Slovakia	C	Medicines Agency	Sales	100	Y	Y	Y	N	Eurostat
	H	Medicines Agency	Sales	100	Y	Y	Y	N	Eurostat
Slovenia	C	Other	Sales/reimbursement	100	Y	Y	Y	Y	National Statistics Agency
	H	Hospital network	Sales/reimbursement	100	Y	Y	Y	Y	National Statistics Agency
Spain	C	Ministry of Health	Reimbursement	100	Y	N	N	N	National Statistics Agency
Sweden	C	Community pharmacists	Sales	100	Y	Y	Y	Y	National Statistics Agency
	H	Other	Sales	100	Y	Y	Y	Y	National Statistics Agency
United Kingdom	C	Other	Reimbursement	100	Y	N	N	N	Eurostat
	H	Other	Sales/reimbursement	100	Y	N	N	N	Eurostat

** Oral and rectal nitroimidazole derivates as antiprotozoals (ATC subgroup P01AB), oral vancomycin as intestinal anti-infective (ATC chemical substance A07AA09) are additionally reported.*

C: community; H: hospital sector; T: total care (i.e. community and hospital sector combined); Y: yes; N: no.

3. Consumption of antimicrobials for systemic use in the community

This chapter covers data on consumption of antibacterials and of antimycotics and antifungals for systemic use in the community (i.e. outside hospitals).

3.1 Consumption of antibacterials for systemic use (ATC group J01)

3.1.1 Defined daily doses and number of packages per 1 000 inhabitants per day

DDD per 1 000 inhabitants per day, 2014

All 30 countries participating in ESAC-Net reported data on consumption of antibacterials for systemic use (ATC group J01) in the community for 2014. As in previous years, there were large inter-country variations in consumption. These variations were observed both for the total consumption of antibacterials for systemic use (ATC group J01) and for all subgroups of antibacterials for systemic use - i.e. at ATC group level 3.
Results for Cyprus and Romania, which reported total care data in 2014, are shown jointly with the consumption data for the community (primary care sector).

The population-weighted EU/EEA mean consumption of antibacterials for systemic use (ATC group J01) in the community was 21.9 DDD per 1 000 inhabitants per day, ranging from 10.6 DDD per 1 000 inhabitants per day (the Netherlands) to 35.1 DDD per 1 000 inhabitants per day (Greece).

Figure 3.2 shows a north–south gradient with the lowest consumption (<20 DDD per 1 000 inhabitants per day) in the north of Europe - e.g. Scandinavian and Baltic countries, and the highest consumption (≥20 DDD per 1 000 inhabitants per day) in the south of Europe - e.g. Greece and Romania.

Consumption of seven major subgroups of antibacterials for systemic use (ATC group J01) in the community in 2014 is presented in Table 3.1 and in Figure 3.1. Corresponding figures for 2013 are presented in Annex 4. Detailed results for the subgroups are presented in Chapters 3.1.2–3.1.9.

In 2014, 13 antibacterial agents accounted for more than 50% of the consumption of antibacterials for systemic use (ATC group J01) in the community: doxycycline (J01AA02), lymecycline (J01AA04), amoxicillin (J01CA04), pivmecillinam (J01CA08), phenoxymethylpenicillin (J01CE02), flucloxacillin (J01CF05), amoxicillin and enzyme inhibitor (J01CR02), cephalexin (J01DB01), cefuroxime (J01DC02), clarithromycin (J01FA09), azithromycin (J01FA10), nitrofurantoin (J01XE01) and methenamine (J01XX05). Of these agents, five are penicillins (ATC group J01C). In 22 (73%) of the 30 EU/EEA countries, three or fewer different agents were responsible for more than 50% of the consumption of antibacterials for systemic use (ATC group J01). Amoxicillin, alone (ATC code J01CA04) or in combination with an enzyme inhibitor (J01CR02), was the antibacterial agent most often consumed in these 22 countries, with the exception of Iceland and Norway where the most consumed agent was doxycycline (J01AA02) and methenamine (J01XX05), respectively.

Table 3.1 Consumption of antibacterials for systemic use (ATC group J01) at ATC group level 3 in the community, EU/EEA countries, 2014, expressed as DDD per 1 000 inhabitants per day

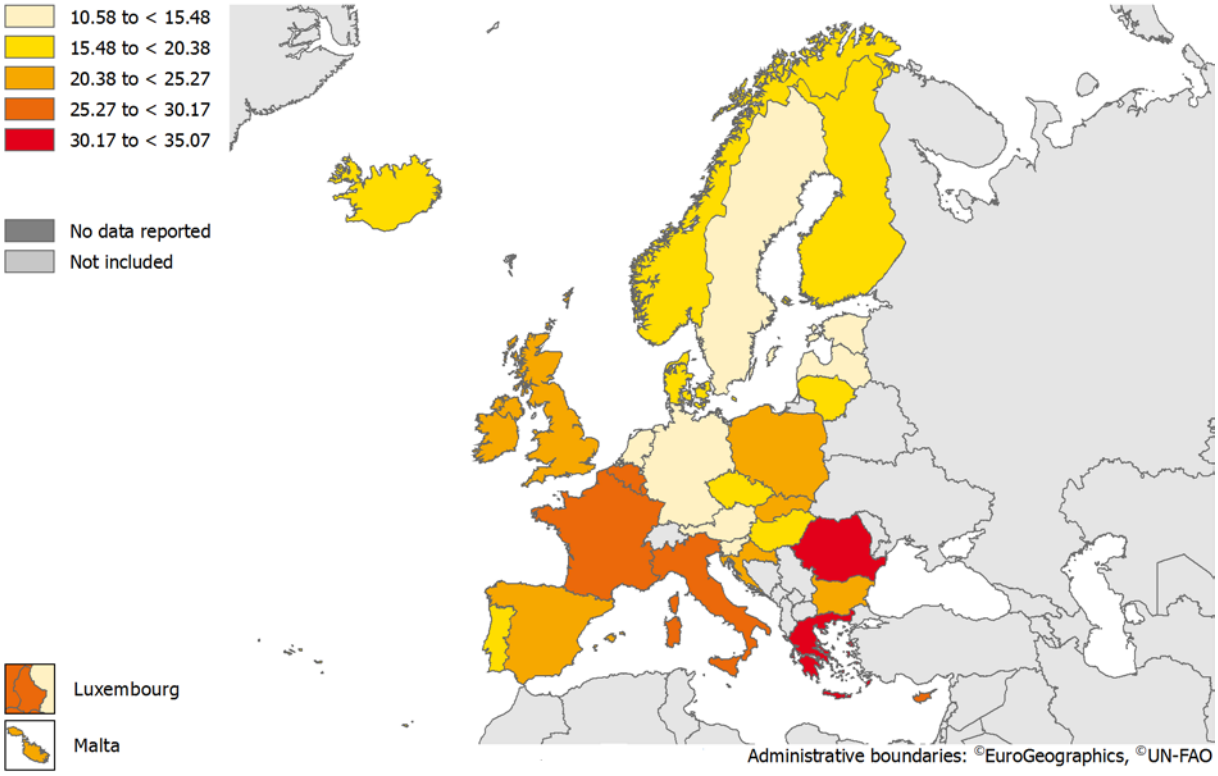
Country	Tetra-cyclines (J01A)	Beta-lactams, penicillins (J01C)	Other beta-lactam antibac-terials (J01D)	Sulfonamides and trimethoprim (J01E)	Macrolides, lincosamides and strepto-gramins (J01F)	Quino-lones (J01M)	Other antibac -terials (J01X)	Sum (J01B, J01G, and J01R)*	Total (ATC group J01)
Austria	1.1	6.5	1.5	0.2	3.0	1.3	0.3	<0.1	13.9
Belgium	2.1	16.0	1.4	0.2	3.4	2.5	2.8	<0.1	28.4
Bulgaria	1.8	8.3	3.4	0.8	3.9	2.9	<0.1	0.2	21.2
Croatia	1.1	11.6	2.8	0.7	2.9	1.5	0.8	0.1	21.4
Cyprus (a)	3.3	11.7	4.5	0.3	2.5	3.3	0.6	0.1	26.1
Czech Republic	2.0	8.1	2.0	0.8	3.8	0.9	1.5	0.1	19.3
Denmark	1.7	10.5	<0.1	0.8	1.8	0.5	0.7	<0.1	15.9
Estonia	1.5	4.6	1.1	0.4	2.4	0.9	0.8	<0.1	11.7
Finland	4.1	6.4	2.2	1.3	1.2	0.8	2.0	<0.1	18.1
France	3.2	18.0	2.1	0.5	3.0	1.7	0.4	<0.1	29.0
Germany	2.1	4.6	3.0	0.5	2.5	1.3	0.5	<0.1	14.6
Greece	2.4	13.9	7.3	0.3	7.9	2.6	0.7	0.1	35.1
Hungary	1.2	6.8	1.9	0.5	3.1	2.4	0.3	<0.1	16.2
Iceland	4.4	10.5	0.5	0.7	1.6	0.9	0.9	0	19.3
Ireland	2.7	13.2	1.1	1.0	4.2	0.8	0.1	<0.1	23.1
Italy	0.6	15.7	2.3	0.3	4.7	3.4	0.7	0.1	27.8
Latvia	2.2	6.1	0.5	0.8	1.6	1.1	0.3	<0.1	12.6
Lithuania	1.4	9.0	1.1	0.4	1.9	0.9	1.4	<0.1	16.0
Luxembourg	1.7	12.9	3.4	0.3	3.7	2.6	1.3	<0.1	25.8
Malta	1.2	9.7	4.6	0.3	3.8	3.1	0.5	0.7	23.7
Netherlands	2.2	4.2	0.0	0.4	1.4	0.8	1.5	<0.1	10.6
Norway	3.1	6.5	0.1	0.7	1.5	0.5	3.6	<0.1	15.9
Poland	2.4	8.9	2.4	0.5	3.8	1.2	3.5	<0.1	22.8
Portugal	0.8	11.6	1.4	0.4	2.8	2.1	1.1	<0.1	20.3
Romania (a)	1.1	16.6	5.3	0.9	2.9	3.7	0.2	0.4	31.2
Slovakia	1.7	8.1	4.4	0.4	5.6	0.7	0.1	<0.1	20.9
Slovenia	0.5	9.5	0.3	0.8	1.8	1.1	0.3	<0.1	14.2
Spain (b)	0.8	14.0	1.6	0.3	2.0	2.3	0.5	0.1	21.6
Sweden	2.7	6.9	0.1	0.4	0.6	0.7	1.6	<0.1	13.0
United Kingdom	5.0	9.2	0.3	1.5	3.2	0.5	1.0	<0.1	20.8
EU/EEA	**2.3**	**11.0**	**2.1**	**0.6**	**3.1**	**1.7**	**1.0**	**0.1**	**21.9**

(a) Cyprus and Romania provided total care data - i.e. including the hospital sector.

(b) Spain provided reimbursement data - i.e. not including consumption without a prescription and other non-reimbursed courses.

**J01B: amphenicols; J01G: aminoglycoside antibacterials; J01R: combinations of antibacterials.*

Figure 3.1 Consumption of antibacterials for systemic use (ATC group J01) in the community, EU/EEA countries, 2014, expressed as DDD per 1 000 inhabitants per day

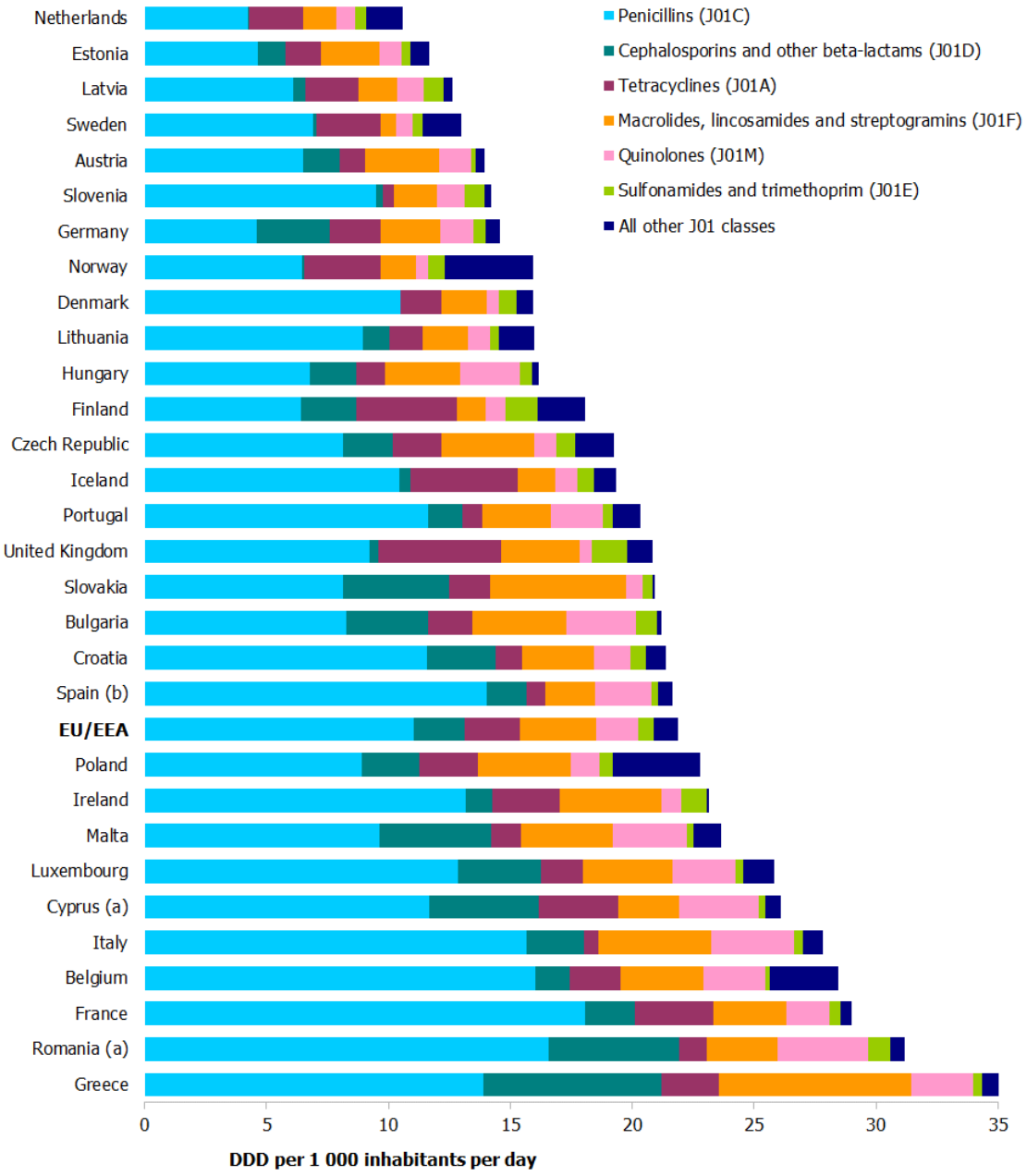


Cyprus and Romania provided total care data - i.e. including the hospital sector.

Spain provided reimbursement data - i.e. not including consumption without a prescription and other non-reimbursed courses.

For more information on the map scales, see Chapter 2.3.

Figure 3.2 Consumption of antibacterials for systemic use (ATC group J01) at ATC group level 3 in the community, EU/EEA countries, 2014, expressed as DDD per 1 000 inhabitants per day



(a) Cyprus and Romania provided total care data - i.e. including the hospital sector.

(b) Spain provided reimbursement data - i.e. not including consumption without a prescription and other non-reimbursed courses.

EU/EEA refers to the corresponding population-weighted mean consumption.

Consumption of amphenicols (ATC group J01B), aminoglycosides (ATC group J01G) and combinations of antibacterials (ATC group J01R) are presented together in Table 3.1, but are included with other antibacterials (ATC group J0X) as 'other J01 classes' in Figure 3.1. In 2014, consumption of these three ATC groups (J01B, J01G and J01R) in the community varied from 0.001 DDD per 1 000 inhabitants per day (Portugal) to 0.7 DDD per 1 000 inhabitants per day (Malta). Iceland did not report any consumption of this group.

Number of packages per 1 000 inhabitants per day, 2014

In 2014, 21 countries reported data on the number of consumed packages of antibacterials for oral use (Table 3.2. and Figure 3.3). On average, three packages of antibacterials for systemic use (ATC group J01) were consumed per 1 000 inhabitants per day in EU/EEA countries in 2014. The total consumption of antibacterials for systemic use (ATC group J01, oral administration) in the community ranged from 1.0 package per 1 000 inhabitants per day (Sweden) to 4.6 packages per 1 000 inhabitants per day (France).

When considering major ATC groups, average consumption ranged from 0.07 packages per 1 000 inhabitants per day for sulfonamides and trimethoprim (ATC group J01E) to 1.4 packages per 1 000 inhabitants per day for penicillins (ATC group J01C).

Compared with the ranking of antimicrobial consumption expressed as DDD per 1 000 inhabitants, no country retained the same ranking when the results were expressed as packages per 1 000 inhabitants per day (Table 3.2). When consumption was expressed in packages instead of DDD a few countries showed an increase (Bulgaria) or decrease (Belgium, Denmark, Iceland, Lithuania, Portugal and Spain) of their ranking position by more than three places.

Table 3.2 Consumption of packages of antibacterials for systemic use (ATC group J01, oral administration) in the community, EU/EEA countries, 2014, expressed as packages per 1 000 inhabitants per day

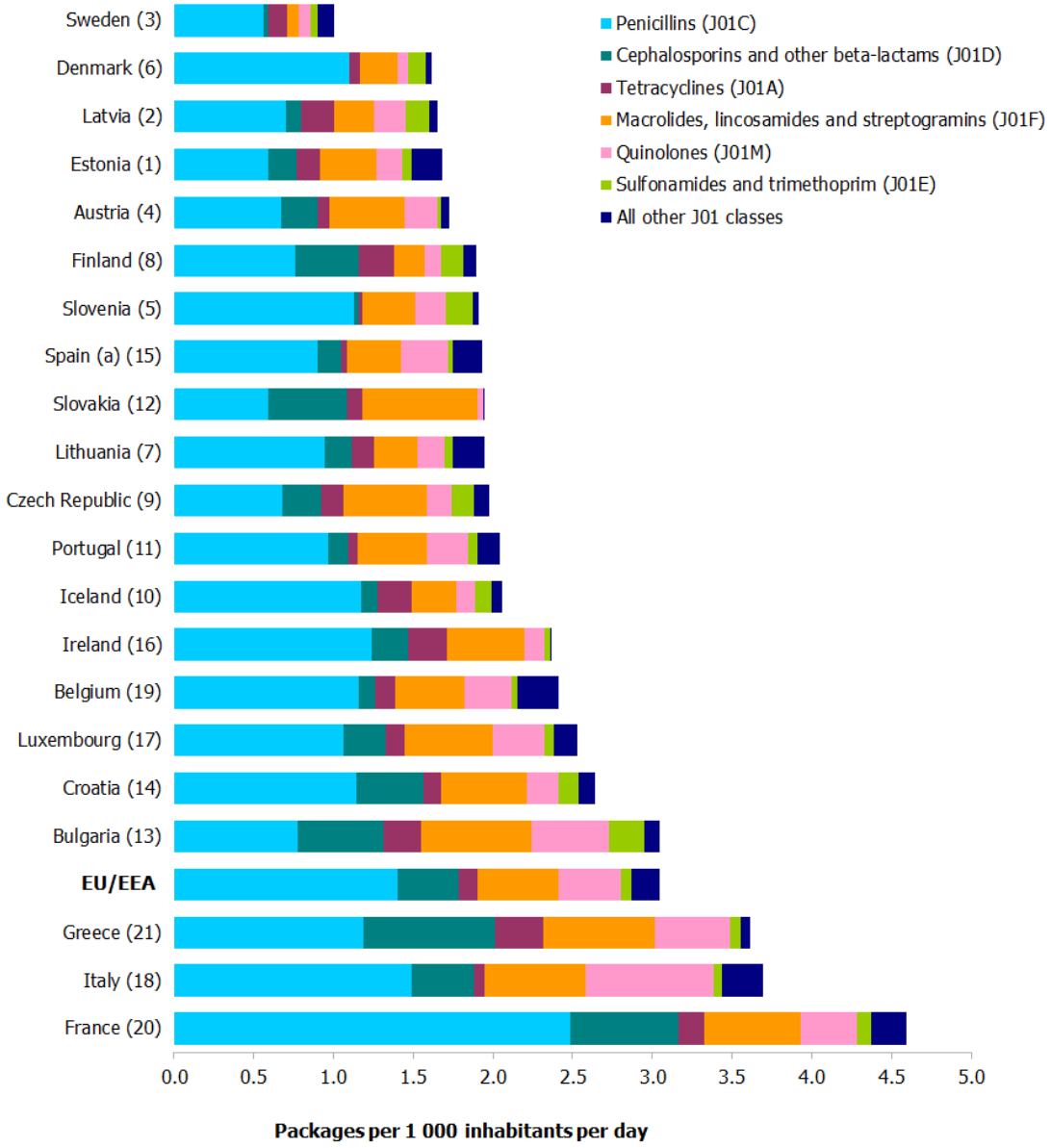
Country	Tetra-cyclines (J01A)	Beta-lactams, penicillins (J01C)	Other beta-lactam antibacterials (J01D)	Sulfonamides and trimethoprim (J01E)	Macrolides, lincosamides and strepto-gramins (J01F)	Quino-lones (J01M)	Other antibacterials (J01X)	Sum (J01B, J01G, and J01R)*	Total (ATC group J01)
Austria	0.07	0.67	0.23	0.02	0.47	0.20	0.05	0	1.73
Belgium	0.13	1.16	0.10	0.04	0.43	0.29	0.26	0	2.41
Bulgaria	0.23	0.78	0.54	0.22	0.70	0.49	0.00	0	3.04
Croatia	0.11	1.15	0.42	0.12	0.54	0.20	0.10	0	2.64
Czech Republic	0.14	0.68	0.24	0.14	0.52	0.16	0.10	0	1.98
Denmark	0.07	1.10	0.00	0.11	0.24	0.06	0.04	0	1.62
Estonia	0.15	0.59	0.18	0.06	0.35	0.16	0.19	0	1.68
Finland	0.22	0.76	0.40	0.14	0.19	0.10	0.08	0	1.89
France	0.16	2.48	0.68	0.09	0.61	0.35	0.22	<0.01	4.59
Greece	0.30	1.19	0.82	0.07	0.70	0.47	0.06	<0.01	3.61
Iceland	0.22	1.18	0.10	0.11	0.28	0.11	0.07	0	2.06
Ireland	0.24	1.24	0.23	0.04	0.49	0.13	0.00	<0.01	2.36
Italy	0.07	1.49	0.39	0.05	0.63	0.80	0.26	<0.01	3.70
Latvia	0.20	0.70	0.10	0.14	0.26	0.20	0.05	0	1.65
Lithuania	0.14	0.94	0.17	0.05	0.28	0.17	0.19	<0.01	1.95
Luxembourg	0.12	1.07	0.27	0.06	0.55	0.32	0.15	0	2.53
Portugal	0.05	0.96	0.13	0.06	0.44	0.26	0.13	0	2.04
Slovakia	0.09	0.59	0.50	0.00	0.73	0.04	0.00	0	1.94
Slovenia	0.02	1.13	0.03	0.17	0.33	0.19	0.04	0	1.91
Spain (a)	0.04	0.91	0.14	0.03	0.34	0.30	0.17	0.01	1.93
Sweden	0.12	0.56	0.03	0.04	0.08	0.08	0.10	0	1.00
EU/EEA	**0.12**	**1.41**	**0.38**	**0.07**	**0.51**	**0.39**	**0.17**	**0.01**	**3.05**

(a) Spain provided reimbursement data - i.e. not including consumption without a prescription and other non-reimbursed courses.

EU/EEA refers to the corresponding population-weighted mean consumption based on the 21 countries that provided data.

**J01B: amphenicols; J01G: aminoglycoside antibacterials; J01R: combinations of antibacterials*

Figure 3.3 Consumption of packages of antibacterials for systemic use (ATC group J01, oral administration) in the community in EU/EEA countries, 2014, at group level 3, expressed as packages per 1 000 inhabitants per day



(a) Spain provided reimbursement data - i.e. not including consumption without a prescription and other non-reimbursed courses.

The numbers in parentheses indicate the ranking of each of these 21 countries when community consumption of antibacterials for systemic use (ATC group J01) is expressed as DDD per 1 000 inhabitants per day (see Figure 3.1).

EU/EEA refers to the corresponding population-weighted mean consumption based on the 21 countries that provided data.

Trends: DDD per 1 000 inhabitants per day, 2010–2014

Trends in the community consumption of antibacterials for systemic use (ATC group J01) expressed in DDD per 1 000 inhabitants per day for the period 2010–2014 are presented in Table 3.3 (see also Chapter 2.3 for trend analyses).

The EU/EEA population-weighted mean consumption of antibacterials for systemic use did not show any statistically significant change between 2010 and 2014. A statistically significant increasing trend in the consumption of antibacterials for systemic use (ATC group J01) during 2010–2014 was observed for only one country (United Kingdom). Two countries (Sweden and Cyprus) showed a statistically significant decreasing trend in the consumption of antibacterials for systemic use (ATC group J01) during this period.

Table 3.3 Trends in consumption of antibacterials for systemic use (ATC group J01) in the community, EU/EEA countries, 2010–2014, expressed as DDD per 1 000 inhabitants per day

Country	2010	2011	2012	2013	2014	Trends in antimicrobial consumption, 2010–2014	Average annual change 2010–2014	Statistically significant trend
Netherlands	11.2	11.4	11.3	10.8	10.6		-0.18	
Estonia	11.1	12.2	11.7	11.7	11.7		0.07	
Latvia	11.8	12.8	13.0	13.5	12.6		0.23	
Sweden	14.2	14.3	14.1	13.0	13.0		-0.36	↓
Austria	15.0	14.5	14.0	16.3	13.9		-0.04	
Slovenia	14.4	14.4	14.3	14.5	14.2		-0.03	
Germany	14.1	13.9	14.8	15.7	14.6		0.28	
Norway	15.8	16.5	16.9	16.2	15.9		<0.01	
Denmark	16.5	17.4	16.4	16.4	15.9		-0.21	
Lithuania	17.7*	19.0*	16.2	18.5	16.0		N/A	
Hungary	15.9	16.2	15.1	15.6	16.2		-0.02	
Finland	18.5	20.1	19.5	18.3	18.1		-0.26	
Czech Republic	17.9	18.5	17.5	19.0	19.2		0.32	
Iceland	22.3*	22.3*	22.1*	21.9*	19.3		N/A	
Portugal	22.4	23.2	22.7	19.6*	20.3*		N/A	
United Kingdom	18.7	18.8	20.1	20.6	20.8		0.62	↑
Slovakia		23.8*	20.0	23.6	20.9		N/A	
Bulgaria	18.2	19.5	18.5	19.9	21.2		0.64	
Croatia	20.1	19.4	21.7	21.1	21.4		0.43	
Spain	20.3†	20.9†	19.7†	20.3†	21.6†		0.21	
EU/EEA	**20.7**	**21.5**	**21.7**	**22.3**	**21.9**		**0.30**	
Poland	19.0†	21.7†	22.9	23.6	22.8		N/A	
Ireland	20.3	22.6	23.0	23.8	23.1		0.68	
Malta	21.3	23.4	22.5	23.8	23.7		0.50	
Luxembourg	27.6	27.8	27.7	27.7	25.8		-0.36	
Cyprus	31.1*	32.0*	29.7*	28.3*	26.1*		-1.36	↓
Italy	27.9	28.2	27.6	28.6	27.8		0.03	
Belgium	28.4	29.0	29.8	29.7	28.4		0.06	
France	28.2	28.7	29.7	30.1	29.0		0.30	
Romania		30.9*	30.4*	31.6*	31.2*		N/A	
Greece	39.8*	35.7	32.5	32.2	35.1		N/A	

EU/EEA refers to the corresponding population-weighted mean consumption.

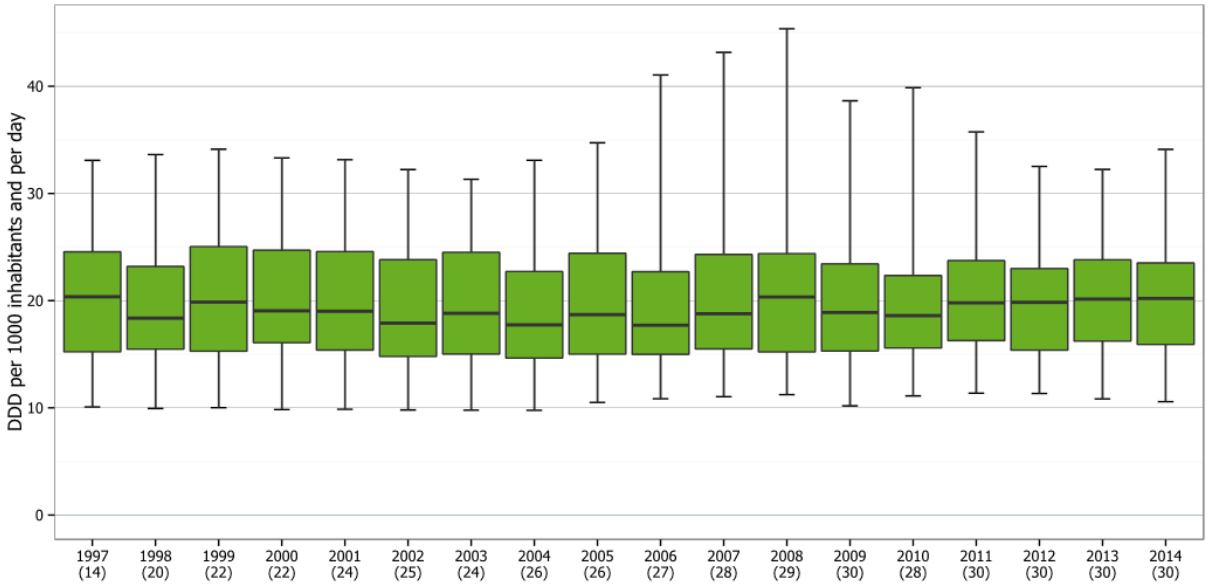
**Total care data, including the hospital sector.*
† Reimbursement data (i.e. not including consumption without a prescription and other non-reimbursed courses).

N/A = not applicable; linear regression was not applied due to missing data, changes in the type of data or changes of sector for which data were reported (community versus total care data) between 2010 and 2014.

The symbols ↑ and ↓ indicate statistically significant increasing and decreasing trends, respectively.

Overall trends in the annual EU/EEA median consumption for the EU/EEA countries that reported data to the ESAC project and ESAC-Net from 1997 onwards are shown in boxplots relating to the antibacterials for systemic use. Between 2013 and 2014 there was no statistically significant increase or decrease (Figure 3.4).

Figure 3.4. Trends and inter-country variations of antibacterials for systemic use (ATC group J01) in the community, EU/EEA countries, 1997–2014, expressed as DDD per 1 000 inhabitants per day



Boxes indicate the lower and upper quartiles. The bold lines indicate the medians. Whiskers indicate the minimum and maximum values. For 1997–2009, data are only included from ESAC countries that also participated in ESAC-Net in 2014. The number of participating countries is shown in parentheses.

Trends: number of packages per 1 000 inhabitants per day, 2010–2014

Trends in community antibiotic consumption expressed as packages per 1 000 inhabitants relating to antibacterials for systemic use are presented in Annex 3, Table A3. The EU/EEA population-weighted mean consumption did not show any statistically significant change during the period 2010–2014. A statistically significant decreasing trend was observed for Denmark, Luxembourg, Slovenia, Spain and Sweden during the same period. No country showed a statistically significant increasing trend.

Discussion

In 2014, the EU/EEA population-weighted mean consumption of antibacterials for systemic use (ATC group J01) was at the same level as in 2013 for both indicators and did not show any statistically significant change during the period 2010–2014. Prior to that, a general decrease had been observed during 1999–2004, followed by a gradual increase between 2004 and 2008 [11].

Short-term decreases or increases in the consumption of antibacterials for systemic use (ATC group J01) were reported in several EU/EEA countries. More information is provided by these countries in the comments section of the country overview sheets, available via the ESAC-Net interactive database on the ECDC website [5].

As in the last report, Lithuania and Slovakia were the countries with the largest decrease in consumption within the community. In 2012, this decrease was mainly due to the different type of data reported (total care versus community care). In 2014, the decrease could be explained by consumption returning to previous levels following an increase in 2013.

Antimicrobial consumption expressed in DDD per 1 000 inhabitants per day cannot be directly extrapolated to a number of prescriptions per patient and may therefore be insufficient to describe the antimicrobial prescription in EU/EEA countries.

The ESAC project had proposed that the number of consumed packages be used as a proxy for the number of prescriptions or treatments. A recent study in Belgium showed that for countries dispensing complete packages with an increasing size of packages (number of DDD per package) over time, antimicrobial consumption expressed as packages per 1 000 inhabitants per day may be a more appropriate measure to assess both trends in antibiotic prescribing and the impact of awareness campaigns [4].

Starting with the ESAC-Net report 2010, the number of DDD per package was analysed to validate packages as a proxy for prescription. The average number of DDD per package was calculated for the three main ATC groups under surveillance: antibacterials for systemic use (ATC group J01), antimycotics and antifungals for systemic use (ATC groups J02 & D01B) and antivirals for systemic use (ATC group J05) and stratified by routes of administration and healthcare sectors. It was concluded that, for the community, the number of packages of antibacterials for systemic use (ATC group J01, oral administration) may be an acceptable surrogate for prescriptions of these medicines.

The decreasing trend in community antibiotic consumption of antibacterials for systemic use expressed in packages per 1 000 inhabitants per day in a quarter of countries reporting data for this indicator (Annex 3, Table A3) probably reflects a decrease in antibiotic prescriptions between 2010 and 2014, although this should be confirmed with national data from other sources. A decrease in the number of packages not followed by a decrease in the number of DDDs could be explained by the fact that packages contain a greater number of DDDs. As the package sizes differ across countries and are mainly driven by the manufacturers' interests instead of scientific or clinical needs, this indicator should be used only as a supplementary indicator at the national level.

Antibacterials for systemic use (ATC group J01) are often used to treat acute infections. In 2014, an average 3.1 packages of antibacterials for systemic use (ATC group J01) per 1 000 inhabitants per day were consumed in the 21 countries that reported data on packages. Should further information become available on the average duration of treatments and the actual daily doses used, it would be possible to extrapolate the number of DDDs to a number of prescriptions and treatments.

3.1.2 Tetracyclines (ATC group J01A)

Results

In 2014, the EU/EEA population-weighted mean of tetracycline (ATC group J01A) consumption in the community was 2.3 DDD per 1 000 inhabitants per day (Tables 3.1, 3.4). It ranged from 0.5 DDD per 1 000 inhabitants per day (Slovenia) to 5.0 DDD per 1 000 inhabitants per day (the United Kingdom). Tetracycline consumption was generally lower in southern Europe than in northern and western Europe (Figure 3.5). Tetracycline consumption as a proportion of the total consumption of ATC group J01 ranged from less than 2.1% (Italy) to 24.4% (the United Kingdom).

In 2014, the most commonly consumed of all tetracyclines in the community was doxycycline which, on average, accounted for 74% of consumption in this group, followed by lymecycline, minocycline and tetracycline. A similar pattern has been observed since 2009.

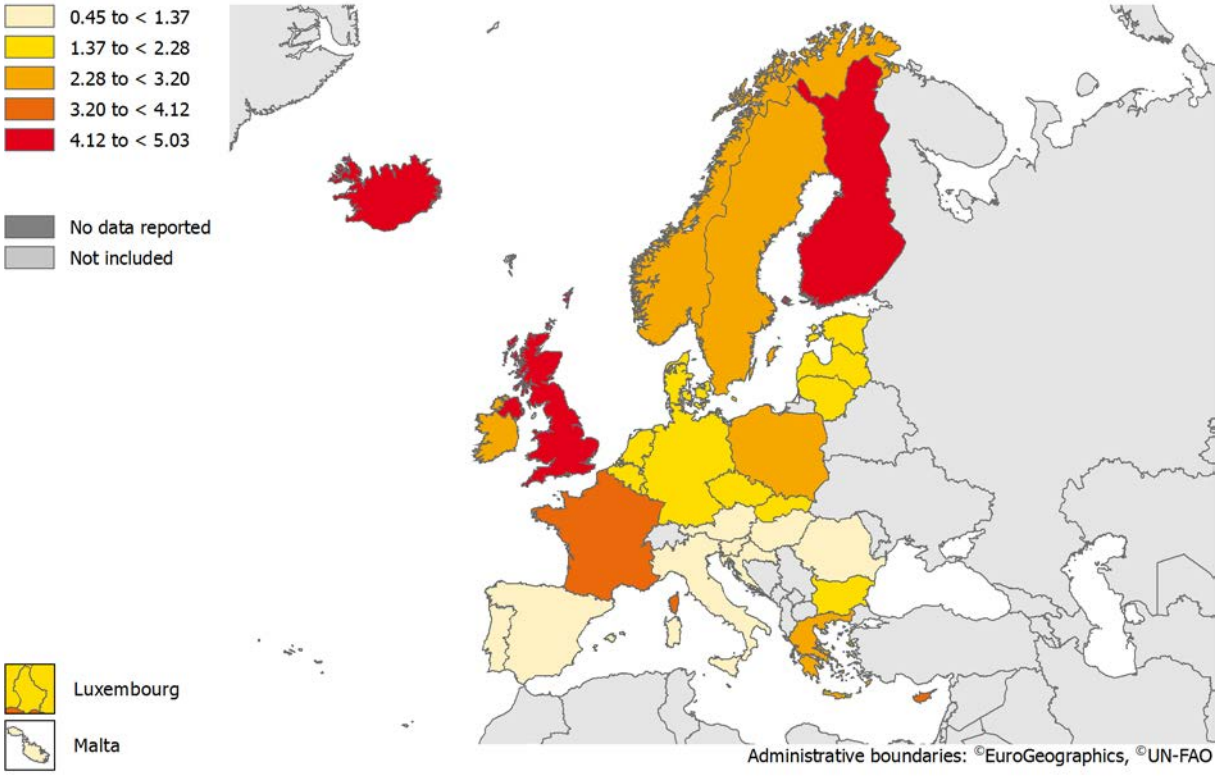
Doxycycline consumption accounted for more than 50% of the total consumption of tetracyclines in 2014 in all Member States except Belgium, Denmark, Sweden and the United Kingdom. However, some countries have shown a different pattern of tetracycline consumption since 2009. In 2014, lymecycline was the most frequently consumed tetracycline in Belgium, accounting for 43.3%, while consumption of doxycycline accounted for only 35.9%.

Trends

Trends in the consumption of tetracyclines (ATC J01A) in the community per country between 2010 and 2014 are shown in Table 3.4. A statistically significant increasing trend in the consumption of tetracyclines (ATC group J01A) was observed for the United Kingdom over the five-year period 2010–2014. Hungary, Luxembourg and the Netherlands showed a statistically significant decreasing trend in the consumption of tetracyclines (ATC group J01A) during the same period.

The trends and inter-country variation in the consumption of tetracyclines (ATC group J01A) within the community, shown in Figure 3.6, indicate a statistically significant decrease between 1997 and 2009. The EU/EEA population-weighted mean consumption of tetracyclines in the community has remained stable since 2009.

Figure 3.5 Consumption of tetracyclines (ATC group J01A) in the community, EU/EEA countries, 2014, expressed as DDD per 1 000 inhabitants per day



Cyprus and Romania provided total care data - i.e. including the hospital sector.

Spain provided reimbursement data - i.e. not including consumption without a prescription and other non-reimbursed courses.

For more information on the map scales, see Chapter2.3.

Table 3.4 Trends in consumption of tetracyclines (ATC group J01A) in the community, EU/EEA countries, 2010–2014, expressed as DDD per 1 000 inhabitants per day

Country	2010	2011	2012	2013	2014	Trends in antimicrobial consumption, 2010-2014	Average annual change 2010-2014	Statistically significant trend
Slovenia	<0.1	0.3	0.4	0.5	0.5		0.10	
Italy	0.5	0.5	0.5	0.6	0.6		0.01	
Spain	0.7†	0.7†	0.7†	0.7†	0.8†		0.02	
Portugal	0.7	1.0	1.1	0.8†	0.8†		N/A	
Austria	1.2	1.2	1.1	1.3	1.1		-0.02	
Croatia	1.2	1.4	1.2	1.2	1.1		-0.03	
Romania		1.3*	1.3*	1.2*	1.1*		N/A	
Hungary	1.4	1.3	1.2	1.2	1.2		-0.06	↓
Malta	1.0	1.1	1.7	1.0	1.2		0.03	
Lithuania	1.7*	1.6*	1.5	1.5	1.4		N/A	
Estonia	1.9	2.1	1.8	1.6	1.5		-0.14	
Denmark	1.7	1.7	1.8	2.0	1.7		0.01	
Slovakia		1.5*	1.4	1.6	1.7		N/A	
Luxembourg	2.0	2.0	1.9	1.9	1.7		-0.06	↓
Bulgaria	1.7	1.8	1.8	1.8	1.8		0.01	
Czech Republic	2.3	2.2	2.0	2.3	2.0		-0.04	
Germany	2.4	2.4	2.2	2.3	2.1		-0.06	
Belgium	2.1	2.1	2.1	2.2	2.1		0.01	
Latvia	2.4	2.5	2.5	2.4	2.2		-0.05	
Netherlands	2.7	2.6	2.5	2.3	2.2		-0.11	↓
EU/EEA	**2.2**	**2.2**	**2.3**	**2.3**	**2.3**		**0.02**	
Greece	2.3*	2.4	1.9	1.8	2.4		N/A	
Poland	2.1†	2.1†	2.4	2.5	2.4		N/A	
Sweden	3.3	3.5	3.4	2.8	2.7		-0.20	
Ireland	2.6	2.8	2.9	3.0	2.7		0.05	
Norway	2.8	3.1	3.4	3.2	3.1		0.08	
France	3.2	3.1	3.3	3.4	3.2		0.04	
Cyprus	3.3*	2.8*	3.1*	2.8*	3.3*		0.01	
Finland	4.1	4.7	4.7	4.3	4.1		-0.03	
Iceland	5.1*	4.9*	4.8*	4.7*	4.4		N/A	
United Kingdom	4.1	4.3	4.6	4.9	5.0		0.24	↑

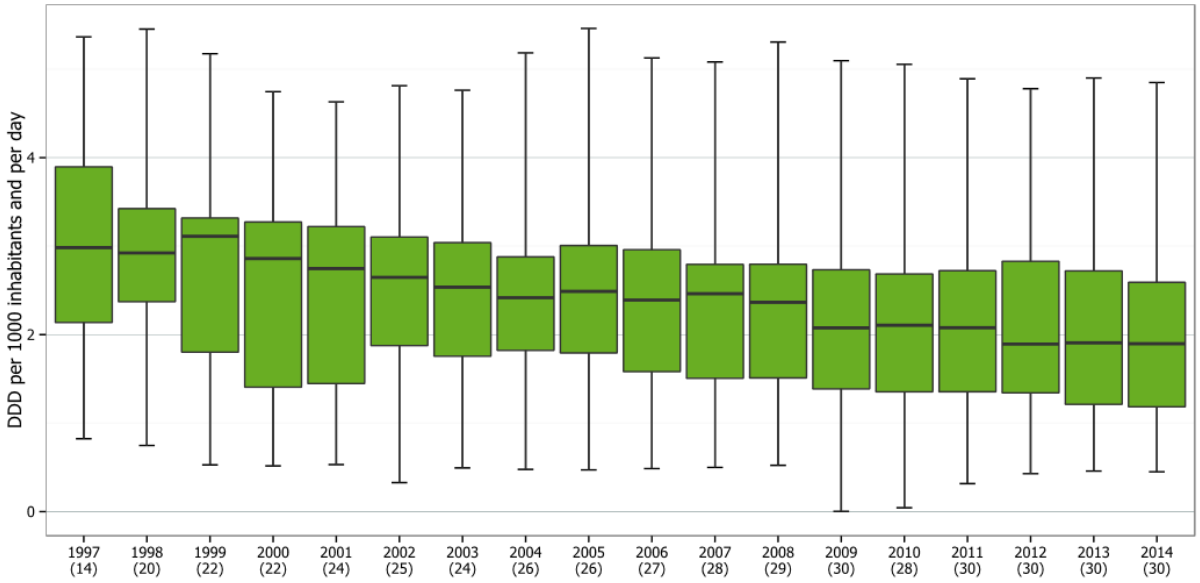
EU/EEA refers to the corresponding population-weighted mean consumption.

**Total care data, including the hospital sector.*
† Reimbursement data (i.e. not including consumption without a prescription and other non-reimbursed courses).

N/A = not applicable; linear regression was not applied due to missing data, changes in the type of data or changes of sector for which data were reported (community versus total care data) between 2010 and 2014.

The symbols ↑ and ↓ indicate statistically significant increasing and decreasing trends, respectively.

Figure 3.6 Trends and inter-country variations in consumption of tetracyclines (ATC group J01A) within the community, EU/EEA countries, 1997–2014, expressed as DDD per 1 000 inhabitants per day



Boxes indicate the lower and upper quartiles. The bold lines indicate the medians. Whiskers indicate the minimum and maximum values. For 1997–2009, data are only included from ESAC countries that also participated in ESAC-Net in 2014. The number of participating countries is shown in parentheses.

Discussion

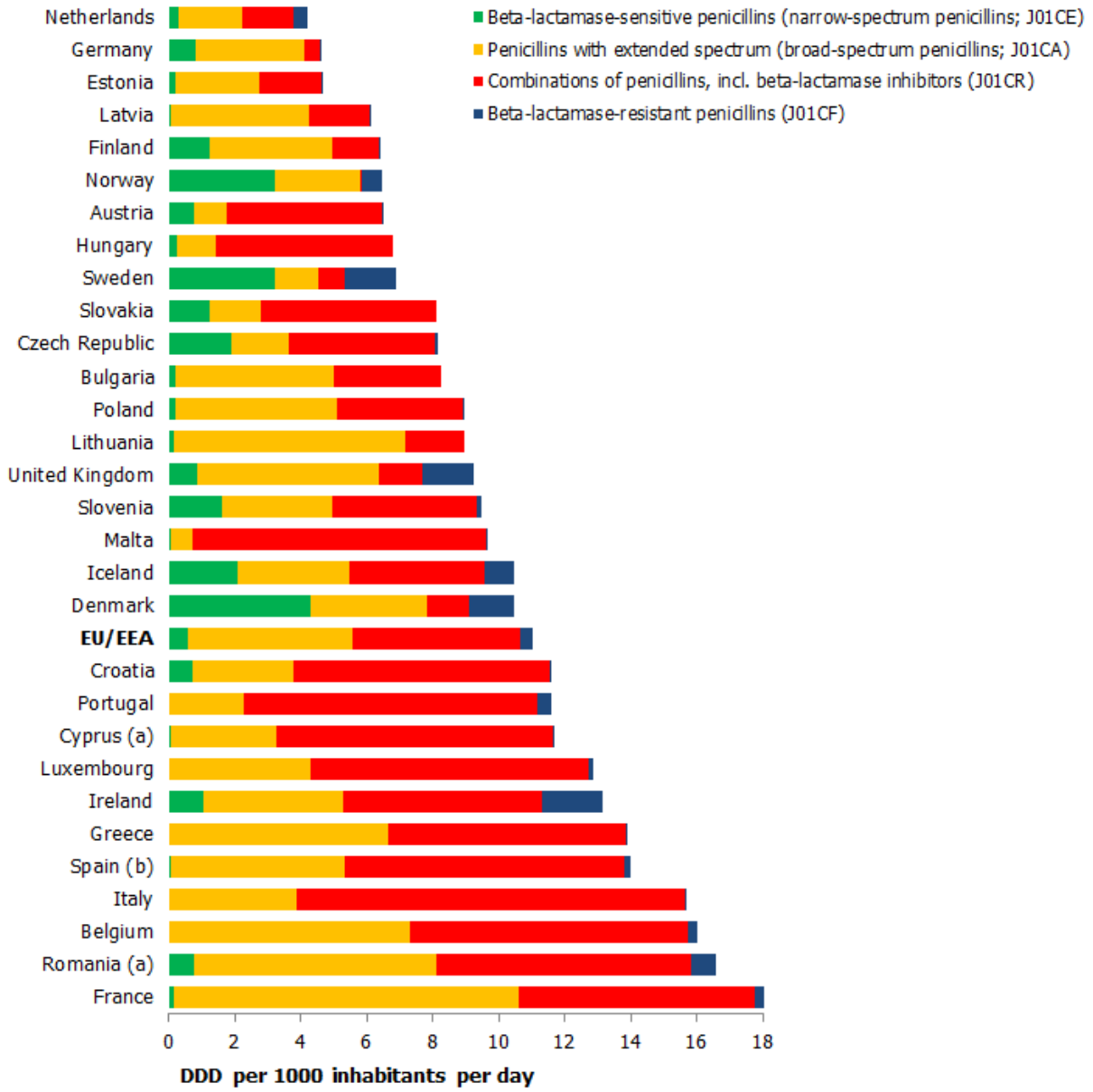
The ESAC project reported a statistically significant decrease in the consumption of tetracyclines (J01A) within the community during the period 1997–2009 [13]. However, the EU/EEA population-weighted mean consumption of tetracyclines in the reporting EU/EEA countries did not show any statistically significant increasing or decreasing trends during the subsequent period, 2010–2014, even though national figures for some countries (less than 15%) included in the analyses did show a statistically significant decrease in the consumption of tetracyclines (J01A) during those five years.

3.1.3 Beta-lactams, penicillins (ATC group J01C)

Results

Penicillins (ATC subgroup J01C) were the most commonly consumed antibacterial in the community in all EU/EEA countries. The EU/EEA population-weighted mean consumption was 11.0 DDD per 1 000 inhabitants per day among the countries reporting data for 2014. Country-specific consumption ranged from 4.2 DDD per 1 000 inhabitants per day (the Netherlands) to 18.0 DDD per 1 000 inhabitants per day (France) (Table 3.5, Figure 3.1). In 13 of 30 countries, penicillins contributed 50% or more of the total consumption of antibacterials for systemic use (ATC group J01) in the community, with Slovenia having the highest percentage (67% of the total antimicrobial consumption in the community) and Germany the lowest (32%).

Figure 3.7 Consumption of broad- and narrow-spectrum penicillins (ATC group J01C) in the community, EU/EEA countries, 2014, expressed as DDD per 1 000 inhabitants per day



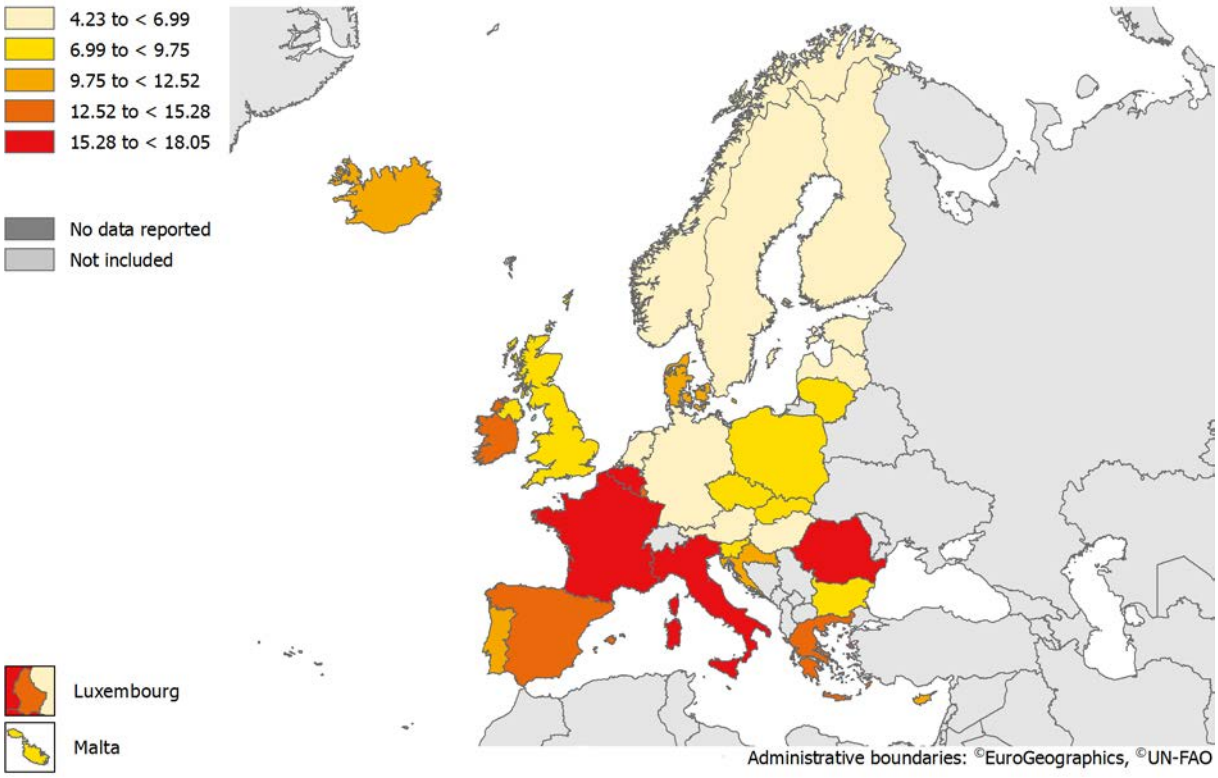
(a) Cyprus and Romania provided total care data - i.e. including the hospital sector.

(b) Spain provided reimbursement data - i.e. not including consumption without a prescription and other non-reimbursed courses.

EU/EEA refers to the corresponding population-weighted mean consumption.

As shown in Figure 3.7, the main subgroups of penicillins in most EU/EEA countries were penicillins with extended spectrum (ATC group J01CA) and combinations of penicillins, including beta-lactamase inhibitors (ATC group J01CR). The Nordic countries, Denmark Norway and Sweden, reported the highest consumption of penicillins for the group of beta-lactamase-sensitive penicillin (ATC group J01CE). In these three countries, the consumption of ATC group J01CE among all penicillins accounted for 41%, 50%, and 47%, respectively. In 2014, consumption of penicillins with extended spectrum (ATC group J01CA) ranged from 0.7 (Malta) to 10.4 (France) DDD per 1 000 inhabitants per day. Consumption of combinations of penicillins, including beta-lactamase inhibitors (ATC group J01CR) ranged from 0.009 DDD per 1 000 inhabitants per day (Norway) to 11.8 DDD per 1 000 inhabitants per day (Italy).

Figure 3.8 Consumption of beta-lactams, penicillins (ATC group J01C) in the community, EU/EEA countries, 2014, expressed as DDD per 1 000 inhabitants per day



Cyprus and Romania provided total care data - i.e. including the hospital sector.

Spain provided reimbursement data - i.e. not including consumption without a prescription and other non-reimbursed courses.

For more information on the map scales, see Chapter 2.3.

Consumption of amoxicillin (J01CA04, i.e. without enzyme inhibitor) ranged from 0.7 DDD per 1 000 inhabitants per day (Malta) to 10.4 DDD per 1 000 inhabitants per day (France). Consumption of amoxicillin with enzyme inhibitor (J01CR02) ranged from 0.008 (Norway) to 11.8 (Italy) DDD per 1 000 inhabitants per day.

Phenoxymethylpenicillin (J01CE02) was the most commonly consumed beta-lactamase-sensitive penicillin in 24 countries (except Croatia, Hungary, Italy, the Netherlands, Portugal and Slovenia). Consumption of phenoxymethylpenicillin in these countries accounted for more than 75% of the total consumption of beta-lactamase-sensitive penicillin. The total consumption of phenoxymethylpenicillin constituted 87% of the beta-lactamase-sensitive penicillin consumption in the 30 EU/EEA countries reporting data to ESAC-Net in 2014.

The proportion of combinations of penicillins, including beta-lactamase inhibitors (ATC group J01CR) among all beta-lactams, penicillins (ATC group J01C) ranged from 0.1% (Norway) to 93% (Malta).

In 2014, more than 50% of the consumption of antibacterials for systemic use (ATC group J01) in the community consisted of 13 different antibacterial agents. Of these agents, five were penicillins (ATC group J01C) (see Chapter 3.1.1).

Trends

The EU/EEA population-weighted mean consumption of beta-lactams, penicillins (ATC group J01C) did not show a statistically significant decreasing or increasing trend between 2010–2014 and remained at the same level between 2013 and 2014 (11.1 and 11.0 DDD per 1 000 inhabitants per day, respectively). Consumption showed a statistically significant increasing trend in three countries (Croatia, France and Ireland) and a statistically significant decreasing trend in one country (Cyprus) during 2010–2014 (Table 3.5).

The EU/EEA population-weighted mean consumption of penicillins with extended spectrum (ATC group J01CA) did not show any statistically significant change between 2010 and 2014.Three countries (France, Ireland and Norway) reported a statistically significant increase in the consumption of this group, whereas two countries (Cyprus and Sweden) reported a statistically significant decrease in the consumption of this group.

The EU/EEA population-weighted mean consumption did not show any statistically significant change in the consumption of beta-lactamase-sensitive penicillins (ATC group J01CE). Ireland and the United Kingdom reported a statistically significant increasing trend and twelve countries (Bulgaria, Croatia, Cyprus, Denmark, Estonia, Finland, Hungary, Italy, Luxembourg, the Netherlands, Norway and Sweden) reported a statistically significant decreasing trend in consumption for this group of penicillins.

The EU/EEA population-weighted mean consumption showed a statistically significant increasing trend ($p<0.02$, average annual change: 0.01 DDD per 1 000 inhabitants per day) in the consumption of beta-lactamase-resistant penicillins (ATC group J01CF). Seven countries reported a statistically significant increasing or decreasing trend Consumption increased in Croatia, Denmark, Finland, the Netherlands, Sweden and the United Kingdom, and decreased in France.

The EU/EEA population-weighted mean consumption of penicillin combinations including beta-lactamase inhibitors (ATC group J01CR) did not show any statistically significant decreasing or increasing trend between 2010–2014. Statistically significant increasing trends were observed in nine countries (Bulgaria, Croatia, Denmark, Estonia, Germany, Italy, Latvia, Norway and Slovenia). None of the participating countries reported a statistically significant decreasing trend.

The trend in the consumption of penicillins (ATC group J01C) within the community since 1997 is shown in the boxplot of Figure 3.9. The median consumption did not show any obvious trend since 2006. Most countries reported stable consumption in 2013 and 2014.

Table 3.5 Trends in consumption of beta-lactams, penicillins (ATC group J01C) in the community, EU/EEA countries, 2010–2014, expressed as DDD per 1 000 inhabitants per day

Country	2010	2011	2012	2013	2014	Trends in antimicrobial consumption, 2010-2014	Average annual change 2010-2014	Statistically significant trend
Netherlands	4.4	4.5	4.5	4.4	4.2		-0.03	
Germany	4.1	3.9	4.5	4.8	4.6		0.19	
Estonia	4.2	4.6	4.5	4.5	4.6		0.07	
Latvia	5.6	6.1	6.2	6.6	6.1		0.14	
Finland	6.6	6.6	6.5	6.2	6.4		-0.08	
Norway	6.8	6.8	6.8	6.6	6.5		-0.09	
Austria	6.7	6.5	6.3	7.4	6.5		0.05	
Hungary	6.8	7.1	6.7	6.8	6.8		-0.04	
Sweden	7.1	7.1	7.0	6.6	6.9		-0.09	
Slovakia		9.3*	7.9	9.0	8.1		N/A	
Czech Republic	7.6	8.1	7.0	8.1	8.1		0.11	
Bulgaria	8.0	8.4	7.8	8.5	8.3		0.05	
Poland	9.5†	11.8†	9.2	9.5	8.9		N/A	
Lithuania	9.7	10.4	9.1	10.6	9.0		N/A	
United Kingdom	8.6	8.7	9.3	9.2	9.2		0.17	
Slovenia	9.7	9.7	9.6	9.8	9.5		-0.02	
Malta	9.8	10.2	9.0	9.5	9.7		-0.10	
Iceland	12.1*	12.1*	12.0*	11.6*	10.5		N/A	
Denmark	10.3	10.9	10.3	10.6	10.5		0.01	
EU/EEA	**10.1**	**10.8**	**10.8**	**11.1**	**11.0**		**0.22**	
Croatia	9.5	9.6	11.2	11.3	11.6		0.57	↑
Portugal	12.1	12.3	12.4	11.1†	11.6†		N/A	
Cyprus	14.4*	15.4*	13.8*	12.9*	11.7*		-0.80	↓
Luxembourg	13.4	13.5	13.7	13.8	12.9		-0.08	
Ireland	10.7	12.2	12.5	13.1	13.2		0.59	↑
Greece	13.0*	12.4	12.9	12.6	13.9		N/A	
Spain	12.6†	13.1†	12.3†	12.8†	14.0†		0.25	
Italy	14.8	15.6	15.4	16.1	15.7		0.21	
Belgium	16.3	16.6	17.0	16.9	16.0		-0.02	
Romania		17.6*	17.2*	17.9*	16.6*		N/A	
France	15.6	16.5	17.4	18.4	18.0		0.67	↑

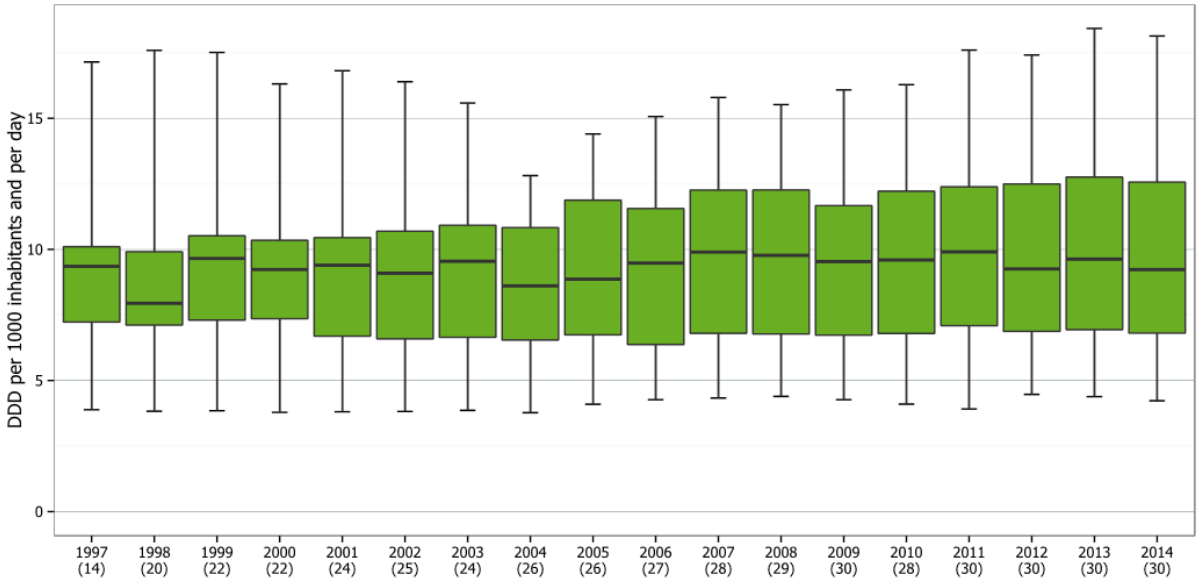
EU/EEA refers to the corresponding population-weighted mean consumption.

**Total care data, including the hospital sector.*
† Reimbursement data (i.e. not including consumption without a prescription and other non-reimbursed courses).

N/A = not applicable; linear regression was not applied due to missing data, changes in the type of data or changes of sector for which data were reported (community versus total care data) between 2010 and 2014.

The symbols ↑ and ↓ indicate statistically significant increasing and decreasing trends, respectively.

Figure 3.9 Trends and inter-country variations of consumption of beta-lactams, penicillins (ATC group J01C) in the community, EU/EEA countries, 1997-2014, expressed as DDD per 1 000 inhabitants per day



Boxes indicate the lower and upper quartiles. The bold lines indicate the medians. Whiskers indicate the minimum and maximum values. For 1997–2009, data are only included from ESAC countries that also participated in ESAC-Net in 2014. The number of participating countries is shown in parentheses.

Discussion

Penicillins (ATC group J01C) are the most frequently prescribed and consumed antibacterials for systemic use in the community. The percentage of total consumption of antibacterials for systemic use (ATC group J01) corresponding to penicillins (ATC group J01C) has been suggested as a quality indicator for consumption in the community (Table 3.16).

Phenoxymethylpenicillin (ATC J01CE02) is the most commonly consumed penicillin in Denmark, Norway and Sweden, where it is used as a first-line drug among the penicillins, whereas in other countries amoxicillin (J01CA04) and amoxicillin with enzyme inhibitor (J01CR02) are the most commonly consumed penicillins. In some countries, e.g. Portugal, phenoxymethylpenicillin is not consumed because it is not available.

During the period 2010–2014, half of the countries included in the national trend analyses showed a statistically significant increase in the consumption of broad-spectrum penicillins, either penicillins with extended spectrum (ATC group J01CA) or combinations of penicillins, including beta-lactamase inhibitors (ATC group J01CR). Meanwhile, the consumption of narrow-spectrum penicillins (as defined by the quality indicator of the ESAC project, see Chapter 3.3), and beta-lactamase-sensitive penicillins (ATC group J01CE) showed a statistically significant decreasing trend in more than half of the countries. Interestingly, the use of beta-lactamase-sensitive penicillins (ATC group J01CE) showed a statistically significant increasing trend in Italy and the United Kingdom.

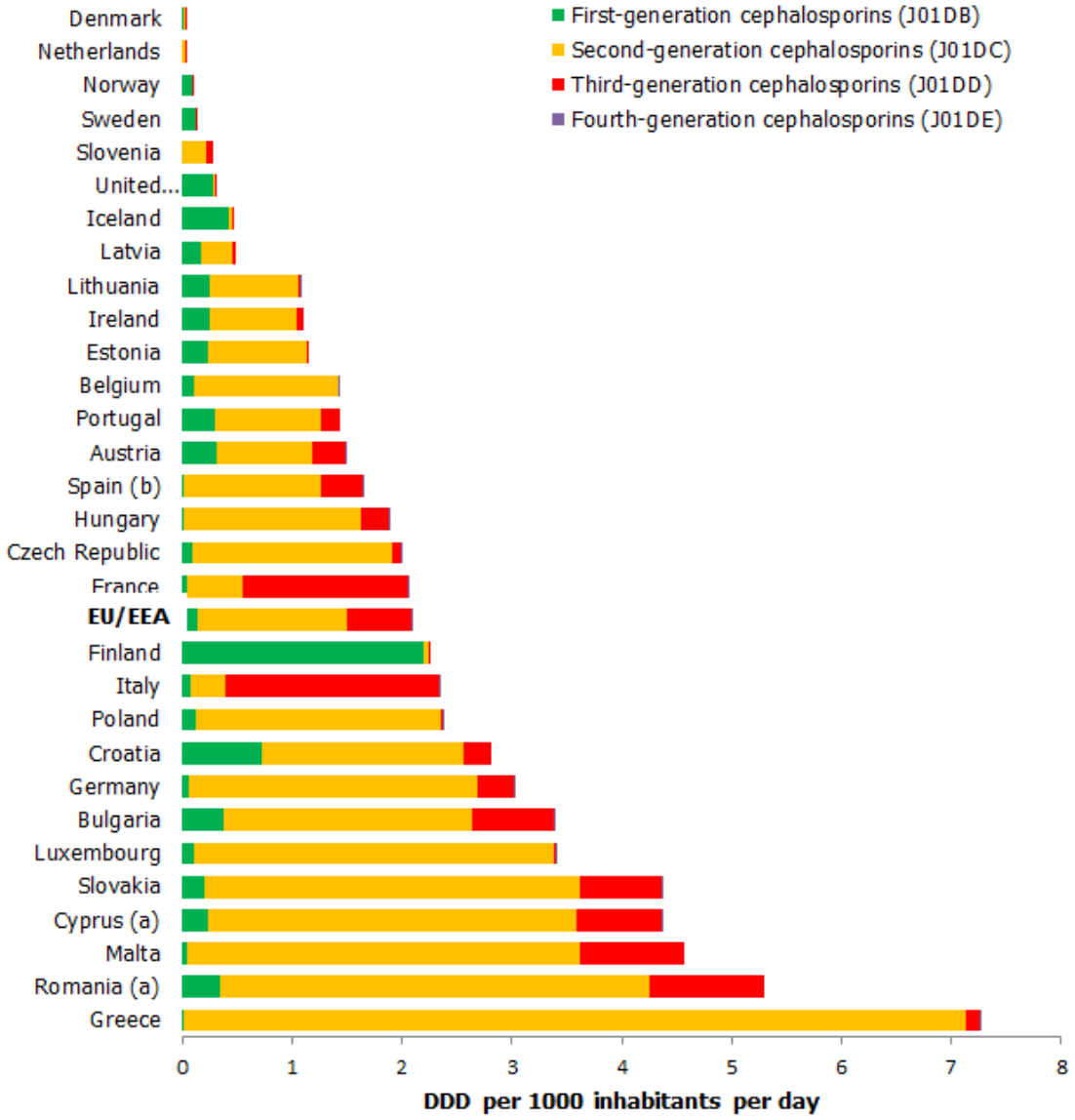
The ESAC project reported an overall statistically significant increase in the consumption of penicillins (ATC group J01C) during the period 1997–2009 [14]. However, as the consumption increased or remained stable in the majority of EU/EEA countries with larger populations, the trend of the population-weighted EU/EEA mean did not reveal any statistically significant change (Table 3.5).

3.1.4 Other beta-lactam antibacterials (ATC group J01D)

Results

As shown in Figure 3.1 and Table 3.6, the EU/EEA population-weighted mean consumption of other beta-lactam antibacterials (ATC group J01D), the group which includes cephalosporins, was 2.1 DDD per 1 000 inhabitants per day in 2014. Country-specific consumption ranged from 0.03 DDD per 1 000 inhabitants per day (Denmark) to 7.3 DDD per 1 000 inhabitants per day (Greece). All countries except Cyprus, Greece, Malta, Romania and Slovakia reported a consumption of less than 3.4 DDD per 1 000 inhabitants per day (Table 3.6, Figure 3.10). The proportion of cephalosporins consumed (ATC groups J01DB–DE) out of the total consumption of antibacterials for systemic use (ATC group J01) ranged from 0.2% (Denmark) to 20.9% (Slovakia). Only three countries (the Czech Republic, Romania and the United Kingdom) reported consumption of other cephalosporins and penems (ATC group J01DI) in 2014.

Figure 3.10 Consumption of first-, second-, third- and fourth-generation cephalosporins (ATC groups J01DB–DE) in the community, EU/EEA countries, 2014, expressed as DDD per 1 000 inhabitants per day



(a) Cyprus and Romania provided total care data - i.e. including the hospital sector.

(b) Spain provided reimbursement data - i.e. not including consumption without a prescription and other non-reimbursed courses.

EU/EEA refers to the corresponding population-weighted mean consumption.

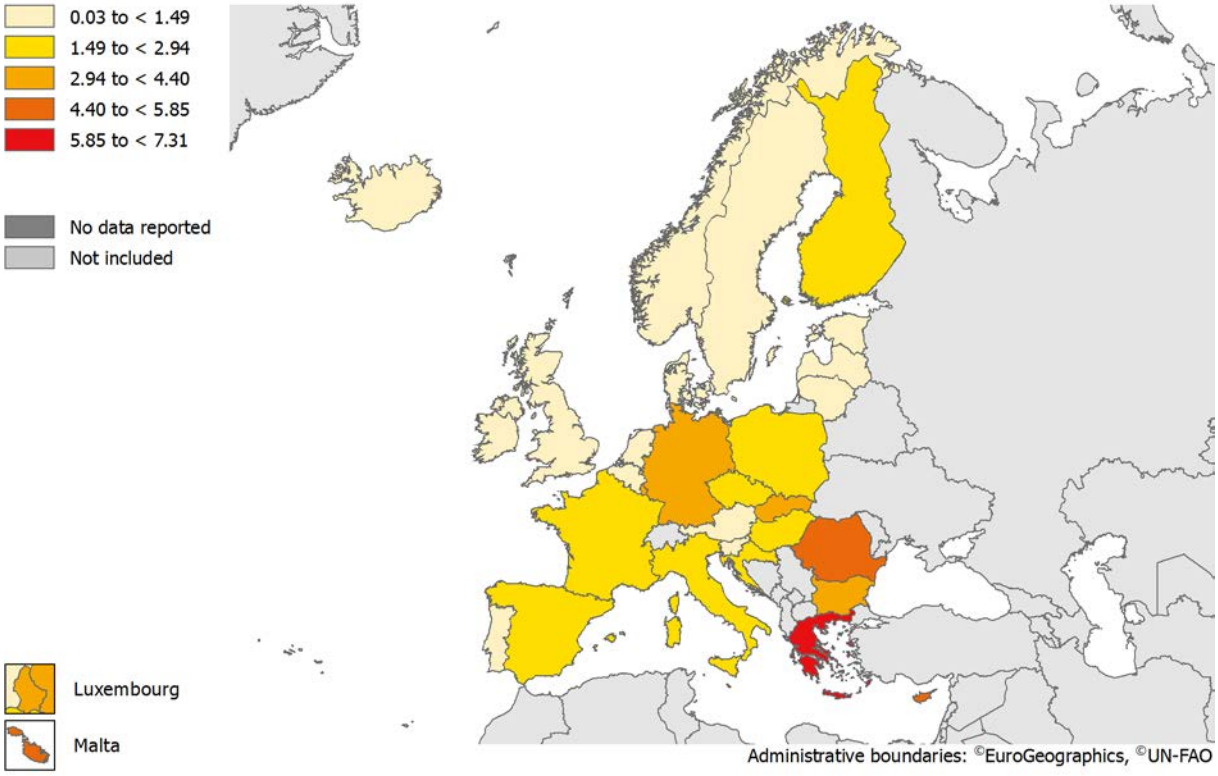
In 2014, the EU/EEA population-weighted mean proportion of first-generation cephalosporins (ATC group J01DB) among cephalosporins was 7.0% in the community. Consumption of first-generation cephalosporins ranged from 0.003 DDD per 1 000 inhabitants per day (the Netherlands) to 2.2 DDD per 1 000 inhabitants per day (Finland). One country (Slovenia) did not report any consumption for this subgroup (Figure 3.10).

As shown in Figure 3.10, second-generation cephalosporins (ATC group J01DC) were the most frequently consumed subgroup of cephalosporins. In 2014, consumption of second-generation cephalosporins ranged from <0.001 DDD per 1 000 inhabitants per day (Sweden) to 7.1 DDD per 1 000 inhabitants per day (Greece).

In 2014, the highest consumption of third-generation cephalosporins (ATC group J01DD) was reported as 1.5 DDD per 1 000 inhabitants per day in France and 1.9 DDD per 1 000 inhabitants per day in Italy. In these two countries, third-generation cephalosporins accounted for over two thirds of all cephalosporin consumption.

In 2014, consumption of fourth-generation cephalosporins (ATC group J01DE) was very low in EU/EEA countries. The highest consumption reported was 0.008 DDD per 1 000 inhabitants per day (Italy) and 15 countries did not report any consumption.

Figure 3.11 Consumption of other beta-lactam antibacterials (ATC group J01D) in the community, EU/EEA countries, 2014, expressed as DDD per 1 000 inhabitants per day



Cyprus, Iceland and Romania provided total care data - i.e. including the hospital sector.

Spain provided reimbursement data - i.e. not including consumption without a prescription and other non-reimbursed courses.

For more information on the map scales, see Chapter 2.3.

Table 3.6 Trends in consumption of other beta-lactam antibacterials (ATC group J01D) in the community, EU/EEA countries, 2010–2014, expressed as DDD per 1 000 inhabitants per day

Country	2010	2011	2012	2013	2014	Trends in antimicrobial consumption, 2010-2014	Average annual change 2010-2014	Statistically significant trend
Denmark	0.03	0.05	0.03	0.03	0.03		<0.01	
Netherlands	0.04	0.04	0.04	0.04	0.04		<0.01	
Norway	0.12	0.12	0.11	0.11	0.09		-0.01	↓
Sweden	0.20	0.18	0.18	0.16	0.15		-0.01	↓
Slovenia	0.40	0.33	0.30	0.30	0.28		-0.03	↓
United Kingdom	0.55	0.42	0.35	0.35	0.33		-0.05	↓
Iceland	0.6*	0.6*	0.70*	0.77*	0.46		N/A	
Latvia	0.57	0.50	0.47	0.52	0.48		-0.02	
Lithuania	1.1*	1.3*	0.92	1.22	1.07		N/A	
Ireland	1.21	1.21	1.24	1.36	1.11		<0.01	
Estonia	0.89	0.98	0.99	1.10	1.14		0.06	↑
Belgium	1.59	1.52	1.53	1.53	1.42		-0.03	
Portugal	1.81	1.65	1.55	1.43†	1.44†		N/A	
Austria	1.70	1.66	1.58	1.95	1.49		-0.01	
Spain	1.56†	1.53†	1.44†	1.57†	1.64†		0.02	
Hungary	1.95	1.94	1.78	1.82	1.87		-0.03	
Czech Republic	1.62	1.51	1.44	1.76	2.04		0.11	
France	2.67	2.55	2.39	2.25	2.06		-0.15	↓
EU/EEA	**2.07**	**2.11**	**2.01**	**2.17**	**2.09**		0.01	
Finland	2.33	2.36	2.30	2.28	2.25		-0.02	↓
Italy	2.60	2.53	2.37	2.48	2.35		-0.06	
Poland	2.45†	2.59†	2.20	2.50	2.37		N/A	
Croatia	3.45	2.87	3.53	2.99	2.81		-0.12	
Germany	2.61	2.72	2.82	3.22	3.01		0.13	
Bulgaria	2.37	2.59	2.44	2.80	3.38		0.22	
Luxembourg	4.04	3.80	3.62	3.80	3.39		-0.13	
Slovakia		3.89*	3.49	4.51	4.37		N/A	
Cyprus	5.41*	6.07*	5.37*	4.87*	4.49*		-0.30	
Malta	5.04	5.68	5.27	5.52	4.57		-0.11	
Romania		4.06*	4.36*	4.82*	5.33*		N/A	
Greece	9.01*	7.73	6.57	7.43	7.31		N/A	

EU/EEA refers to the corresponding population-weighted mean consumption.

**Total care data, including the hospital sector.*

† *Reimbursement data (i.e. not including consumption without a prescription and other non-reimbursed courses).*

N/A = not applicable; linear regression was not applied due to missing data, changes in the type of data or changes of sector for which data were reported (community versus total care data) between 2010 and 2014.

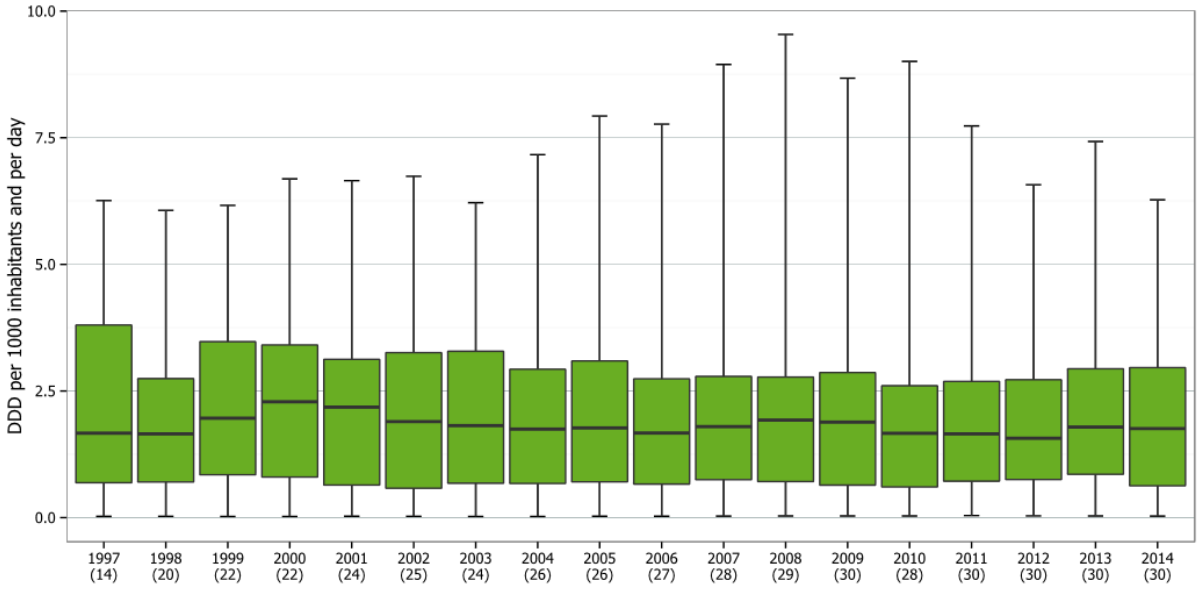
The symbols ↑ and ↓ indicate statistically significant increasing and decreasing trends, respectively.

Trends

Community consumption of other beta-lactam antibacterials (ATC group J01D) showed a statistically significant increasing trend in one country (Estonia) and statistically significant decreasing trends in six countries (Finland, France, Norway, Slovenia, Sweden and the United Kingdom) during the period 2010–2014 (Table 3.6).

For first-generation cephalosporins (ATC group J01DB), the EU/EEA population-weighted mean consumption showed a statistically significant decreasing trend during 2010–2014 (p=0.006, average annual change was -0.01). None of the countries showed a statistically significant increasing trend in consumption, and 13 countries (Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, France, Germany, Italy, Latvia, the Netherlands, Norway, Spain, and the United Kingdom) showed a statistically significant decreasing trend in consumption for this group.

Figure 3.12 Trends and inter-country variations of consumption of other beta-lactam antibacterials (ATC group J01D) in the community, EU/EEA countries, 1997–2014, expressed as DDD per 1 000 inhabitants per day



Boxes indicate the lower and upper quartiles. The bold lines indicate the medians. Whiskers indicate the minimum and maximum values. For 1997–2009, data are only included from ESAC countries that also participated in ESAC-Net in 2014. The number of participating countries is shown in parentheses.

The EU/EEA population-weighted mean consumption remained unchanged for ATC groups J01DC and J01DE whereas a statistically significant decreasing trend was observed for ATC group J01DD (p=0.028, average annual change was -0.02).

Four countries (Bulgaria, Estonia, Germany and Latvia) showed a statistically significant increasing trend in the consumption of second-generation cephalosporins (ATC group J01DC), whereas two countries (Finland and Italy) showed a statistically significant decreasing trend.

Three countries (Belgium, Bulgaria and Luxembourg) showed a statistically significant increasing trend in the consumption of third-generation cephalosporins (ATC group J01DD) and six countries (Croatia, France, Germany, Hungary, Slovenia, and Spain) showed a statistically significant decreasing trend.

Only France showed a statistically significant increasing trend in the consumption of fourth-generation cephalosporins (ATC group J01DE), however, the consumption reported for 2014 was very low: 0.001 DDD per 1 000 inhabitants per day. No country showed a statistically significant decreasing trend.

Four countries (Cyprus, France, the Netherlands and the United Kingdom) showed a low but statistically significant increasing trend in the consumption of carbapenems (ATC group J01DH) in the community, and one country (Ireland) showed a statistically significant decreasing trend.

The trend in the community consumption of other beta-lactam antibacterials (ATC group J01D) since 1997 is shown in Figure 3.12. The median consumption in 2014 was at a similar level to that for 2013.

Discussion

The ESAC project reported a statistically significant increase in the consumption of other beta-lactam antibacterials (ATC group J01D) between 1997 and 2009 [15]. However, for the period 2010–2014, the trend of the EU/EEA population-weighted mean consumption for that group did not show any statistically significant change (Table 3.6).

Consumption of other beta-lactam antibacterials (ATC J01D), as presented in this chapter, includes a mix of various beta-lactams, from narrow-spectrum first-generation cephalosporins and monobactams, to broader-spectrum cephalosporins, and finally carbapenems which are generally considered last-line antimicrobials.

During the period 2010–2014, the overall consumption of other beta-lactam antibacterials (ATC group J01D) decreased significantly in almost one quarter of the countries included in the trend analyses. This was mainly due to a decrease in the consumption of first- and second-generation cephalosporins (ATC groups J01DB and J01DC).

Carbapenems (ATC group J01DH) are last-line antibacterials that are only administered parenterally. Consumption in the community showed a statistically significant increase in nearly 15% of the countries during the period 2010–2014.

The percentage of total consumption of antibacterials for systemic use (ATC group J01) corresponding to third- plus fourth-generation cephalosporins (ATC groups J01DD & J01DE) has been suggested as a quality indicator for consumption in the community (Table 3.16). Results from the former ESAC project suggest that variations in the consumption of second- and third-generation cephalosporins between countries and over time could be an indication of inappropriate use [15].

3.1.5 Sulfonamides and trimethoprim (ATC group J01E)

Results

In 2014, the EU/EEA population-weighted mean consumption of sulfonamides and trimethoprim (ATC J01E) was 0.6 DDD per 1 000 inhabitants per day. Country-specific consumption ranged from 0.2 DDD per 1 000 inhabitants per day (Belgium) to 1.5 DDD per 1 000 inhabitants per day (the United Kingdom) (Tables 3.1 and 3.7). The proportion of sulfonamides and trimethoprim consumed out of the total consumption of antibacterials for systemic use (ATC group J01) ranged from 0.6% (Malta) to 7.3% (Finland).

In 2014, the most commonly consumed agents from ATC group J01E in the community were trimethoprim (J01EA01) alone and the combination of sulfamethoxazole and trimethoprim (J01EE01), which together made up 96% of consumption for this group. In the United Kingdom, more than three quarters of the consumption in this group was reported as trimethoprim (J01EA01) at 1.3 DDD per 1 000 inhabitants per day.

Trends

Temporal trends in the consumption of sulfonamides and trimethoprim (ATC group J01E) are presented in Table 3.7. For the period 2010–2014, the EU/EEA population-weighted mean showed no statistically significant trend. Among the countries reporting data for the period 2010–2014, community consumption showed a statistically significant decreasing trend in seven countries (Austria, Croatia, Germany, Hungary, Luxembourg, the Netherlands and Slovenia) (Table 3.7). The United Kingdom reported a statistically significant increasing trend in the consumption of this group.

During the period the trend of the EU/EEA population-weighted mean consumption did not show any statistically significant change in the consumption of combinations of sulfonamides and trimethoprim, including derivatives (ATC group J01EE). The same seven countries as above showed a statistically significant decreasing trend. Norway and the United Kingdom were the only countries showing a statistically significant increasing trend in the consumption of this group.

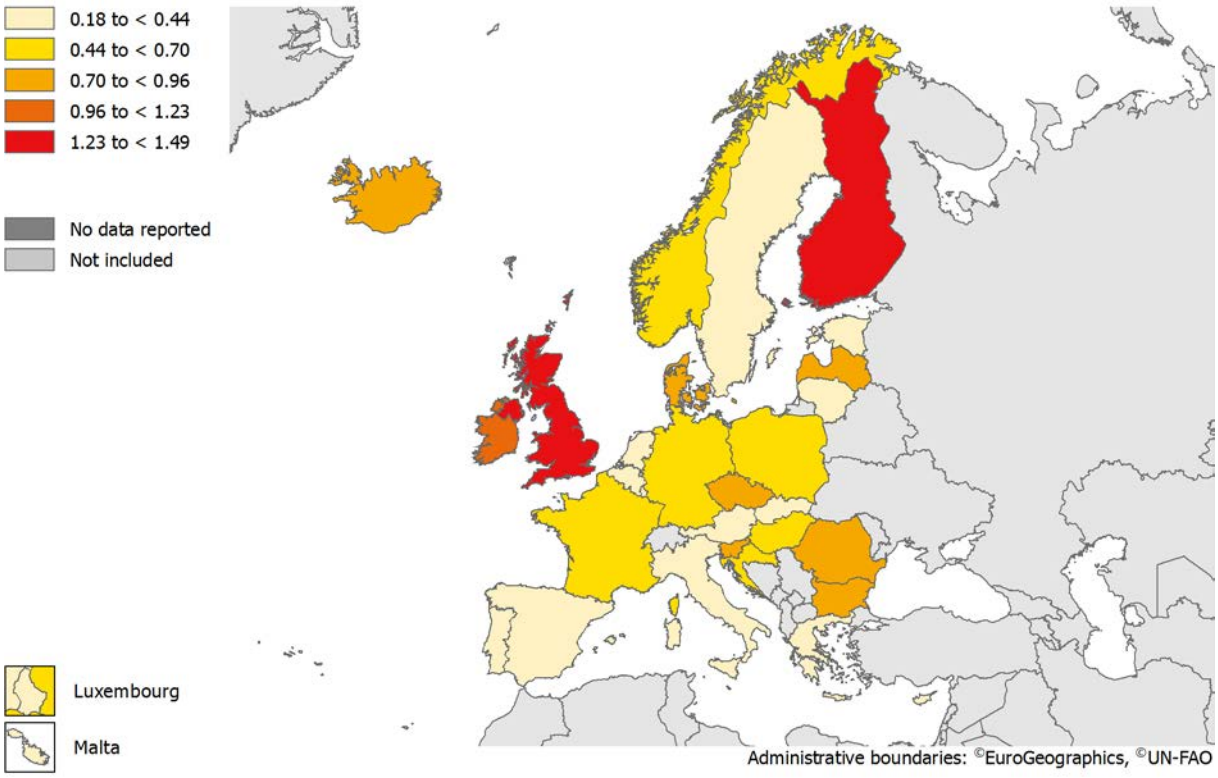
As shown in Figure 3.14, the median consumption of sulfonamides and trimethoprim (ATC group J01E) in EU/EEA countries has decreased from 0.80 DDD in 2004 to 0.49 DDD per 1 000 inhabitants per day in 2014.

Discussion

Consumption of sulfonamides and trimethoprim (ATC group J01E) is dominated by one substance – trimethoprim, used alone (ATC J01EA01) or in combination with sulfamethoxazole (ATC J01EE01).

The statistically significant decrease in the consumption of combinations of sulfonamides and trimethoprim, including derivatives (ATC group J01EE), within the community in a number of countries between 2010 and 2014 continued the decreasing trend observed by the ESAC project for the period 1997–2009.

Figure 3.13 Consumption of sulfonamides and trimethoprim (ATC group J01E) in the community, EU/EEA countries, 2014, expressed as DDD per 1 000 inhabitants per day



Cyprus and Romania provided total care data - i.e. including the hospital sector.

Spain provided reimbursement data - i.e. not including consumption without a prescription and other non-reimbursed courses.

For more information on the map scales, see Chapter 2.3.

Table 3.7 Trends in consumption of sulfonamides and trimethoprim (ATC group J01E) in the community, EU/EEA countries, 2010–2014, expressed as DDD per 1 000 inhabitants per day

Country	2010	2011	2012	2013	2014	Trends in antimicrobial consumption, 2010-2014	Average annual change 2010-2014	Statistically significant trend
Belgium	0.3	0.3	0.3	0.3	0.2		-0.02	
Austria	0.3	0.2	0.2	0.2	0.2		-0.01	↓
Malta	0.2	0.3	0.2	0.2	0.3		0.01	
Spain	0.3†	0.3†	0.3†	0.3†	0.3†		<0.01	
Cyprus	0.4*	0.3*	0.4*	0.3*	0.3*		-0.01	
Luxembourg	0.3	0.3	0.3	0.3	0.3		-0.01	↓
Greece	0.3*	0.3	0.3	0.3	0.3		N/A	
Italy	0.5	0.4	0.4	0.4	0.3		-0.02	
Lithuania	0.4*	0.4*	0.4	0.4	0.4		N/A	
Estonia	0.4	0.4	0.4	0.4	0.4		<0.01	
Sweden	0.4	0.5	0.4	0.4	0.4		<0.01	
Slovakia		0.4*	0.3	0.4	0.4		N/A	
Netherlands	0.6	0.5	0.5	0.5	0.4		-0.03	↓
Portugal	0.5	0.7	0.5	0.4†	0.4†		N/A	
France	0.4	0.4	0.4	0.3	0.5		<0.01	
Germany	0.7	0.6	0.6	0.5	0.5		-0.05	↓
Hungary	0.6	0.6	0.5	0.5	0.5		-0.02	↓
Poland	0.1†	0.1†	1.5	0.6	0.5		N/A	
EU/EEA	**0.6**	**0.6**	**0.7**	**0.6**	**0.6**		**0.01**	
Croatia	0.9	0.7	0.7	0.7	0.7		-0.05	↓
Norway	0.7	0.7	0.7	0.7	0.7		-0.01	
Iceland	0.9*	1.0*	1.0*	0.8*	0.7		N/A	
Denmark	0.8	0.7	0.8	0.8	0.8		<0.01	
Czech Republic	0.9	0.8	0.7	0.8	0.8		-0.02	
Slovenia	1.1	1.0	0.9	0.9	0.8		-0.06	↓
Bulgaria	0.9	0.9	0.8	0.8	0.8		-0.01	
Latvia	0.9	1.0	1.0	1.0	0.8		-0.02	
Romania		1.0*	0.9*	0.9*	0.9*		N/A	
Ireland	1.1	1.2	1.2	1.0	1.0		-0.05	
Finland	1.0	1.5	1.4	1.4	1.3		0.04	
United Kingdom	1.2	1.3	1.3	1.5	1.5		0.07	↑

EU/EEA refers to the corresponding population-weighted mean consumption.

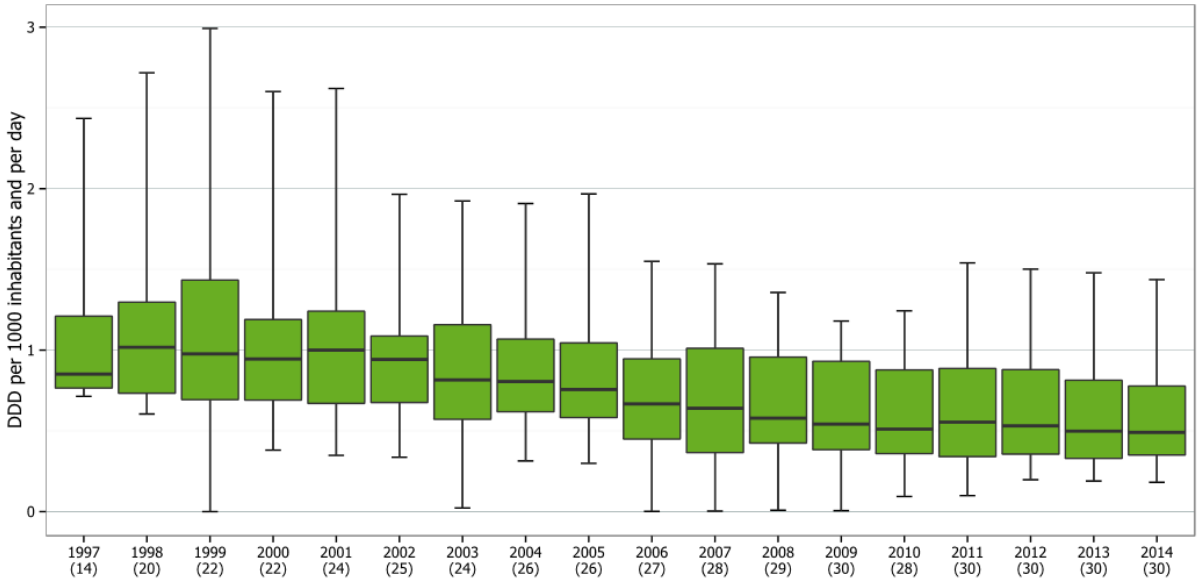
**Total care data, including the hospital sector.*

† *Reimbursement data (i.e. not including consumption without a prescription and other non-reimbursed courses).*

N/A = not applicable; linear regression was not applied due to missing data, changes in the type of data or changes of sector for which data were reported (community versus total care data) between 2010 and 2014.

The symbols ↑ and ↓ indicate statistically significant increasing and decreasing trends, respectively.

Figure 3.14. Trends and inter-country variations in consumption of sulfonamides and trimethoprim (ATC group J01E) within the community, EU/EEA countries, 1997–2014, expressed as DDD per 1 000 inhabitants per day



Boxes indicate the lower and upper quartiles. The bold lines indicate the medians. Whiskers indicate the minimum and maximum values. For 1997–2009, data are only included from ESAC countries that also participated in ESAC-Net in 2014. The number of participating countries is shown in parentheses.

3.1.6 Macrolides, lincosamides and streptogramins (ATC group J01F)

Results

Macrolides, lincosamides and streptogramins (ATC group J01F) form the second most commonly used ATC subgroup in 18 of the reporting countries. In 2014, the EU/EEA population-weighted mean consumption was 3.1 DDD per 1 000 inhabitants per day. Consumption ranged from 0.6 DDD per 1 000 inhabitants per day (Sweden) to 7.9 DDD per 1 000 inhabitants per day (Greece). (Table 3.9)

The EU map, displaying countries according to five equidistant intervals between the minimum and maximum values for 2014 data, shows Greece and Slovakia as the largest consumers of macrolides, lincosamides and streptogramins, with values higher than 4.9 DDD per 1 000 inhabitants per day (i.e. in the last two intervals) (Figure 3.16).

The proportion of macrolides, lincosamides and streptogramins (ATC group J01F) consumed of the total consumption of antibacterials for systemic use (ATC group J01 group) ranged from 4.7% (Sweden) to 26.6% (Slovakia).

Table 3.8 Consumption of short-, intermediate- and long-acting macrolides (ATC group J01F) for systemic use in the community, EU/EEA countries, 2014, expressed as DDD per 1 000 inhabitants per day

Country	Short-acting macrolides	Intermediate-acting macrolides	Long-acting macrolides	Total
Austria	0.01	1.64	0.69	2.34
Belgium	0.06	1.54	1.44	3.04
Bulgaria	0	1.79	1.39	3.17
Croatia	0.02	0.89	1.68	2.59
Cyprus (a)	0.10	1.51	0.78	2.39
Czech Republic	0.07	2.59	0.85	3.51
Denmark	0.28	1.05	0.46	1.79
Estonia	0.01	1.67	0.54	2.22
Finland	0.06	0.44	0.43	0.93
France	0.19	1.39	0.54	2.11
Germany	0.16	1.08	0.53	1.76
Greece	0.00	6.62	0.94	7.57
Hungary	0.03	1.18	1.31	2.52
Iceland	0.25	0.24	0.95	1.43
Ireland	0.74	2.71	0.66	4.11
Italy	0.14	2.97	1.51	4.62
Latvia	0.08	0.92	0.48	1.49
Lithuania	0.02	1.28	0.54	1.84
Luxembourg	0.21	2.04	0.98	3.22
Malta	0.16	2.66	0.76	3.58
Netherlands	0.06	0.39	0.73	1.18
Norway	0.68	0.22	0.31	1.21
Poland	0.26	1.51	1.26	3.03
Portugal	0.05	1.34	1.36	2.75
Romania (a)	0.23	1.92	0.62	2.77
Slovakia	0.18	2.67	2.27	5.13
Slovenia	0.13	0.51	0.92	1.56
Spain (b)	0.09	0.62	1.23	1.94
Sweden	0.15	0.05	0.09	0.29
United Kingdom	1.03	1.74	0.41	3.18
EU/EEA	**0.26**	**1.61**	**0.86**	**2.73**

A classification of macrolides is used as described by the ESAC project [9] according to the mean plasma elimination (Annex 1).

(a) Cyprus and Romania provided total care data - i.e. including the hospital sector.

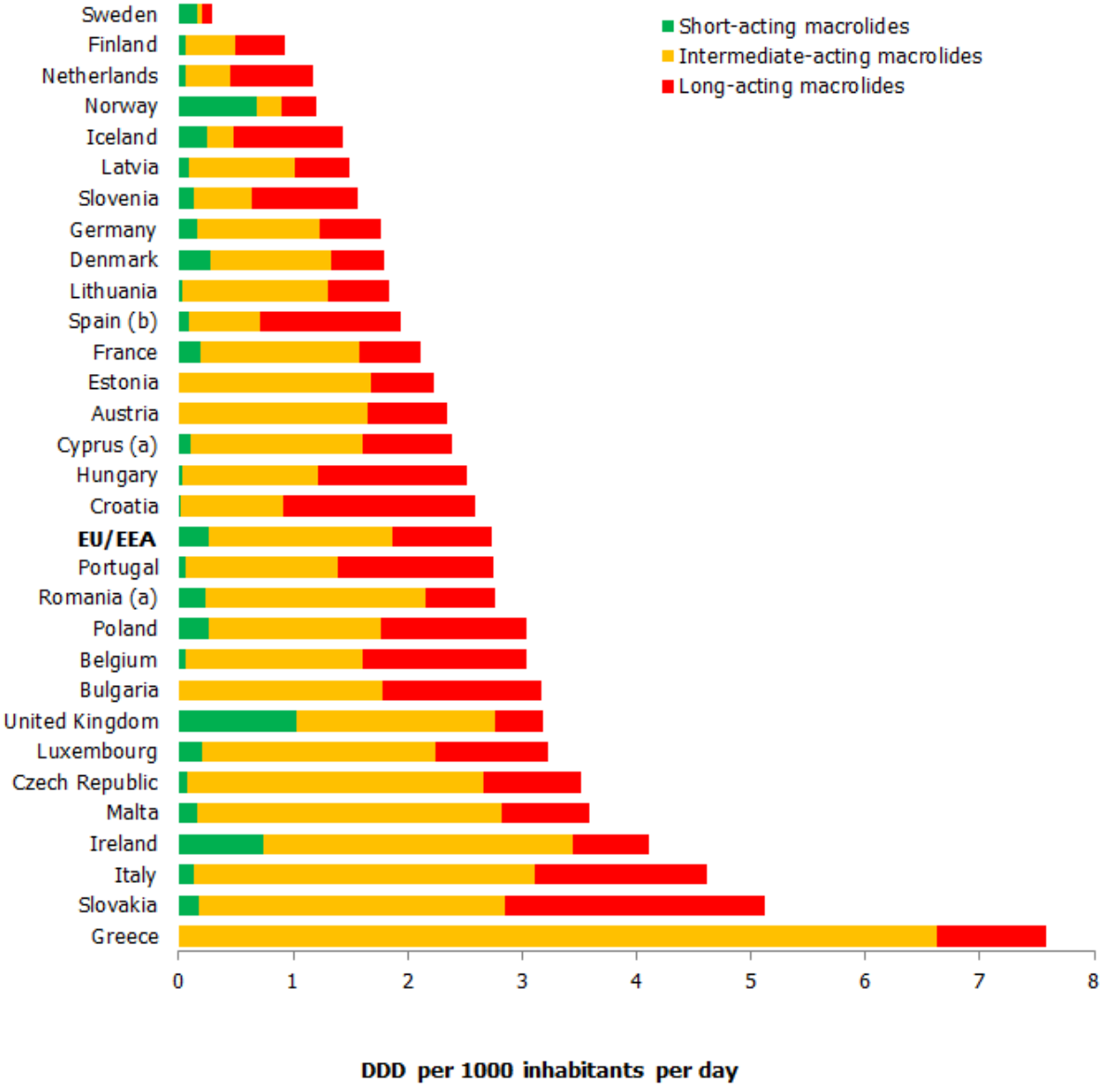
(b) Spain provided reimbursement data - i.e. not including consumption without a prescription and other non-reimbursed courses.

EU/EEA refers to the corresponding population-weighted mean consumption.

In 2014, the overall EU/EEA population-weighted mean consumption of macrolides (ATC group J01FA) was 2.7 DDD per 1 000 inhabitants per day (Table 3.8). Consumption varied by a factor of 25 from 0.3 DDD per 1 000 inhabitants per day (Sweden) to 7.6 DDD per 1 000 inhabitants per day (Greece).

Among short-acting macrolides, two countries, Ireland and the United Kingdom, reported the highest consumption of all reporting EU/EEA countries, with 0.74 and 1.03 DDD per 1 000 inhabitants per day (Figure 3.15). Bulgaria did not report any consumption for this group. Erythromycin (ATC J01FA01) was the most commonly consumed short-acting substance in Norway, Sweden and the United Kingdom, where consumption accounted for 56%, 53% and 32% respectively of the total of all macrolides (ATC group J01FA) consumed.

Figure 3.15 Consumption of short-, intermediate- and long-acting macrolides (ATC group J01F) for systemic use in the community, EU/EEA countries, 2014, expressed as DDD per 1 000 inhabitants per day



A classification of macrolides is used as described by the ESAC project [9] according to the mean plasma elimination (Annex 1).

(a) Cyprus and Romania provided total care data - i.e. including the hospital sector.

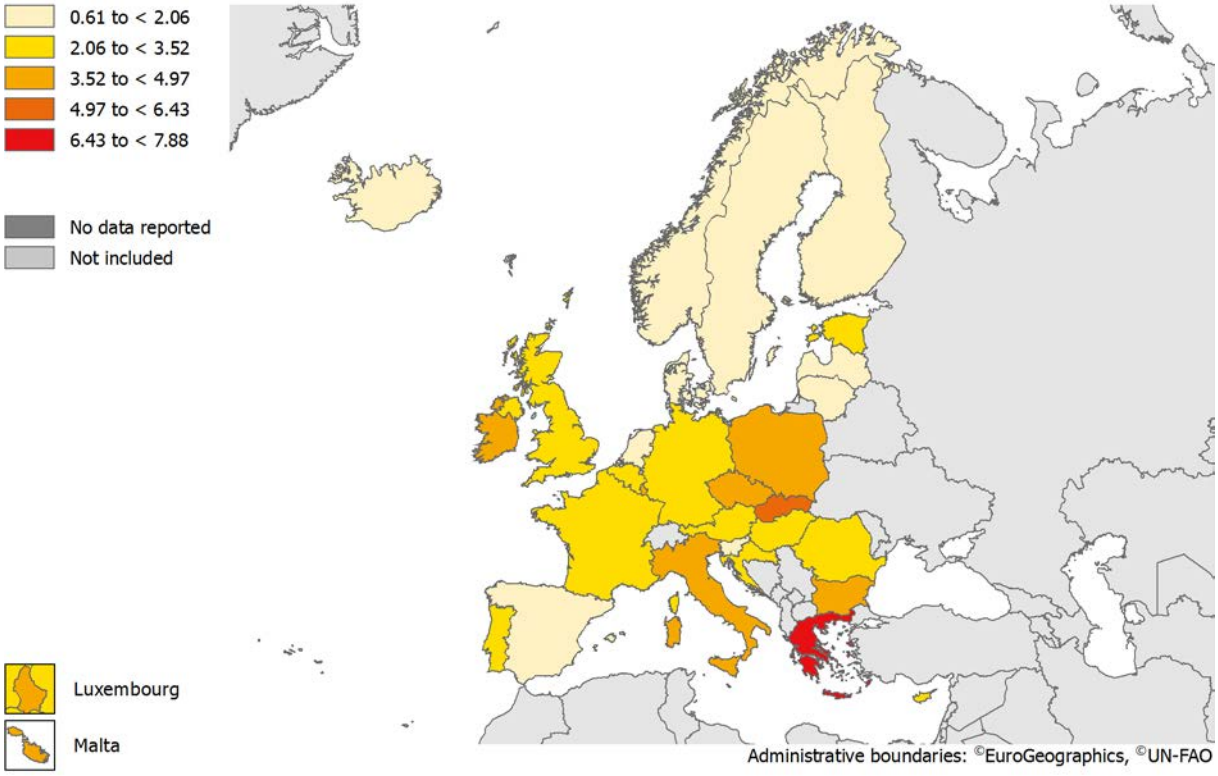
(b) Spain provided reimbursement data - i.e. not including consumption without a prescription and other non-reimbursed courses.

EU/EEA refers to the corresponding population-weighted mean consumption.

Intermediate-acting macrolides, mostly clarithromycin (ATC J01FA09), accounted for 56% of the total consumption of macrolides (ATC group J01FA), with consumption ranging from 0.05 DDD per 1 000 inhabitants per day (Sweden) to 6.6 DDD per 1 000 inhabitants per day (Greece).

Consumption of long-acting macrolides, mostly azithromycin (J01FA10), ranged from 0.09 DDD per 1 000 inhabitants per day (Sweden) to 2.3 DDD per 1 000 inhabitants per day (Slovakia).

Figure 3.16 Consumption of macrolides, lincosamides and streptogramins (ATC group J01F) in the community, EU/EEA countries, 2014, expressed as DDD per 1 000 inhabitants per day



Cyprus and Romania provided total care data - i.e. including the hospital sector.
Spain provided reimbursement data - i.e. not including consumption without a prescription and other non-reimbursed courses.

For more information on the map scales, see Chapter 2.3.

Trends

Temporal trends in the consumption of macrolides, lincosamides and streptogramins (ATC group J01F) are presented in Table 3.9. The EU/EEA population-weighted mean remained unchanged for the period 2010–2014. A statistically significant increasing trend was observed in three countries (Belgium, Latvia and the United Kingdom), while two countries (Italy and Slovenia) reported a statistically significant decreasing trend in the consumption of this group.

Table 3.9 Trends in consumption of macrolides, lincosamides and streptogramins (ATC group J01F) in the community, EU/EEA countries, 2010–2014, expressed as DDD per 1 000 inhabitants per day

Country	2010	2010	2012	2013	2014	Trends in antimicrobial consumption, 2010-2014	Average annual change 2010-2014	Statistically significant trend
Sweden	0.7	0.6	0.6	0.6	0.6		-0.03	
Finland	1.5	1.8	1.6	1.3	1.2		-0.11	
Netherlands	1.4	1.5	1.5	1.4	1.4		-0.03	
Norway	1.8	2.0	2.0	1.7	1.5		-0.09	
Iceland	1.6*	1.6*	1.7*	1.7*	1.6		N/A	
Latvia	1.1	1.4	1.5	1.7	1.6		0.13	↑
Slovenia	2.1	2.0	1.8	1.8	1.8		-0.08	↓
Denmark	2.4	2.7	2.3	1.8	1.8		-0.19	
Lithuania	1.7*	1.9*	1.9	2.4	1.9		N/A	
Spain	2.0†	2.1†	1.9†	1.9†	2.0†		0.00	
Estonia	2.2	2.5	2.5	2.5	2.4		0.04	
Cyprus	2.9*	3.1*	2.9*	2.7*	2.5*		-0.13	
Germany	2.3	2.3	2.7	2.8	2.5		0.08	
Portugal	3.4	3.4	3.2	2.7†	2.8†		N/A	
Croatia	3.0	2.9	3.0	2.8	2.9		-0.04	
Romania		2.9*	2.7*	2.8*	2.9*		N/A	
France	3.8	3.8	3.7	3.5	3.0		-0.18	
Austria	3.6	3.4	3.2	3.6	3.0		-0.09	
EU/EEA	**3.2**	**3.3**	**3.2**	**3.2**	**3.1**		**-0.01**	
Hungary	3.0	3.1	2.7	2.8	3.1		-0.01	
United Kingdom	2.7	2.8	3.1	3.2	3.2		0.14	↑
Belgium	2.9	3.2	3.4	3.4	3.4		0.11	↑
Luxembourg	3.7	3.9	4.0	3.9	3.7		-0.01	
Malta	3.1	3.7	3.7	4.0	3.8		0.15	
Poland	3.6†	3.9†	3.5	3.9	3.8		N/A	
Czech Republic	3.5	3.6	3.5	3.7	3.8		0.08	
Bulgaria	3.0	3.3	3.0	3.3	3.9		0.18	
Ireland	3.7	4.2	4.2	4.4	4.2		0.12	
Italy	5.1	5.0	4.7	4.8	4.7		-0.11	↓
Slovakia		5.8*	4.9	5.9	5.6		N/A	
Greece	8.9*	9.5	7.8	7.2	7.9		N/A	

EU/EEA refers to the corresponding population-weighted mean consumption.

**Total care data, including the hospital sector.*

† Reimbursement data (i.e. not including consumption without a prescription and other non-reimbursed courses).

N/A = not applicable; linear regression was not applied due to missing data, changes in the type of data or changes of sector for which data were reported (community versus total care data) between 2010 and 2014.

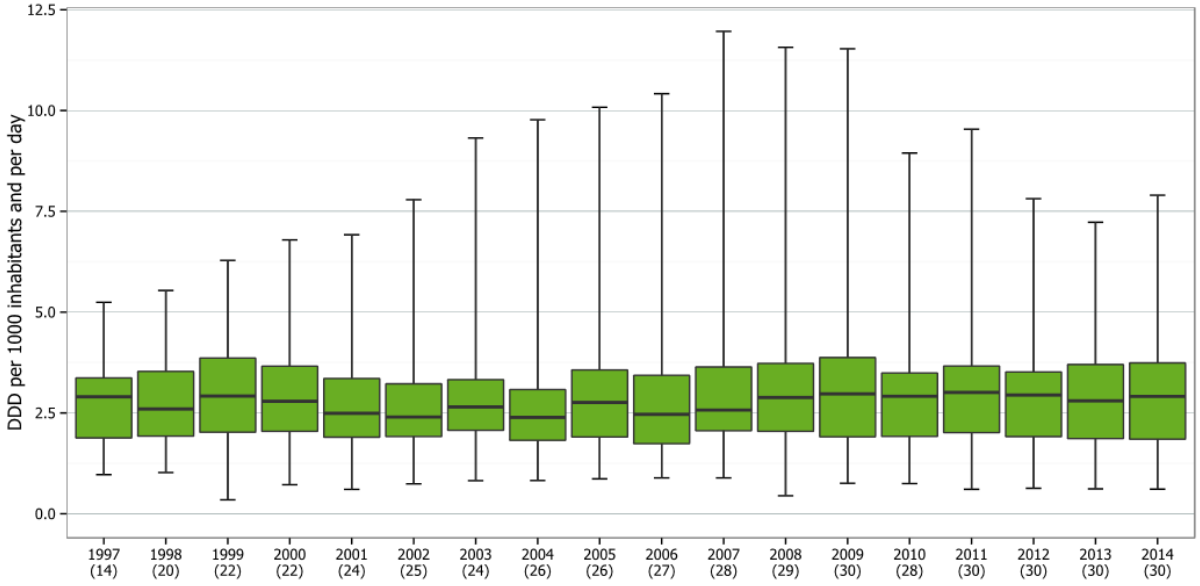
The symbols ↑ and ↓ indicate statistically significant increasing and decreasing trends, respectively.

The EU/EEA population-weighted mean consumption showed a statistically significant increasing trend during the period 2010–2014 (p=0.042, average annual change was 0.03). Twelve countries (Belgium, Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, France, Ireland, Latvia, Luxembourg, the Netherlands and the United Kingdom) showed a statistically significant increasing trend in the consumption of lincosamides (ATC group J01FF). No country reported a statistically significant decreasing trend in the consumption of this group.

Neither the EU/EEA population-weighted mean consumption nor any country-specific consumption of streptogramins (ATC group J01FG) showed any statistically significant trend during 2010–2014.

The median consumption of macrolides, lincosamides and streptogramins (ATC group J01F) did not show any statistically significant change between 2013 and 2014 and was reported at the same level as at the start of surveillance in 1997 – 3.1 DDD per 1 000 inhabitants per day (Figure 3.17).

Figure 3.17 Trends and inter-country variations in the consumption of macrolides, lincosamides and streptogramins (ATC group J01F) within the community, EU/EEA countries, 1997–2014, expressed as DDD per 1 000 inhabitants per day



Boxes indicate the lower and upper quartiles. The bold lines indicate the medians. Whiskers indicate the minimum and maximum values. For 1997–2009, data are only included from ESAC countries that also participated in ESAC-Net in 2014. The number of participating countries is shown in parentheses.

Discussion

Macrolides (ATC group J01FA), in particular intermediate-acting substances, were the most frequently consumed antibacterials of the group comprising macrolides, lincosamides and streptogramins (ATC group J01F) in all countries, with the exception of Sweden where lincosamides (ATC group J01FF) were predominantly used.

Half of the countries showed a significantly increasing trend in the consumption of lincosamides (ATC group J01FF) during the five-year period 2010–2014.

This report shows that the EU/EEA population-weighted mean consumption of macrolides, lincosamides and streptogramins (ATC group J01F) did not change significantly between 2010 and 2014. A significant increase in the consumption of macrolides and lincosamides, and in the ratio of long-acting to intermediate-acting macrolide consumption (compositional data analysis for ESAC project data from 1997 to 2009) was previously reported by the former ESAC project for the period 1997–2009 [9].

The large inter-country variation in the consumption of macrolides may indicate inappropriate use in some of the reporting countries.

3.1.7 Quinolone antibacterials (ATC group J01M)

Results

The pattern of community consumption of quinolone antibacterials (ATC group J01M) shows a gradient from northern to southern Europe (Figure 3.19). In 2014, the EU/EEA population-weighted mean consumption was 1.7 DDD per 1 000 inhabitants per day (Tables 3.1, 3.11). Consumption varied by a factor of seven, ranging from 0.5 DDD per 1 000 inhabitants per day (United Kingdom) to 3.7 DDD per 1 000 inhabitants per day (Romania). The proportion of quinolone antibacterials (ATC group J01M) consumed out of the total consumption of antibacterials for systemic use (ATC group J01) ranged from 2.3% (United Kingdom) to 15.0% (Hungary).

Table 3.10 Consumption of first-, second- and third-generation quinolones (ATC group J01M) for systemic use in the community, EU/EEA countries, 2014, expressed as DDD per 1 000 inhabitants per day

Country	First-generation quinolones	Second-generation quinolones	Third-generation quinolones	Total
Austria	0.08	0.90	0.31	1.30
Belgium	0.14	1.49	0.91	2.55
Bulgaria	0.23	2.56	0.08	2.87
Croatia	0.84	0.60	0.05	1.50
Cyprus (a)	0.88	2.23	0.15	3.26
Czech Republic	0.15	0.76	<0.01	0.91
Denmark	0	0.47	0.02	0.50
Estonia	0.24	0.66	<0.01	0.90
Finland	0.06	0.70	0.06	0.82
France	0.38	1.26	0.11	1.75
Germany	0.06	1.16	0.12	1.34
Greece	0.03	2.02	0.53	2.57
Hungary	0.33	2.00	0.10	2.43
Iceland	0	0.88	<0.01	0.88
Ireland	0	0.80	0.04	0.85
Italy	0.12	2.99	0.29	3.41
Latvia	0.22	0.83	<0.01	1.05
Lithuania	0.21	0.70	<0.01	0.91
Luxembourg	0.10	2.04	0.43	2.57
Malta	0.23	2.80	0.03	3.06
Netherlands	0.09	0.68	0.03	0.79
Norway	0	0.50	0.01	0.50
Poland	0.30	0.90	0.01	1.21
Portugal	0.15	1.65	0.32	2.12
Romania (a)	0.85	2.84	0.06	3.74
Slovakia	0.31	0.36	0.01	0.68
Slovenia	0.21	0.79	0.10	1.11
Spain (b)	0.22	1.87	0.22	2.31
Sweden	0.01	0.67	0.01	0.69
United Kingdom	<0.01	0.47	0.01	0.48
EU/EEA	**0.19**	**1.41**	**0.14**	**1.74**

Quinolone antibacterials are classified into three generations, based on their chemical structure and antimicrobial activity, as described by the ESAC project [8] (Annex 1).

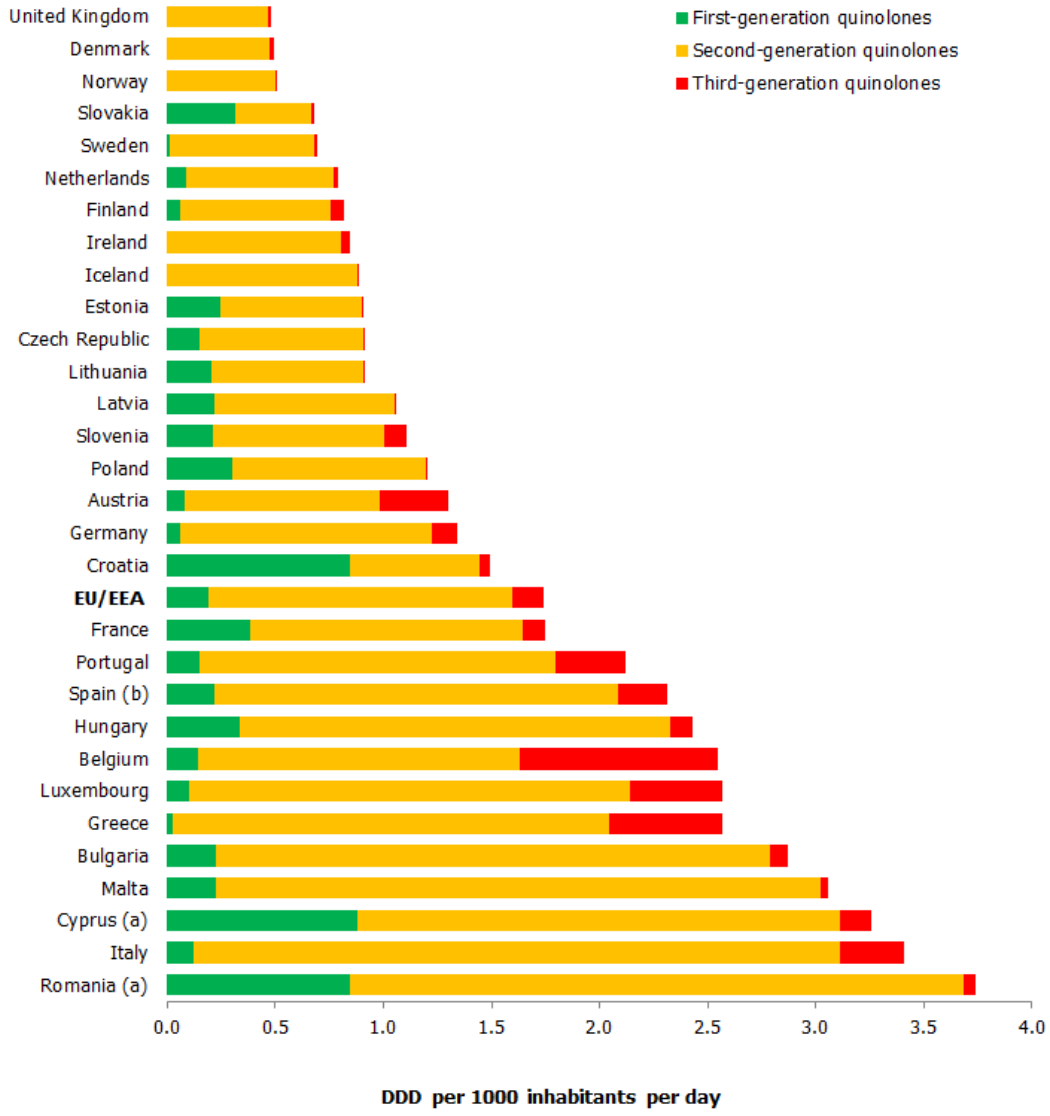
(a) Cyprus and Romania provided total care data - i.e. including the hospital sector.

(b) Spain provided reimbursement data - i.e. not including consumption without a prescription and other non-reimbursed courses.

EU/EEA refers to the corresponding population-weighted mean consumption.

In 2014, consumption of first-generation quinolones ranged from <0.01 DDD per 1 000 inhabitants per day (the United Kingdom) to 0.9 DDD per 1 000 inhabitants per day (Cyprus). Denmark, Iceland, Ireland and Norway did not report any consumption of first-generation quinolones (Table 3.10, Figure 3.18).

Figure 3.18 Consumption of first-, second- and third-generation quinolones for systemic use (ATC group J01M) in the community, EU/EEA countries, 2014, expressed as DDD per 1 000 inhabitants per day



Quinolone antibacterials are classified into three generations based on their chemical structure and antimicrobial activity, as described by the ESAC project [8] (Annex 1).

(a) Cyprus and Romania provided total care data - i.e. including the hospital sector.

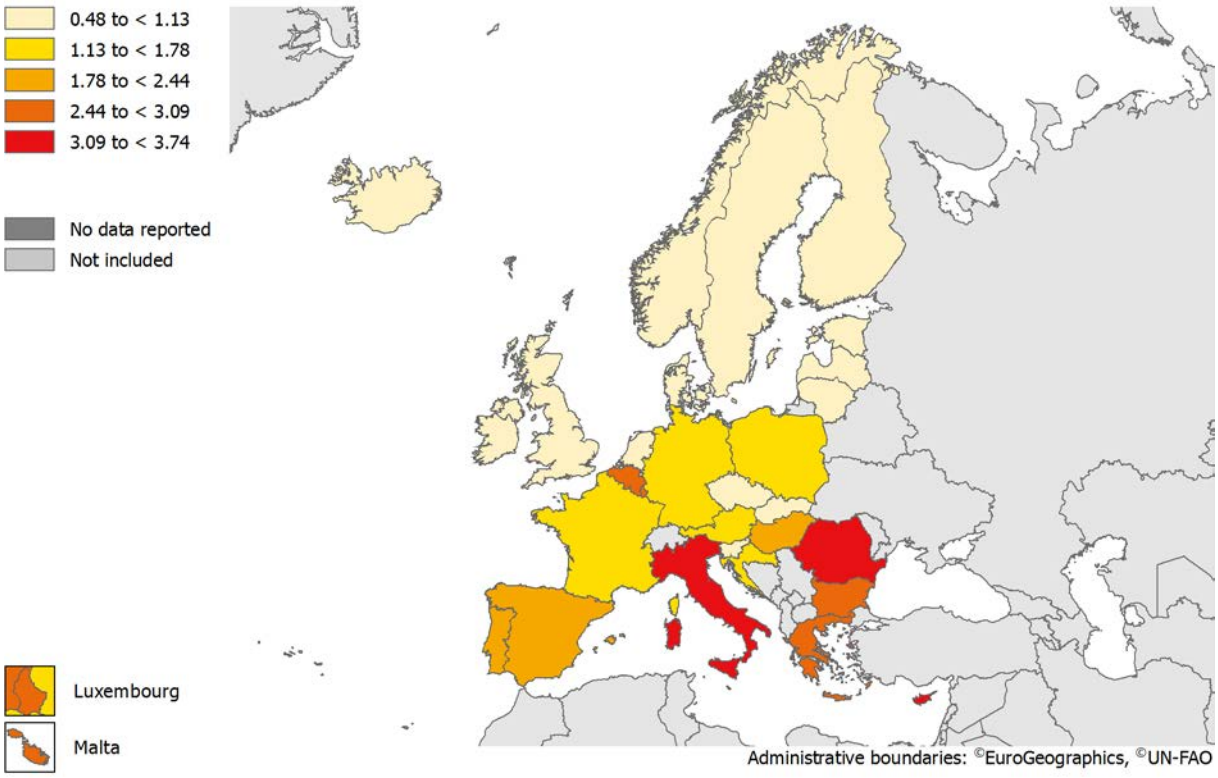
(b) Spain provided reimbursement data - i.e. not including consumption without a prescription and other non-reimbursed courses.

EU/EEA refers to the corresponding population-weighted mean consumption.

In 2014, second-generation quinolones were consumed on average four times more often than first- and third-generation quinolones together. Ciprofloxacin (J01MA02) accounted for 68% of the consumption of second-generation quinolones in all countries. The lowest consumption of ciprofloxacin was reported from Slovakia and the highest from Romania with 0.15 and 1.8 DDD per 1 000 inhabitants per day, respectively.

The proportion of third-generation quinolones consumed out of the total consumption of quinolone antibacterials (ATC J01M) varied from 0.11% in Iceland to 35.9% in Belgium.

Figure 3.19 Consumption of quinolone antibacterials (ATC group J01M) in the community, EU/EEA countries, 2014, expressed as DDD per 1 000 inhabitants per day



Cyprus and Romania provided total care data - i.e. including the hospital sector.

Spain provided reimbursement data - i.e. not including consumption without a prescription and other non-reimbursed courses.

For more information on the map scales, see Chapter 2.3.

Trends

Temporal trends in the consumption of quinolone antibacterials (ATC group J01M) are presented in Table 3.11. The EU/EEA population-weighted mean consumption remained unchanged during the period 2010–2014. Among countries reporting data for the period 2010–2014, the trend in community consumption of quinolone antibacterials (ATC group J01M) showed a statistically significant increase in five countries (Bulgaria, Croatia, Estonia, Latvia and Malta). At the same time, six countries (the Czech Republic, Germany, Luxembourg, the Netherlands, Spain and Sweden) showed a statistically significant decreasing trend in consumption of this group.

Table 3.11 Trends in consumption of quinolone antibacterials (ATC group J01M) in the community, EU/EEA countries, 2010–2014, expressed as DDD per 1 000 inhabitants per day

Country	2010	2011	2012	2013	2014	Trends in antimicrobial consumption, 2010-2014	Average annual change 2010-2014	Statistically significant trend
United Kingdom	0.5	0.4	0.4	0.5	0.5		0.01	
Denmark	0.5	0.6	0.6	0.5	0.5		-0.01	
Norway	0.5	0.6	0.6	0.5	0.5		-0.01	
Slovakia		2.5*	2.0	2.2	0.7		N/A	
Sweden	0.8	0.8	0.7	0.7	0.7		-0.02	↓
Netherlands	0.9	0.8	0.8	0.8	0.8		-0.02	↓
Finland	0.9	0.9	0.9	0.8	0.8		-0.02	
Ireland	0.9	0.9	0.9	0.9	0.8		-0.02	
Iceland	1.0*	1.1*	1.0*	1.1*	0.9		N/A	
Estonia	0.8	0.8	0.9	0.9	0.9		0.02	↑
Czech Republic	1.2	1.1	1.1	0.9	0.9		-0.09	↓
Lithuania	1.1*	1.2*	1.0	1.0	0.9		N/A	
Latvia	0.9	1.0	1.0	1.1	1.1		0.04	↑
Slovenia	1.1	1.1	1.1	1.1	1.1		<0.01	
Poland	1.2†	1.2†	1.2	1.2	1.2		N/A	
Austria	1.4	1.3	1.3	1.5	1.3		<0.01	
Germany	1.5	1.5	1.4	1.4	1.3		-0.04	↓
Croatia	1.3	1.3	1.5	1.5	1.5		0.05	↑
EU/EEA	**1.8**	**1.8**	**1.8**	**1.8**	**1.7**		**-0.01**	
France	2.0	1.8	1.9	1.8	1.7		-0.05	
Portugal	3.0	2.7	2.5	2.2†	2.1†		N/A	
Spain	2.5†	2.6†	2.5†	2.4†	2.3†		-0.07	↓
Hungary	2.0	2.0	2.0	2.1	2.4		0.10	
Belgium	2.7	2.7	2.8	2.6	2.5		-0.04	
Luxembourg	2.9	2.8	2.8	2.6	2.6		-0.08	↓
Greece	2.9*	2.6	2.4	2.1	2.6		N/A	
Bulgaria	2.0	2.3	2.4	2.5	2.9		0.20	↑
Malta	1.8	1.9	2.0	2.9	3.1		0.36	↑
Cyprus	4.1*	3.8*	3.5*	4.0*	3.3*		-0.15	
Italy	3.5	3.5	3.5	3.6	3.4		-0.01	
Romania		3.4*	3.4*	3.5*	3.7*		N/A	

EU/EEA refers to the corresponding population-weighted mean consumption.

**Total care data, including the hospital sector.*

† Reimbursement data (i.e. not including consumption without a prescription and other non-reimbursed courses).

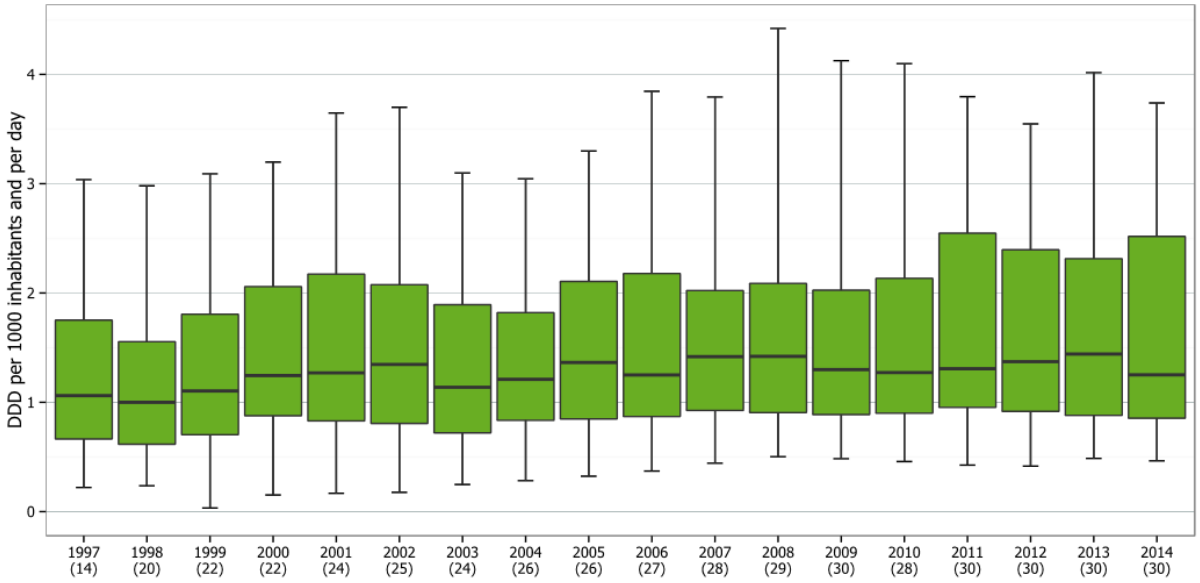
N/A = not applicable; linear regression was not applied due to missing data, changes in the type of data or changes of sector for which data were reported (community versus total care data) between 2010 and 2014.

The symbols ↑ and ↓ indicate statistically significant increasing and decreasing trends, respectively.

In addition, five countries (France, Italy, Latvia, the Netherlands and Spain) and the EU/EEA population-weighted mean showed a statistically significant decrease in the consumption of other quinolones (ATC group J01MB).

As shown in Figure 3.20, the median consumption of quinolone antibacterials (ATC group J01M) increased from 1.1 DDD per 1 000 inhabitants per day in 1997 to 1.4 DDD per 1 000 inhabitants per day in 2007 and remained at a similar level until 2013. In 2014 the median decreased to 1.25 DDD per 1 000 inhabitants per day.

Figure 3.20 Trends and inter-country variations of consumption of quinolone antibacterials (ATC group J01M) in the community, EU/EEA countries, 1997–2014, expressed as DDD per 1 000 inhabitants per day



Boxes indicate the lower and upper quartiles. The bold lines indicate the medians. Whiskers indicate the minimum and maximum values. For 1997–2009, data are only included from ESAC countries that also participated in ESAC-Net in 2014. The number of participating countries is shown in parentheses.

Discussion

Fluoroquinolones, mostly ciprofloxacin (J01MA02), made up almost the entire consumption of quinolone antibacterials (ATC group J01M).

During the period 2010–2014, more than one fifth of the countries showed a statistically significant decrease in the consumption of fluoroquinolones (ATC group J01MA) in the community.

The total quinolone consumption in the community, as well as seasonal variation of this consumption, increased significantly between 1997 and 2009 [8]. During the same period, the ratio of third-generation to second-generation quinolone consumption also increased. However, the EU/EEA population-weighted mean consumption of quinolone antibacterials (ATC group J01M) has not showed any statistically significant increase or decrease since 2010.

The large inter-country variation in the consumption of quinolone antibacterials (ATC J01M) may indicate inappropriate use in some of the reporting countries. Quinolone consumption is included in two proposed quality indicators for consumption in the community (J01MA_%, J01M_SV, Table 3.16).

3.1.8 Other antibacterials (ATC group J01X)

Results

The pattern of community consumption of other antibacterials (ATC group J01X) shows a gradient from northern to southern Europe (Figure 3.21). In 2014, a mean consumption of 0.97 DDD per 1 000 inhabitants per day was reported. Consumption varied widely, ranging from 0.001 DDD per 1 000 inhabitants per day (Bulgaria) to 3.58 DDD per 1 000 inhabitants per day (Norway) (Tables 3.1, 3.12 and 3.13). The proportion of other antibacterials (ATC group J01X) consumed out of the total consumption of antibacterials for systemic use (ATC group J01) ranged from <0.01% (Bulgaria) to 22.5% (Norway).

Nitrofurantoin (J01XE01) and nifurtoinol (J01XE02) accounted for more than 90% of the consumption of ATC group J01X in eight countries (Belgium, the Czech Republic, Lithuania, Luxembourg, Malta, the Netherlands, Poland and Slovenia).

The Nordic countries showed the highest levels of consumption for methenamine (J01XX05), varying from 1.2 (Sweden) and 1.4 (Finland) DDD per 1 000 inhabitants per day to 3.3 (Norway).

Table 3.12 Consumption of other antibacterials (ATC group J01X) at ATC group level 4 in the community, EU/EEA countries, 2014, expressed as DDD per 1 000 inhabitants per day

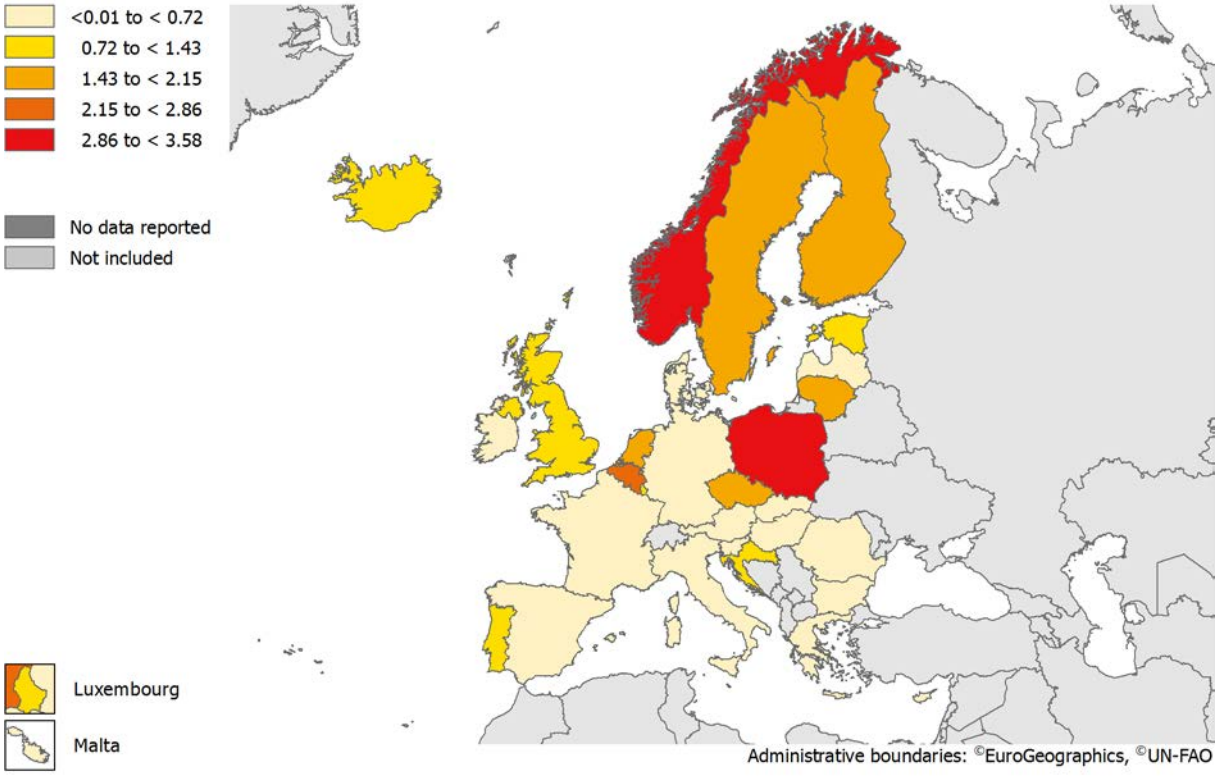
Country	Glycopeptide antibacterials (J01XA)	Polymyxins (J01XB)	Steroid antibacterials (J01XC)	Imidazole derivatives (J01XD)	Nitrofuran derivatives (J01XE)	Other antibacterials (J01XX)	Total (ATC group J01X)
Austria	<0.01	0.01	0.03	<0.01	0.26	0.04	0.33
Belgium	<0.01	0.02	0	0	2.58	0.16	2.76
Bulgaria	<0.01	0	0	<0.01	0	<0.01	<0.01
Croatia	<0.01	<0.01	<0.01	<0.01	0.78	<0.01	0.78
Cyprus (a)	0.05	0.02	<0.01	0.13	0.36	0.02	0.58
Czech Republic	0.02	0.01	0	0.05	1.41	<0.01	1.49
Denmark	<0.01	0.02	0.01	<0.01	0.48	0.16	0.67
Estonia	0	<0.01	<0.01	0.22	0.53	<0.01	0.75
Finland	<0.01	0	<0.01	<0.01	0.52	1.45	1.97
France	0	0.02	0.08	0	0.18	0.14	0.42
Germany	<0.01	0.01	0	<0.01	0.45	0.08	0.55
Greece	0.02	0.03	0.02	0.03	0.55	0.03	0.68
Hungary	0	<0.01	0	0	0.19	0.07	0.27
Iceland	<0.01	0	0	<0.01	0.58	0.31	0.89
Ireland	<0.01	0.05	0.01	<0.01	<0.01	0.01	0.07
Italy	<0.01	<0.01	0	<0.01	0.22	0.49	0.71
Latvia	<0.01	0	0	0.01	0.28	0.03	0.33
Lithuania	<0.01	0	0	<0.01	1.41	0.03	1.44
Luxembourg	<0.01	<0.01	0	0	1.19	0.10	1.28
Malta	0	<0.01	<0.01	0.04	0.44	0	0.48
Netherlands	<0.01	0.01	<0.01	<0.01	1.40	0.06	1.47
Norway	<0.01	0.01	<0.01	<0.01	0.30	3.27	3.58
Poland*	0	<0.01	0	<0.01	3.53	0.02	3.55
Portugal	0	0	0.03	0	0.90	0.17	1.10
Romania (a)	0	0.03	0	0.03	0	0	0.18
Slovakia	<0.01	0.01	0	0.01	0	0.05	0.07
Slovenia	0	0	0	0	0.25	<0.01	0.26
Spain (b)	<0.01	0	<0.01	<0.01	0.13	0.33	0.46
Sweden	<0.01	<0.01	0.01	<0.01	0.38	1.20	1.60
United Kingdom	0.01	0.07	0.01	<0.01	0.87	0.04	1.00
EU/EEA	**<0.01**	**0.02**	**0.01**	**<0.01**	**0.72**	**0.21**	**0.97**

(a) Cyprus and Romania provided total care data - i.e. including the hospital sector.

(b) Spain provided reimbursement data - i.e. not including consumption without a prescription and other non-reimbursed courses.

EU/EEA refers to the corresponding population-weighted mean consumption.

Figure 3.21 Consumption of other antibacterials (ATC group J01X) in the community, EU/EEA countries, 2014, expressed as DDD per 1 000 inhabitants per day



Cyprus and Romania provided total care data - i.e. including the hospital sector.

Spain provided reimbursement data - i.e. not including consumption without a prescription or other non-reimbursed courses.

For more information on the map scales, see Chapter2.3.

Trends

Temporal trends in the consumption of other antibacterials (ATC group J01X) are presented in Table 3.13. The EU/EEA population-weighted mean consumption did not change significantly.

Among countries reporting data for the period 2010–2014, the trend of community consumption increased significantly in 11 countries (Austria, Belgium, Cyprus, the Czech Republic, Germany, Hungary, Latvia, the Netherlands, Norway, Slovenia and Spain), while four other countries (Denmark, France, Ireland and Sweden) showed a significant decrease in consumption for this group during the same period.

Table 3.13 Trends in consumption of other antibacterials (ATC group J01X) in the community, EU/EEA countries, 2010–2014, expressed as DDD per 1 000 inhabitants per day

Country	2010	2011	2012	2013	2014	Trends in antimicrobial consumption, 2010-2014	Average annual change 2010-2014	Statistically significant trend
Bulgaria	0.004	0.004	0.001	0.004	0.001		<0.01	
Ireland	0.101	0.095	0.082	0.077	0.065		-0.01	↓
Slovakia		0.410*	0.038	0.060	0.068		N/A	
Romania		0.121*	0.135*	0.158*	0.180*		N/A	
Slovenia	0.008	0.065	0.114	0.187	0.259		0.06	↑
Hungary	0.096	0.193	0.216	0.252	0.267		0.04	↑
Latvia	0.250	0.261	0.265	0.287	0.329		0.02	↑
Austria	0.239	0.247	0.282	0.359	0.332		0.03	↑
France	0.568	0.516	0.469	0.461	0.418		-0.04	↓
Spain	0.391†	0.412†	0.413†	0.436†	0.463†		0.02	↑
Malta	0.238	0.428	0.343	0.410	0.480		0.05	
Germany	0.419	0.473	0.506	0.523	0.546		0.03	↑
Cyprus	0.482*	0.460*	0.503*	0.589*	0.585*		0.03	↑
Denmark	0.813	0.798	0.785	0.759	0.666		-0.03	↓
Greece	3.017*	0.574	0.556	0.676	0.677		N/A	
Italy	0.678	0.663	0.681	0.704	0.712		0.01	
Estonia	0.705	0.729	0.761	0.752	0.750		0.01	
Croatia	0.688	0.599	0.682	0.715	0.785		0.03	
Iceland	1.032*	1.042*	0.928*	1.119*	0.892*		N/A	
EU/EEA	**0.730**	**0.650**	**0.880**	**0.948**	**0.966**		**0.08**	
United Kingdom	0.960	0.792	0.882	0.997	1.000		0.03	
Portugal	0.988	1.372	1.436	0.995†	1.099†		N/A	
Luxembourg	1.221	1.413	1.308	1.311	1.284		<0.01	
Lithuania	1.984*	1.972*	1.327	1.370	1.443		N/A	
Netherlands	1.260	1.353	1.434	1.430	1.469		0.05	↑
Czech Republic	0.764	1.031	1.152	1.342	1.491		0.18	↑
Sweden	1.651	1.618	1.621	1.610	1.599		-0.01	↓
Finland	2.086	2.044	2.138	2.043	1.972		-0.02	
Belgium	2.537	2.608	2.641	2.711	2.759		0.05	↑
Poland	0.019†	0.024†	2.871	3.457	3.548		N/A	
Norway	3.057	3.161	3.291	3.399	3.580		0.13	↑

EU/EEA refers to the corresponding population-weighted mean consumption.

**Total care data, including the hospital sector.*

† Reimbursement data (i.e. not including consumption without a prescription and other non-reimbursed courses).

N/A = not applicable; linear regression was not applied due to missing data, changes in the type of data or changes of sector for which data were reported (community versus total care data) between 2010 and 2014.

The symbols ↑ and ↓ indicate statistically significant increasing and decreasing trends, respectively.

No statistically significant change was observed for the EU/EEA population-weighted mean consumption of parenteral glycopeptide antibacterials (ATC group J01XA). Community consumption showed a statistically significant increase in Cyprus, the Netherlands and the United Kingdom. Three countries (Croatia, Italy and Sweden) showed a statistically significant decrease.

The EU/EEA population-weighted mean community consumption of polymyxins (ATC group J01XB) did not show any statistically significant change. Polymyxin consumption showed a statistically significant increase in seven countries (the Czech Republic, Germany, Hungary, Latvia, the Netherlands, Norway and Sweden). Denmark and Ireland showed a significant decreasing trend.

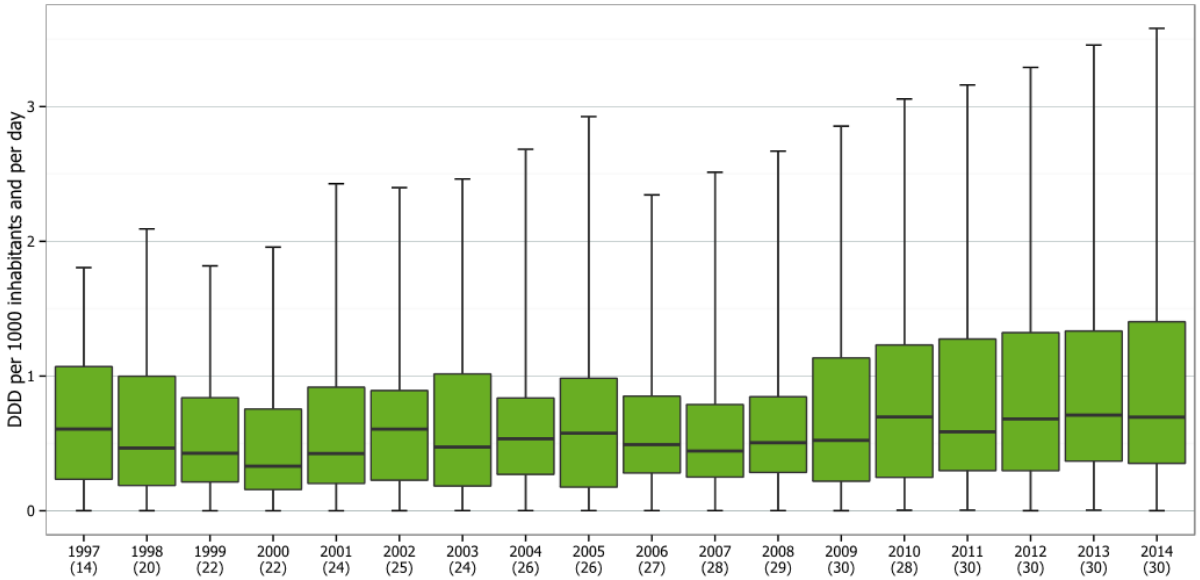
The EU/EEA population-weighted mean community consumption of steroid antibacterials (ATC group J01XC) showed a statistically significant decrease during the period 2010–2014. There was no statistically significant increase in consumption in any country and eight countries (Cyprus, Denmark, Finland, France, Ireland, Norway, Spain and Sweden) showed a statistically significant decrease in consumption of this group.

The EU/EEA population-weighted mean community consumption of parenteral imidazole derivatives (ATC group J01XD) did not show any statistically significant change. There was a statistically significant increase in consumption in one country (Italy) and three countries (Estonia, Latvia and Spain) showed a statistically significant decrease in consumption of this group.

The EU/EEA population-weighted mean community consumption of nitrofuran derivatives (ATC group J01XE) showed a statistically significant increase during the period 2010–2014. A statistically significant increasing trend was observed in 15 countries (Austria, Belgium, Cyprus, the Czech Republic, Estonia, Germany, Greece, Hungary, Latvia, Malta, the Netherlands, Slovenia, Spain, Sweden and the United Kingdom), whereas two countries (Denmark and France) showed a statistically significant decreasing trend in consumption of this group.

The EU/EEA population-weighted mean community consumption of other antibacterials (ATC group J01XX) showed a statistically significant increase during the period 2010–2014. There was a statistically significant increase in consumption in 11 countries (Austria, Belgium, Germany, Hungary, Italy, Luxembourg, the Netherlands, Norway, Slovenia, Spain and the United Kingdom), whereas three countries (Ireland, Latvia and Sweden) showed a statistically significant decrease in consumption of this group.

Figure 3.22 Trends and inter-country variations in consumption of other antibacterials (ATC group J01X) in the community, EU/EEA countries, 1997–2014, expressed as DDD per 1 000 inhabitants per day



Boxes indicate the lower and upper quartiles. The bold lines indicate the medians. Whiskers indicate the minimum and maximum values. For 1997-2009, data were only included from ESAC countries that also participated in ESAC-Net in 2014. The number of participating countries is shown in parentheses.

Discussion

During the five-year period 2010–2014, half of the countries included in the trend analyses showed a statistically significant increasing trend in consumption of other antibacterials (ATC group J01X). The overall increase in median EU/EEA consumption between 2007–2014 (Figure 3.22) was mainly due to an increased use of nitrofuran derivatives (ATC group J01XE) and other antibacterials (ATC group J01XX) such as fosfomycin (J01XX01), methenamine (J01XX05) and linezolid (J01XX08).

The high consumption of methenamine reported for the Nordic countries (e.g. 3.3 DDD per 1 000 inhabitants per year in Norway) is due to the long duration of treatment for methenamine compared to shorter treatments for other antibacterials in ATC group J01X.

Although community parenteral consumption of glycopeptide antibacterials (ATC group J01XA), fosfomycin (J01XX01) and linezolid (J01XX08) is low, these trends are important since antibacterials of this type are mainly prescribed for treating infections with multidrug-resistant bacteria, often in the hospital sector.

3.1.9 Antibacterials from other ATC groups (A07, J04 and P01AB)

Results

Due to the structure of the ATC classification and the route of administration for some antimicrobials, these substances are classified in different ATC anatomical groups. This is the case for vancomycin and metronidazole. Vancomycin is classified as an anti-infective for systemic use (ATC group J) when administered parenterally and as a drug for the alimentary tract and metabolism (ATC group A) when administered orally as it does not pass the intestinal barrier. In its oral form, it is prescribed for the treatment of *Clostridium difficile* infections.

Similarly, the nitroimidazole derivate metronidazole is classified as an anti-infective for systemic use (ATC group J) when administered parenterally and as an anti-parasitic product (ATC group P) when administered orally. In addition to treating systemic anaerobic infections in an oral form, it is prescribed for the treatment of *Clostridium difficile* infections.

Table 3.14 Consumption of oral vancomycin (A07AA09), antimycobacterials rifampicin (J04AB02), and oral metronidazole (P01AB01) in the community, EU/EEA countries, 2013 and 2014, expressed as DDD per 1 000 inhabitants per day

Country	Vancomycin* (A07AA09)		Metronidazole (P01AB01)		Rifampicin (J04AB02)	
	2013	2014	2013	2014	2013	2014
Austria	0.001	<0.001	0.10	0.09	0.06	0.05
Belgium	0	0	0.13	0.12	0.05	0.05
Bulgaria	0	0	0.13		0.07	0.06
Croatia	0	0	0.02	0.26	0	0.09
Cyprus	0	0	0.46	0.45	0.03	0.02
Czech Republic	0	0	0	0	0.03	0.04
Denmark	<0.001	<0.001	0.33	0.33	0.03	0.03
Estonia	0	0	0.01	0.00	0	0
Finland	0	0	0.40	0.40	<0.01	0
France	0.002	0.003	0.29	0.30	0.03	0.03
Germany	0	0	0.08	0.09	0.12	0.11
Greece	0.003	0.003	0.63	0.67	0.05	0.05
Hungary	0	0.001	0.19	0.21	0.05	0.06
Iceland	0	0	0.17	0.15	0.02	0.02
Ireland	0.004	0.002	0.02	0.02	0.05	0.06
Italy	<0.001	<0.001	0.07	0.07	0	0
Latvia	0.001	0.001	0.24	0.23	0.07	0
Lithuania	0	0	0.05	0.04	<0.01	<0.01
Luxembourg	0	0	0.18	0.20	0.08	0.04
Malta	0	0	0.43	0.57	0.11	0.10
Netherlands	0	0	0.11	0.11	<0.01	<0.01
Norway	0.001	<0.001	0.21	0.21	0.06	<0.01
Poland	<0.001	<0.001		0.19	0.03	0.04
Portugal	0	0	0.11	0.12	0	0.07
Romania	0	0	0.21	0.22	0.01	0.01
Slovakia	0	0		0.17	0	0
Slovenia	0	0	0.13	0.12	0.05	0.06
Spain	0	0	0.05		0	0
Sweden	0.004	0	0.20	0.19	0.08	0.08
United Kingdom	0.001	0.001	0.37	0.39	0	<0.01
EU/EEA	**<0.001**	**<0.001**	**0.17**	**0.2**	**0.04**	**0.04**

** oral vancomycin (ATC A07AA09) used as a non-absorbable intra-intestinal anti-infective*

EU/EEA refers to the corresponding population-weighted mean consumption based on countries that provided data.

In 2014, eleven countries reported consumption of oral vancomycin (A07AA09), ranging from <0.001 DDD per 1 000 inhabitants per day in Denmark, Italy and Poland to 0.003 DDD per 1 000 inhabitants per day in France and Greece.

In 2014, oral and rectal nitroimidazole derivatives (ATC group P01AB) were commonly used, as observed in 27 countries. Consumption ranged from <0.001 DDD per 1 000 inhabitants per day in Italy to 0.65 DDD per 1 000 inhabitants per day in Hungary. Metronidazole represented between 77% and 100% of all nitroimidazole derivatives.

Oral rifampicin (ATC J04AB02) consumption in 2014, reported in 24 countries, ranged from a minimum of <0.01 DDD per 1 000 inhabitants per day in the Lithuania, the Netherlands, Norway and the United Kingdom to a maximum of 0.11 DDD per 1 000 inhabitants per day in Germany.

Consumption of oral vancomycin, metronidazole and rifampicin was similar during the two-year period in all reporting countries. The consumption of metronidazole was more than twice the EU/EEA population-weighted mean in Cyprus, Finland, Greece and Malta. Consumption of rifampicin was nearly three times higher than the EU/EEA population-weighted mean in Germany.

Discussion

In the community, the proportion of oral vancomycin consumed is much lower than the proportion of parenteral vancomycin (see Chapter 3.18). However the infections targeted are different for oral vancomycin and parenteral vancomycin. While parenteral vancomycin is mostly used in hospitals to treat systemic infections caused by MRSA, the oral form is used to treat *Clostridium difficile* infections. In some countries, oral vancomycin is not available and a parenteral solution is used orally or rectally off label.

The proportion of nitroimidazole derivatives given orally or rectally is much higher than the proportion given parenterally for which the EU/EEA-weighted mean is less than 0.01 DDD per 1 000 inhabitants per day. Metronidazole in its oral form is prescribed for the treatment of systemic anaerobic infections, and also for the treatment of *Clostridium difficile* infections.

Rifampicin is classified as a drug for the treatment (and prophylaxis) of tuberculosis (ATC group J04). Nowadays in the EU/EAA countries, tuberculosis is mostly treated with combined products, including rifampicin. In rare cases, the treatment will consist only of rifampicin or a combination of single products one of which is rifampicin. However, rifampicin as a single drug, for which data are reported here, may also be given to treat other bacterial infections (e.g. MRSA), often in combination with other antibacterials or for prophylaxis against bacterial infections (e.g. meningococcal infections, *Haemophilus influenza*). In rare cases, it is used as an adjacent agent in the treatment of brucellosis, Legionnaires' disease and serious staphylococcal infections. Thus, it is assumed that a substantial part of the rifampicin used as a single product is for treating bacterial infections other than tuberculosis.

3.2 Consumption of antimycotics and antifungals for systemic use (ATC groups J02 and D01B)

Results

In 2014, 27 countries reported data on the consumption of antimycotics and antifungals for systemic use (ATC groups J02 & D01B) in the community (Table 3.15 and Figure 3.23).

The EU/EEA population-weighted mean consumption was 1.18 DDD per 1 000 inhabitants per day. The consumption varied by a factor of 8.8, ranging from 0.36 DDD per 1 000 inhabitants per day (Croatia) to 3.18 DDD per 1 000 inhabitants per day (Belgium).

In 2014, terbinafine (D01BA02), fluconazole (J02C01), and itraconazole (J02AC02) made up 92% of the total consumption of antimycotics and antifungals for systemic use (ATC groups J02 & D01B) in the community in all countries.

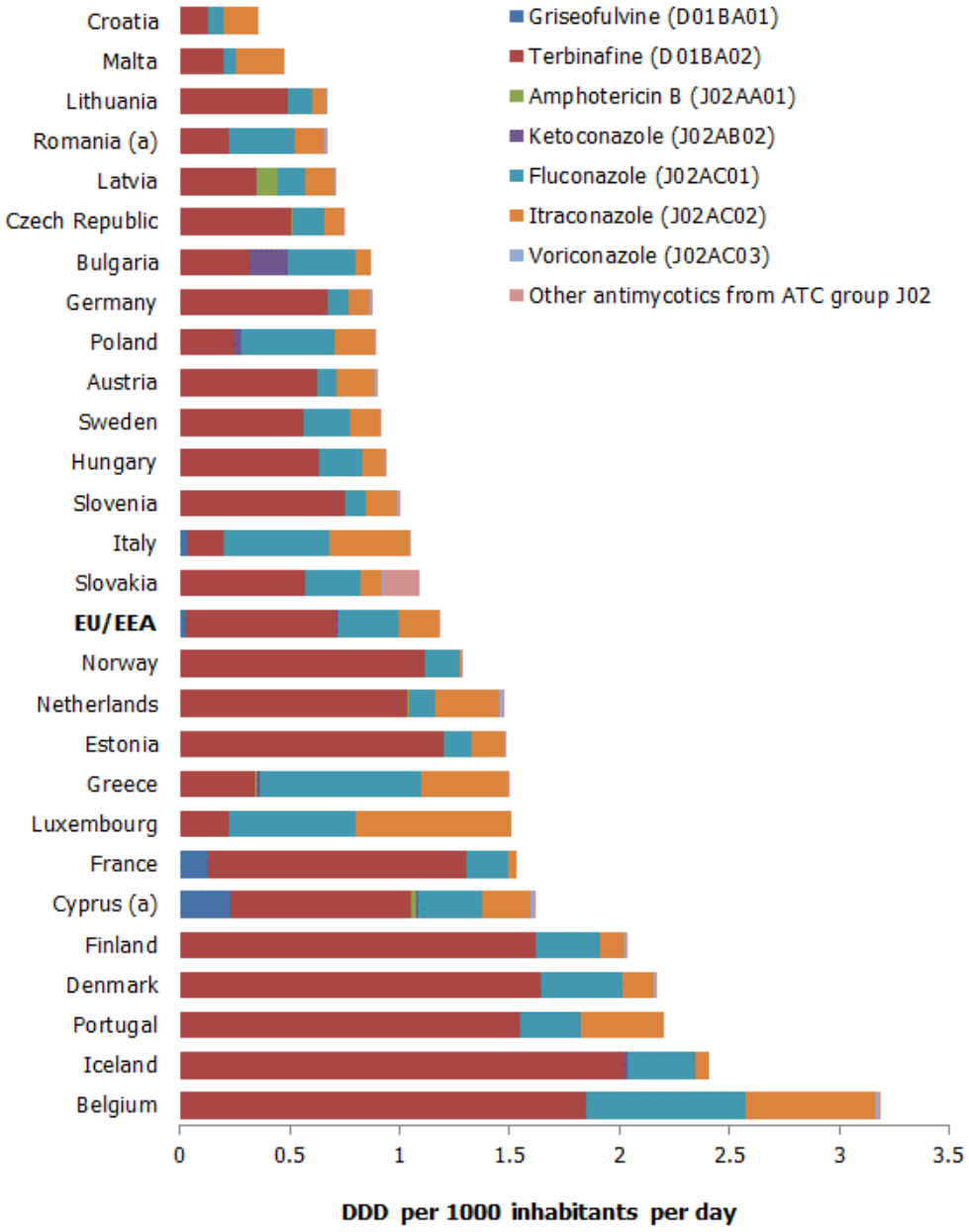
Table 3.15. Consumption of antimycotics (ATC group J02) and antifungals (ATC group D01B) for systemic use in the community, EU/EEA countries, 2014, expressed as DDD per 1 000 inhabitants per day

Country	Griseofulvine (D01BA01)	Terbinafine (D01BA02)	Amphotericin B (J02AA01)	Ketoconazole (J02AB02)	Fluconazole (J02AC01)	Itraconazole (J02AC02)	Voriconazole (J02AC03)	Other antimycotics for systemic use	Total (J02 & D01B)
Austria	0	0.63	<0.01	0	0.09	0.17	0.01	<0.01	0.90
Belgium	0	1.84	0	<0.01	0.72	0.59	0.01	<0.01	3.18
Bulgaria	0	0.31	0	0.17	0.31	0.07	<0.01	<0.01	0.87
Croatia	0	0.13	0	0	0.07	0.16	0	0	0.36
Cyprus (a)	0.23	0.82	0.03	0.01	0.29	0.22	0.01	0.01	1.62
Czech Republic	0	0.51	0.01	<0.01	0.14	0.09	0.01	<0.01	0.75
Denmark	0	1.64	<0.01	0	0.38	0.14	<0.01	<0.01	2.16
Estonia	<0.01	1.20	0	<0.01	0.12	0.15	<0.01	<0.01	1.48
Finland	0	1.62	<0.01	0	0.29	0.11	0.01	<0.01	2.03
France	0.13	1.18	<0.01	0	0.19	0.04	0	0	1.54
Germany	0.01	0.66	<0.01	<0.01	0.10	0.09	0.01	<0.01	0.87
Greece	0	0.34	<0.01	0.02	0.73	0.40	<0.01	<0.01	1.50
Hungary	0	0.63	<0.01	<0.01	0.19	0.11	<0.01	<0.01	0.94
Iceland	0	2.02	0	0.01	0.31	0.06	0	0	2.41
Italy	0.04	0.16	0	0	0.48	0.37	<0.01	<0.01	1.05
Latvia	<0.01	0.35	0.09	0	0.13	0.13	<0.01	<0.01	0.70
Lithuania	0	0.49	0	0	0.12	0.06	<0.01	0	0.66
Luxembourg	0	0.22	0	0	0.58	0.71	0	0	1.51
Malta	<0.01	0.20	0	0	0.05	0.22	0	0	0.47
Netherlands	<0.01	1.04	<0.01	<0.01	0.12	0.29	0.01	<0.01	1.47
Norway	<0.01	1.11	<0.01	0	0.16	0.01	<0.01	<0.01	1.28
Poland	0	0.25	<0.01	0.03	0.42	0.18	<0.01	<0.01	0.88
Portugal	0	1.55	0	<0.01	0.27	0.38	0	0	2.20
Romania (a)	0	0.22	<0.01	<0.01	0.30	0.14	0.01	0.01	0.67
Slovakia	0	0.57	<0.01	0	0.26	0.09	0.01	0.16	1.09
Slovenia	0	0.75	<0.01	0	0.09	0.15	0.01	<0.01	1.00
Sweden	0	0.56	<0.01	0	0.22	0.13	0.00	0.01	0.92
EU/EEA	**0.03**	**0.68**	**<0.01**	**0.01**	**0.27**	**0.18**	**<0.01**	**<0.01**	**1.18**

(a) Cyprus and Romania provided total care data - i.e. including the hospital sector.

EU/EEA refers to the corresponding population-weighted mean consumption.

Figure 3.23 Consumption of antimycotics (ATC group J02) and antifungals (ATC group D01B) for systemic use in the community, EU/EEA countries, 2014, expressed as DDD per 1 000 inhabitants per day



(a) Cyprus and Romania provided total care data - i.e. including the hospital sector.

EU/EEA refers to the corresponding population-weighted mean consumption based on 27 countries that provided data.

Terbinafine (D01BA02) consumption alone accounted for more than 50% of the total consumption of antimycotics and antifungals for systemic use (ATC groups J02 & D01B) in 19 (70%) of the reporting countries. The proportion of terbinafine consumption ranged from 9.8% (Greece) to 86.7% (Norway).

Half of the countries reported zero consumption for Ketoconazole (J02AA01).

In the Netherlands and Denmark, countries that generally have a low consumption of antibacterials for systemic use (ATC group J01), the total consumption of antimycotics and antifungals for systemic use (ATC groups J02 & D01B) was 1.2 and 1.8 times higher, respectively, than the EU/EEA population-weighted mean total consumption (1.2 DDD per 1 000 inhabitants per day).

Trends

The analysis of trends in the community consumption of antimycotics and antifungals for systemic use (ATC groups J02 & D01B) during the period 2010–2014 included 22 countries and showed no statistically significant trend for the EU/EEA population-weighted mean consumption. A statistically significant increasing trend was observed for Bulgaria, Estonia and Latvia (see also Chapter 2.3 for trend analyses). Two countries (Cyprus and Italy) showed a statistically significant decreasing trend in the consumption of this group.

Discussion

Of all 14 substances under surveillance (12 antimycotics of ATC group J02 and two antifungals of ATC group D01B), four dominated the consumption patterns, as in previous years.

Since 2013, EMA's CHMP has recommended that marketing authorisations of oral ketoconazole-containing medicines should be suspended throughout the EU for safety reasons. As a result, consumption in the community decreased in all countries compared to 2013 (see Chapter 4.3).

Seasonal variations of the consumption of antifungals and antimycotics for systemic use have previously been described [16]. Such variations were not analysed for this report. In a situation similar to antibacterials for systemic use, the fact that only nine countries reported reimbursement data may have resulted in underreporting since this means that data on antifungals and antimycotics obtained without prescription or not reimbursed due to the price being below a reimbursement limit are not included in reimbursement databases [12, 16].

Nevertheless, ESAC-Net data and historical data from the ESAC project are publicly available, standardised and validated European reference data on consumption of antifungals and antimycotics for systemic use (ATC groups J02 & D01B). These data can be used for monitoring and evaluating policies relating to appropriate prescribing in the community [16].

3.3 Quality indicators relating to consumption of antibacterials for systemic use (ATC group J01) in the community

Background

In 2007, the ESAC project published data on antimicrobial consumption in the community in Europe by adopting 12 consensus quality indicators based on ESAC project data from 1997 to 2003. It was concluded that these indicators could be used to better describe antimicrobial consumption and assess changes in national prescribing patterns in Europe. It was also felt that work towards improving indicator values could have an impact on reducing antimicrobial resistance. This in turn would improve patient health and cost-effectiveness and provide information for public health policy makers [2]. These quality indicators are grouped as follows:

- Total consumption of antibacterials for systemic use (ATC group J01) and subgroups;
- Relative consumption of beta-lactamase-sensitive penicillins, combinations of penicillins including beta-lactamase inhibitors, third- and fourth-generation cephalosporins, and fluoroquinolones;
- The ratio of broad- to narrow-spectrum antibacterials;
- Seasonal variations of total consumption of antibacterials for systemic use and consumption of quinolone antibacterials.

Results

The values of the proposed quality indicators for the 30 reporting countries in 2014 are presented in Table 3.16. In addition, the minimum value (p0), 25th percentile (p25), median (p50), 75th percentile (p75) and maximum value (p100) are displayed at the bottom of the table. For all quality indicators except the indicator of the relative consumption of beta-lactamase sensitive penicillins (J01CE_%), low values suggest better quality with the best quality being within the first quartile (i.e. p0 ≤ values ≤ p25). For the indicator J01CE_%, high values suggest better quality with the best quality being within the fourth quartile (i.e. p75 < values ≤ p100).

Quality indicators relating to total consumption of antibacterials for systemic use (ATC group J01) and subgroups

The first five indicators (displayed as J01, J01C, J01D, J01F and J01M) report consumption expressed in DDD per 1 000 inhabitants per day for ATC group J01 and four subgroups (ATC J01C, J01D, J01F and J01M) and are presented in Chapter 3 (Table 3.1 and Figure 3.1).

The Netherlands reported values within the first quartile (p0-p25) for all five indicators. Latvia and Sweden reported values within the first quartile for ATC group J01 and for three other indicators. Conversely, Luxembourg reported values within the fourth quartile (p75-p100) for four indicators.

Quality indicators on the relative consumption of beta-lactamase-sensitive penicillins, combinations of penicillins including beta-lactamase inhibitors, third- and fourth-generation cephalosporins and fluoroquinolones

The four indicators displayed as J01CE_%, J01CR_%, J01DD+DE_% and J01MA_% report on the percentage of total consumption of antibacterials for systemic use (ATC group J01) corresponding to various subgroups: beta-lactamase-sensitive penicillins (ATC group J01CE), combinations of penicillins including beta-lactamase inhibitors (ATC group J01CR), third- and fourth-generation cephalosporins (ATC groups J01DD and J01DE), and fluoroquinolones (ATC group J01MA).

- Three countries (Denmark, Finland and Norway) reported values within the quartiles, suggesting the best quality for all four indicators (see above under Results).
- Conversely, Italy and Malta reported values within the quartiles, suggesting the lowest quality for all four indicators.
- Indicator J01CE_% (relative consumption of beta-lactamase-sensitive penicillins) ranged from <0.1% to 26.9%. The Czech Republic, Denmark, Finland, Iceland, Norway, Slovenia, Slovakia and Sweden reported values within the fourth quartile, suggesting a better quality than all other quartiles.
- Indicator J01CR_% (relative consumption of combinations of penicillins including beta-lactamase inhibitors) ranged from 0.1% to 43.8%. Denmark, Finland, Germany, Latvia, Lithuania, Norway, Sweden and the United Kingdom showed values within the first quartile, suggesting a better quality than for those in all other quartiles.
- Indicator J01DD+DE_% (relative consumption of third- and fourth-generation cephalosporins) ranged from <0.1% to 7.0%. Belgium, Denmark, Finland, Iceland and Norway showed values within the first quartile, suggesting a better quality than for those in all other quartiles.
- Indicator J01MA_% (relative consumption of fluoroquinolones) ranged from 2.3% to 14.9%. The Czech Republic, Denmark, Iceland, Ireland, Norway, Slovakia and the United Kingdom showed values within the first quartile, suggesting a better quality than for those in all other quartiles.

Quality indicator on the ratio of broad- to narrow-spectrum antibacterials

The tenth quality indicator as defined in [2] and displayed as J01_B/N reports on the ratio of consumption of broad-spectrum penicillins, cephalosporins and macrolides to the consumption of narrow-spectrum penicillins, cephalosporins and macrolides. The indicator values ranged from 0.4% in Sweden to 637% in Greece.

Quality indicators on seasonal variations of total consumption of antibacterials for systemic use and consumption of quinolone antibacterials

The last two quality indicators (displayed as J01_SV and J01M_SV) report on seasonal variations of the total consumption of antibacterials for systemic use (ATC group J01) and consumption of quinolone antibacterials (J01M). As these indicators are calculated based on consecutive winter quarters and summer quarters they start in July prior to the year of data reporting for the current report (the period for calculating seasonal variations for this report starts in July 2013) and end one year later (i.e. in June 2014). These indicators could only be calculated for the 17 countries that provided quarterly data for 2014 and 2013 (see legend of Table 3.15).

Indicator values for the seasonality of total consumption of antibacterials for systemic use (ATC group J01) ranged from 4.6% (Ireland) to 41.7% (Hungary).

The indicator values for seasonality of the consumption of quinolone antibacterials (J01M) ranged from 0.2% (Iceland) to 37.5% (Hungary).

Trends

Among countries reporting data for the period 2010–2014, trends for the first five quality indicators expressed in DDD per 1 000 inhabitants per day for ATC group J01 and four subgroups (ATC J01C, J01D, J01F and J01M) are shown in the corresponding chapters (Chapters 3.1, 3.1.3, 3.1.4, 3.1.6 and 3.1.7, respectively).

In addition, trends were assessed for the four indicators which report on the percentage of total consumption of antibacterials for systemic use (ATC group J01) corresponding to the following subgroups: beta-lactamase-sensitive penicillins (displayed as J01CE_%), combinations of penicillins including beta-lactamase inhibitors (displayed as J01CR_%), third- and fourth-generation cephalosporins (displayed as J01DD+DE_%), and fluoroquinolones (displayed as J01MA_%).

Ireland reported a statistically significant increasing trend for the indicator J01CE_% which suggests an improvement of quality. A statistically significant decreasing trend for this indicator was observed in 10 countries (Austria, Bulgaria, Croatia, Denmark, Estonia, Hungary, Italy, Luxembourg, the Netherlands and Norway).

On the other hand, a statistically significant increasing trend for the indicator J01CR_% was observed in 13 countries (Austria, Bulgaria, Croatia, Denmark, Estonia, France, Germany, Hungary, Italy, Latvia, Luxembourg, Norway and Slovenia). Two countries (Belgium and the Netherlands) showed a statistically significant decreasing trend of this indicator, suggesting an improvement in quality.

A statistically significant increasing trend of the indicator J01DD+DE_% was observed in four countries (Belgium, Bulgaria, Cyprus and Luxembourg). A statistically significant decreasing trend was observed in seven countries (Austria, Croatia, France, Germany, Ireland, Slovenia and Spain), suggesting an improvement in quality.

A statistically significant increasing trend of the indicator J01MA_% was observed in Bulgaria, Croatia, Hungary, Latvia and Malta. A statistically significant decrease was observed in six countries (Belgium, the Czech Republic, Finland, Germany, Ireland, and Norway), suggesting an improvement in quality.

Discussion

In half of the EU/EEA countries included in the trend analysis, trends in the results used for quality indicators J01CE_% and J01CR_% confirmed a statistically significant decreasing trend in the consumption of beta-lactamase-sensitive penicillins (ATC group J01CE), as well as a statistically significant increasing trend in the consumption of broad-spectrum combinations of penicillins, including beta-lactamase inhibitors (ATC group J01CR). Conversely, trends in the proportion of third- and fourth-generation cephalosporins and fluoroquinolones did not show any statistically significant trend.

Table 3.16 ESAC quality indicators for consumption data relating to antibacterials for systemic use (ATC group J01) from the community, EU/EEA countries, 2014

(The indicator codes are explained in the legend)

	Consumption (DDD per 1000 inhabitants per day)					Relative consumption (%)				Broad/ narrow	Seasonal variation	
Country	J01*	J01C	J01D	J01F	J01M	J01CE_ % ‡	J01CR_ %	J01DD+DE_ %	J01MA_ %	J01_B/N	J01_SV %	J01M_SV %
Austria	13.94	6.5	1.49	3.04	1.3	5.6	33.8	2.1	9.3	8.17	16.3	9.0
Belgium	28.45	16.01	1.42	3.39	2.55	0.1	29.7	<0.1	9	79.92	25.9	19.0
Bulgaria	21.21	8.27	3.38	3.85	2.87	0.9	15.5	3.5	13.5	17.7	-	-
Croatia	21.39	11.57	2.81	2.91	1.5	3.4	36.5	1.1	7	8.27	28.5	14.1
Cyprus (a)	26.1	11.65	4.49	2.46	3.26	0.3	32.0	3	12.5	51.05	-	-
Czech Republic	19.24	8.14	2.04	3.81	0.91	9.8	23.0	0.4	4.7	4.66	19.6	7.0
Denmark	15.94	10.48	0.03	1.84	0.5	26.9	8.2	<0.1	3.1	0.63	9.2	4.9
Estonia	11.67	4.63	1.14	2.4	0.9	1.7	16.1	0.1	7.7	11.9	24.5	6.2
Finland	18.08	6.43	2.25	1.17	0.82	6.9	7.7	<0.1	4.5	0.76	5.5	4.9
France	29.01	18.04	2.06	3.01	1.75	0.6	24.8	5.2	6	43.44	-	-
Germany	14.56	4.59	3.01	2.48	1.34	5.5	3.2	2.2	9.2	6.31	22.8	19.4
Greece	35.01	13.87	7.31	7.88	2.57	<0.1	20.6	0.4	7.3	636.74	-	-
Hungary	16.17	6.78	1.88	3.13	2.43	1.6	33.1	1.6	14.9	36.36	41.7	37.5
Iceland	19.34	10.45	0.46	1.56	0.88	10.8	21.2	<0.1	4.5	2.26	10.2	0.2
Ireland	23.13	13.16	1.11	4.18	0.85	4.5	26.0	0.3	3.7	5.07	4.6	11.4
Italy	27.81	15.67	2.35	4.66	3.41	<0.1	42.4	7	12.2	56.87	26.8	22.0
Latvia	12.62	6.09	0.48	1.61	1.05	0.5	14.3	0.3	8.1	14.24	22.1	3.2
Lithuania	16	8.96	1.07	1.87	0.91	1.0	11.3	0.1	5.4	10.49	-	-
Luxembourg	25.83	12.87	3.39	3.66	2.57	<0.1	32.6	0.1	9.9	52.42	31.4	21.0
Malta	23.65	9.65	4.57	3.77	3.06	0.2	37.8	4	12.9	119.61	-	-
Netherlands	10.58	4.23	0.04	1.35	0.79	2.9	14.6	0.1	7.4	9.17	-	-
Norway	15.92	6.46	0.09	1.47	0.5	20.1	0.1	<0.1	3.2	0.42	-	-
Poland	22.78	8.9	2.37	3.79	1.21	0.9	16.6	0.1	5.3	9.13	-	-
Portugal	20.31	11.61	1.44	2.79	2.12	<0.1	43.8	0.9	10.4	41.3	25.5	11.9
Romania (a)	31.16	16.57	5.33	2.91	3.74	2.5	24.8	3.4	12	13.35	-	-
Slovakia	20.91	8.14	4.37	5.56	0.68	6.0	25.5	3.5	3.3	9.16	-	-
Slovenia	14.21	9.49	0.28	1.78	1.11	11.4	30.7	0.4	7.8	3.53	18.1	8.6
Spain (b)	21.64	14.01	1.64	2.04	2.31	0.4	39.2	1.8	10.6	130.77	-	-
Sweden	13.01	6.89	0.15	0.61	0.69	24.7	6.2	0.2	5.3	0.44	-	-
United Kingdom	20.85	9.25	0.33	3.24	0.48	4.1	6.3	0.1	2.3	1.64	10.1	9.8
p0	10.58	4.23	0.03	0.61	0.48	<0.1	0.1	<0.01	2.29	0.42	4.6	0.2
p25	15.92	6.81	0.63	1.85	0.85	0.5	14.4	0.07	4.87	4.77	10.2	6.2
p50	20.59	9.37	1.76	2.91	1.25	2.5	23.9	0.42	7.59	9.83	22.1	9.8
p75	23.52	12.57	2.96	3.74	2.52	6.0	32.4	2.18	10.30	42.90	25.9	19.0
p100	35.01	18.04	7.31	7.88	3.74	26.9	43.9	7.03	14.91	636.74	41.7	37.5

Values within the first quartile [p0;p25]
Values within the second quartile]p25;p50]
Values within the third quartile]p50;p75]
Values within the fourth quartile]p75;p100]

* *Denominator for relative consumption*

‡ *Indicators within the fourth quartile (i.e. values > percentile 75 (p75) suggest better quality than indicator values within the third quartile (i.e. p50 ≤ values < p75) and so on. The colour code was subsequently applied inversely. Cells coloured in light blue are better quality than cells coloured in darker blue.*

(a) Cyprus and Romania provided total care data - i.e. including the hospital sector.

(b) Spain provided reimbursement data - i.e. not including consumption without a prescription or other non-reimbursed courses.

*Definitions of indicator codes***

Indicators relating to consumption of antibacterials for systemic use (ATC group J01) and at ATC group level 3:

J01	J01_DID	Consumption of antibacterials for systemic use (J01) expressed in DDD per 1 000 inhabitants per day
J01C	J01C_DID	Consumption of penicillins (J01C) expressed in DDD per 1 000 inhabitants per day
J01D	J01D_DID	Consumption of cephalosporins (J01D) expressed in DDD per 1 000 inhabitants per day
J01F	J01F_DID	Consumption of macrolides, lincosamides and streptogramins (J01F) expressed in DDD per 1 000 inhabitants per day
J01M	J01M_DID	Consumption of quinolones (J01M) expressed in DDD per 1 000 inhabitants per day

Indicators on the relative consumption of antibacterials for systemic use (ATC group 3):

J01CE_%	J01CE_%	Consumption of beta-lactamase-sensitive penicillins (J01CE) expressed as percentage of the total consumption of antibacterials for systemic use (J01)
J01CR_%	J01CR_%	Consumption of combination of penicillins, including beta-lactamase inhibitor (J01CR) expressed as percentage of the total consumption of antibacterials for systemic use (J01)
J01DD+DE_%	J01DD+DE_%	Consumption of third- and fourth-generation cephalosporins (J01(DD+DE)) expressed as percentage of the total consumption of antibacterials for systemic use (J01)
J01MA_%	J01MA_%	Consumption of fluoroquinolones (J01MA) expressed as percentage of the total consumption of antibacterials for systemic use (J01)

Indicators on the ratio of broad and narrow spectrum antibacterials:

J01_B/N	J01_B/N	Ratio of the consumption of broad-spectrum penicillins, cephalosporins and macrolides (J01(CR+DC+DD+(F-FA01))) to the consumption of narrow-spectrum penicillins, cephalosporins and macrolides (J01(CE+DB+FA01))

Indicators on seasonal variation of antibacterials for systemic consumption (ATC group J01, subgroup J01M):

J01_SV_%	J01_SV_%	Seasonal variation of the total antibiotic consumption (J01) of a 12-month period starting in July and ending the following June, expressed as percentage: [(DDD (winter quarters)/DDD (summer quarters)-1] x 100
J01M_SV_%	J01M_SV_%	Seasonal variation of quinolone consumption (J01M) of a 12-month period starting in July and ending the following June, expressed as percentage: [(DDD (winter quarters)/DDD (summer quarters)-1] x 100

*** The second column shows the original labels of the quality indicators, as described in the article 'European Surveillance of Antimicrobial Consumption (ESAC): quality indicators for outpatient antibiotic use in Europe' published in Qual Saf Health Care 2007;16:440–445.*

Any ranking of the countries should be interpreted with caution, as the indicators are not independent (e.g. an increase in the consumption of macrolides, lincosamides and streptogramins (ATC group J01F) will probably result in an increase of the ratio of broad- to narrow-spectrum penicillins, cephalosporins and macrolides.) For countries where changes in the ranking suggest quality improvement, this may just reflect a relative change compared to other countries – i.e. that quality decreased in all countries but less so in that specific country [1]. It should be emphasised that these indicators cannot by themselves indicate quality of antimicrobial use unless they are used with corresponding clinical data (e.g. resistance patterns).

Finally, 2014 data for the two countries (Cyprus and Romania) that reported only total care data - i.e. including hospital sector data - were included in Table 3.16 because the largest proportion of antibacterials for systemic use (ATC group J01) consumed is reported from the community. However, quality indicators from these two countries should be interpreted with caution because certain antibacterials (e.g. broad-spectrum antibacterials) make up a larger proportion of total consumption in the hospital sector than in the community.

4. Consumption of antimicrobials for systemic use in the hospital sector

4.1 Consumption of antibacterials for systemic use (ATC group J01)

Results

For 2014, 23 countries reported data on consumption of antibacterials for systemic use (ATC group J01) in the hospital sector, an increase from 10 in 1997. Table A2 (see Annexes) provides an overview of the total consumption of antibacterials for systemic use (ATC group J01) in the hospital sector, reported for each country during the period 1997–2014.

In 2014, the EU/EEA population-weighted mean consumption of antibacterials for systemic use (ATC group J01) in the hospital sector was 2.0 DDD per 1 000 inhabitants per day (Table 4.1). Consumption varied from 0.95 (the Netherlands) to 2.64 (Finland) DDD per 1 000 inhabitants.

Table 4.1 and Figure 4.1 present the consumption of antibacterials for systemic use (ATC group J01) in the hospital sector, in total and by subgroups.

Table 4.1. Consumption of antibacterials for systemic use (ATC group J01) by ATC group level 3 in the hospital sector, EU/EEA countries, 2014, expressed as DDD per 1 000 inhabitants per day

Country	Tetra-cyclines (J01A)	Beta-lactams, penicillins (J01C)	Other beta-lactam antibac-terials (J01D)	Sulfonamides and trimethoprim (J01E)	Macrolides, lincosamides and strepto-gramins (J01F)	Quino-lones (J01M)	Other antibac-terials (J01X)	Sum (J01B, J01G, and J01R)*	Total (ATC group J01)
Belgium	0.01	0.80	0.35	0.02	0.08	0.18	0.12	0.02	1.60
Bulgaria	0.02	0.19	0.79	0.01	0.13	0.16	0.02	0.12	1.45
Croatia	0.04	0.58	0.55	0.05	0.14	0.23	0.17	0.10	1.86
Denmark	0.04	1.09	0.41	0.11	0.09	0.21	0.14	0.03	2.13
Estonia	0.06	0.64	0.57	0.04	0.18	0.20	0.16	0.06	1.94
Finland (a)	0.21	0.65	0.92	0.11	0.13	0.30	0.33	0.01	2.64
France	0.03	1.24	0.32	0.05	0.11	0.26	0.13	0.06	2.20
Greece	0.05	0.59	0.58	0.02	0.19	0.27	0.35	0.08	2.11
Hungary	0.03	0.41	0.32	0.03	0.12	0.22	0.08	0.03	1.25
Ireland	0.03	0.69	0.21	0.05	0.28	0.12	0.22	0.06	1.66
Italy	0.03	0.89	0.43	0.04	0.20	0.41	0.17	0.05	2.22
Latvia	0.13	0.59	0.67	0.08	0.16	0.38	0.18	0.06	2.25
Lithuania	0.08	1.01	0.66	0.06	0.10	0.18	0.18	0.08	2.35
Luxembourg	0.01	0.66	0.56	0.03	0.15	0.23	0.11	0.06	1.81
Malta	0.13	0.79	0.27	0.05	0.25	0.41	0.17	0.11	2.18
Netherlands	0.02	0.42	0.20	0.03	0.06	0.11	0.07	0.04	0.95
Norway	0.07	0.68	0.30	0.05	0.07	0.07	0.10	0.06	1.41
Poland	0.07	0.46	0.36	0.04	0.08	0.18	0.18	0.07	1.43
Portugal (b)	0.02	0.52	0.44	0.08	0.15	0.17	0.11	0.07	1.55
Slovakia	0.04	0.87	0.70	0.04	0.19	0.35	0.21	0.07	2.47
Slovenia	0.01	0.70	0.32	0.06	0.12	0.24	0.10	0.06	1.61
Sweden	0.18	0.82	0.18	0.06	0.06	0.16	0.09	0.02	1.57
United Kingdom	0.22	1.34	0.17	0.17	0.30	0.11	0.18	0.09	2.59
EU/EEA	**0.08**	**0.90**	**0.35**	**0.07**	**0.16**	**0.23**	**0.16**	**0.06**	**2.01**

(a) Finland: data include consumption in remote primary healthcare centres and nursing homes.

(b) Portugal: data refer to public hospitals. Population was adjusted accordingly based on hospital catchment area information provided by the country.

EU/EEA refers to the corresponding population-weighted mean consumption based on the 23 countries that provided data.
**J01B: amphenicols; J01G: aminoglycoside antibacterials; J01R: combinations of antibacterials*

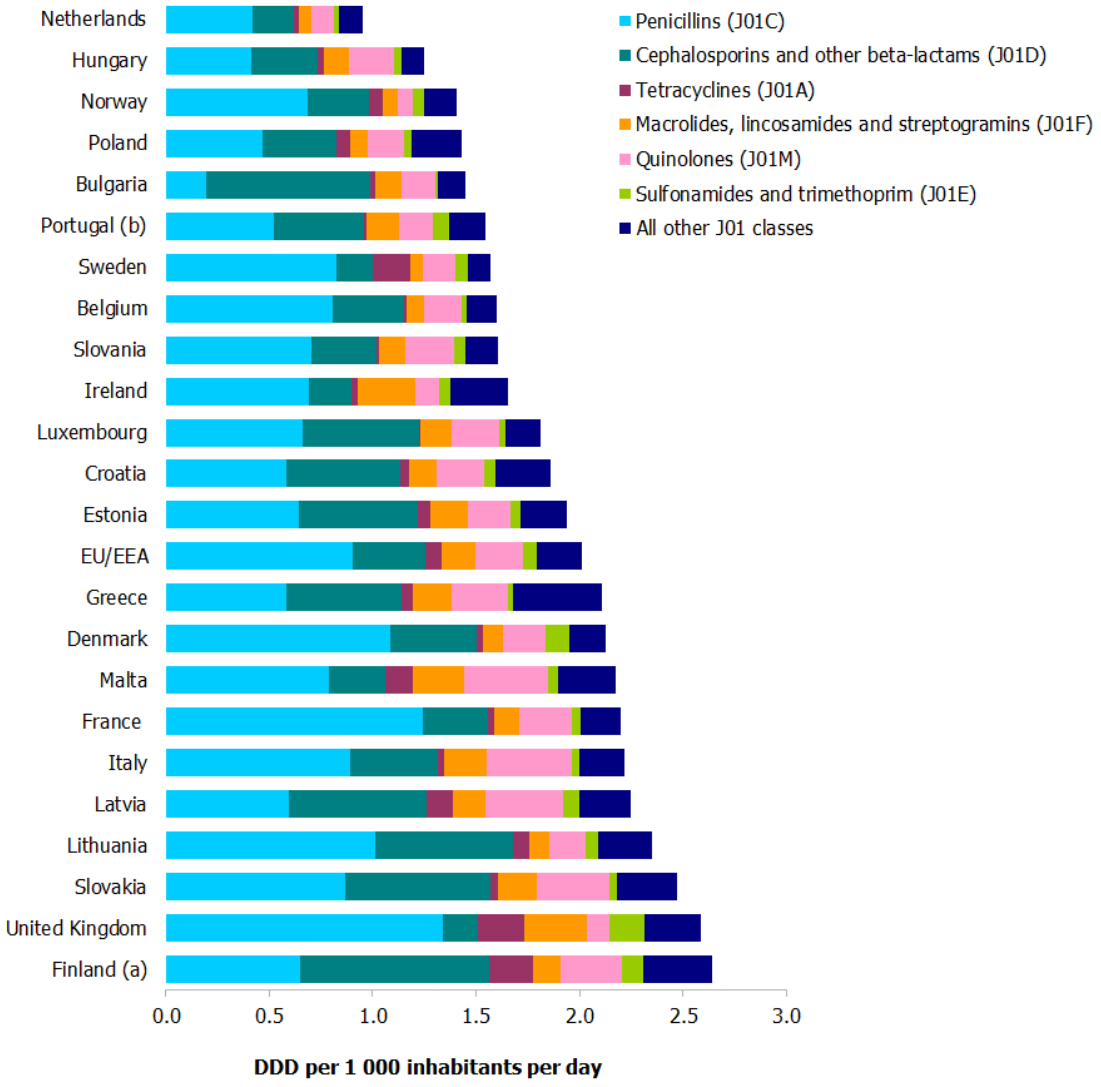
The proportion of tetracyclines (ATC group J01A) of the total consumption of antibacterials for systemic use (ATC group J01) ranged from 0.4% (Luxembourg) to 11.4% (Sweden).

The proportion of penicillins (ATC group J01C) ranged from 13.4% (Bulgaria) to 56.0% (France). In five countries (Belgium, Denmark, France, Sweden and the United Kingdom), the subgroup of penicillins with enzyme inhibitors (J01C) made up ≥50% of the total consumption of antibacterials for systematic use (ATC group J01).

The proportion of cephalosporins and other beta-lactams (ATC group J01D) was the highest in Bulgaria (54.8%), and the lowest in the United Kingdom (6.6%).

The proportion of sulfonamides and trimethoprim (ATC group J01E) ranged from 0.7% (Bulgaria) to 6.4% (the United Kingdom).

Figure 4.1. Consumption of antibacterials for systemic use (ATC group J01) in the hospital sector in EU/EEA countries, 2014, at group level 3, expressed as DDD per 1 000 inhabitants per day



(a) Finland: data include consumption in remote primary healthcare centres and nursing homes.

(b) Portugal: data refer to public hospitals. Population was adjusted accordingly based on hospital catchment area information provided by the country.

EU/EEA refers to the corresponding population-weighted mean consumption based on 23 countries that provided data.

The proportion of macrolides, lincosamides and streptogramins (ATC group J01F) ranged from 3.8% (Sweden) to 16.8% (Ireland).

The proportion of quinolone antibacterials (ATC group J01M) ranged from 4.3% (the United Kingdom) to 18.7% (Malta).

In 2014, the EU/EEA population-weighted mean consumption of penicillins with enzyme inhibitors (ATC group J01CR) was 0.5 DDD per 1 000 inhabitants per day and varied from 0.06 (Norway) to 0.8 (Slovakia) DDD per 1 000 inhabitants per day. Penicillins with enzyme inhibitors accounted for ≥75% of the consumption of penicillins (ATC group J01C) in eight countries (Bulgaria, Croatia, Greece, Hungary, Italy, Luxembourg, Portugal and Slovakia).

In 2014, consumption of carbapenems (ATC group J01DH) varied by a factor of 7, from 0.02 (the Netherlands) to 0.14 DDD per 1 000 inhabitants per day (Greece). Of antibacterials for systemic use (ATC group J01), the proportion of carbapenems (ATC group J01DH) ranged from 1.2% (Latvia) to 9.0% (Portugal), with an EU/EEA population-weighted mean of 2.9%.

In 2014, consumption of glycopeptide antibacterials (ATC group J01XA) varied from 0.01 (Bulgaria) to 0.1 (Ireland) DDD per 1 000 inhabitants per day. Of antibacterials for systemic use (ATC group J01), the proportion of glycopeptide antibacterials (ATC group J01XA) ranged from 0.6% (Lithuania) to 6.1% (Ireland), with an EU/EEA population-weighted mean of 2.3%.

Trends

Trends in the consumption of antibacterials for systemic use (ATC group J01) in the hospital sector from 2010 to 2014 are presented in Table 4.2 (see also Chapter 2.3 for trend analyses). The EU/EEA population-weighted mean consumption did not show any statistically significant change during the period. Among the 18 countries included in the trend analyses for the period 2010–2014, Belgium showed a statistically significant decreasing trend and Denmark a statistically significant increasing trend in consumption within the hospital sector for the whole group of antibacterials for systemic use (ATC group J01).

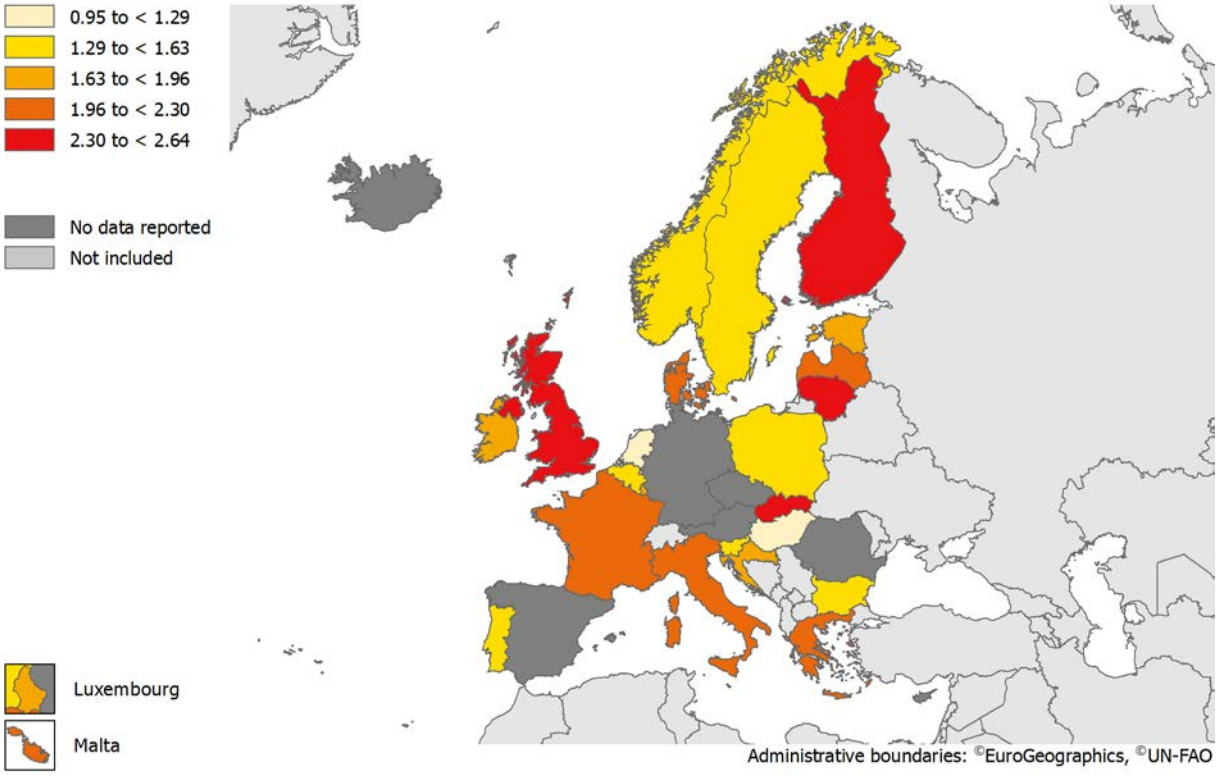
In addition, statistically significant trends in consumption within the hospital sector over the five-year period (2010–2014) were observed for six sub-groups of antibacterials for systemic use (ATC group J01) and for three selected subgroups at the fourth ATC group level. For all these trends, the EU/EEA population-weighted mean consumption is only mentioned when it showed a statistically significant change during the period.

- **Tetracyclines** (ATC group J01A)**:** consumption showed a statistically significant increase in Ireland and Norway, whereas Belgium showed a statistically significant decrease.
- **Beta-lactams, penicillins** (ATC group J01C): consumption showed a statistically significant increase in Denmark, Italy and Slovenia, whereas Belgium and Luxembourg showed a showed a statistically significant decrease. In the subgroup 'penicillins with enzyme inhibitors' (J01CR), consumption showed a statistically significant increase in seven countries (Denmark, Estonia, Finland, Italy, Norway, Portugal and Sweden), whereas in Belgium and the Netherlands there was a statistically significant decrease.
- **Other beta-lactam antibacterials** (ATC group J01D): consumption showed a statistically significant increase in Estonia and the Netherlands while three countries (Belgium, Norway and Slovenia) showed a statistically significant decrease.
  For the subgroup carbapenems (J01DH), the EU/EEA population-weighted mean consumption showed a statistically significant increase, as was the case in six countries (Bulgaria, Denmark, Hungary, Ireland, the Netherlands and Norway). No significant statistically significant decrease was reported.
- **Sulfonamides and trimethoprim** (ATC group J01E): consumption showed a statistically significant increase in Denmark and a statistically significant decrease in the Netherlands for the period 2010–2014.
- **Macrolides, lincosamides and streptogramins** (ATC group J01F): consumption showed a statistically significant change only in two countries: Belgium which reported a statistically significant increase and the Netherlands where there was a statistically significant decrease in consumption.
- **Quinolone antibacterials** (ATC group J01M): consumption did not show any statistically significant increase in any country included in the trend analysis for the period 2010–2014, but eight countries (Belgium, Denmark, Hungary, Ireland, Italy, Luxembourg, the Netherlands and Norway) showed a statistically significant decrease.
- **Other antibacterials** (ATC group J01X): consumption of glycopeptide antibacterials (J01XA) showed a statistically significant increase in four countries (Bulgaria, Estonia, the Netherlands and Norway). A statistically significant decrease was not reported for any country.

Figure 4.2 shows there is no geographical gradient of countries with a lower or higher consumption of antibacterials for systemic use (ATC group J01) within the hospital sector.

In 2014, the median consumption of antibacterials for systemic use (ATC group J01) was 2.0 DDD per 1 000 inhabitants per day, which was slightly higher than in recent years (Figure 4.3).

Figure 4.2 Consumption of antibacterials for systemic use (ATC group J01) in the hospital sector, EU/EEA countries, 2014, expressed as DDD per 1 000 inhabitants per day



Finland: data include consumption in remote primary healthcare centres and nursing homes.

Portugal: data refer to public hospitals. Population was adjusted accordingly based on hospital catchment area information provided by the country.

For more information on the map scales, see Chapter 2.3.

Table 4.2 Trends in consumption of antibacterials for systemic use (ATC group J01) within the hospital sector in EU/EEA countries, 2010–2014, expressed as DDD per 1 000 inhabitants per day

Country	2010	2011	2012	2013	2014	Trends in antimicrobial consumption, 2010–2014	Average annual change 2010–2014	Statistically significant trend
Netherlands	1.06	0.97	0.96	0.95	0.95		-0.02	
Hungary	1.36	1.22	1.23	1.20	1.25		-0.02	
Norway	1.44	1.47	1.44	1.39	1.41		-0.01	
Poland					1.43		N/A	
Bulgaria	1.45	1.45	1.40	1.41	1.45		0.00	
Portugal (b)	1.41	1.45	1.46	1.64	1.55		0.05	
Sweden	1.51	1.60	1.65	1.67	1.57		0.02	
Belgium	2.02	2.02	1.72	1.67	1.60		-0.12	↓
Slovenia	1.72	1.66	1.56	1.55	1.61		-0.03	
Ireland	1.78	1.79	1.76	1.79	1.66		-0.03	
Luxembourg	2.08	2.02	2.02	2.00	1.81		-0.06	
Croatia	1.82	1.88	1.98	1.80	1.86		0.00	
Estonia	1.84	1.86	2.11	1.91	1.94		0.02	
EU/EEA	**1.86**	**1.96**	**1.98**	**2.05**	**2.01**		**0.04**	
Greece		2.18	2.09	2.00	2.11		N/A	
Denmark	1.75	1.74	1.78	2.02	2.13		0.10	↑
Malta	1.97	1.67	1.44	1.75	2.18		0.05	
France	2.23	2.12	2.12	2.17	2.20		<0.01	
Italy	2.18	2.32	2.46	2.23	2.22		0.00	
Latvia	3.16	2.39	2.27	2.30	2.25		-0.19	
Lithuania			2.39	2.38	2.35		N/A	
Slovakia			2.02	2.30	2.47		N/A	
United Kingdom				2.45	2.59		N/A	
Finland (a)	2.83	3.09	2.79	2.77	2.64		-0.07	

EU/EEA refers to the corresponding population-weighted mean consumption.

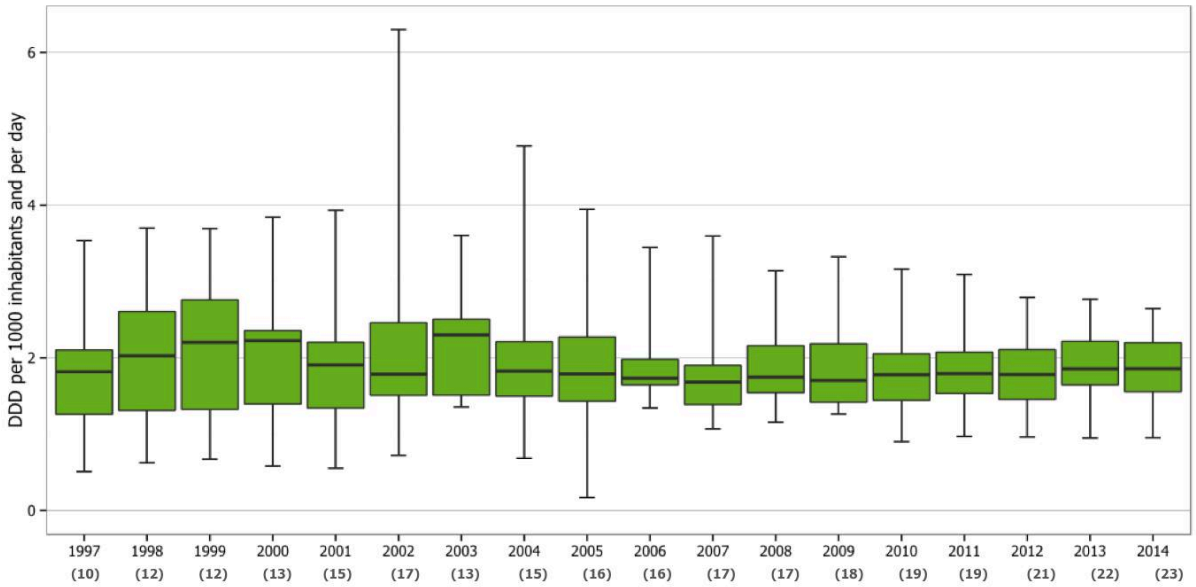
(a) Finland: data include consumption in remote primary healthcare centres and nursing homes.

(b) Portugal: data refer to public hospitals. Population was adjusted accordingly based on hospital catchment area information provided by the country.

N/A = not applicable; linear regression was not applied due to missing data, changes in the type of data or changes of sector for which data were reported (community versus total care data) between 2010 and 2014.

The symbols ↑ and ↓ indicate statistically significant increasing and decreasing trends, respectively.

Figure 4.3 Trends and inter-country variations of consumption of antibacterials for systemic use (ATC group J01) in the hospital sector, EU/EEA countries, 1997–2014, expressed as DDD per 1 000 inhabitants per day



Boxes indicate the lower and upper quartiles. The bold lines indicate the medians. Whiskers indicate the minimum and maximum values. For 1997–2009, data are only included from ESAC countries that also participated in ESAC-Net in 2014. The number of participating countries is shown in parentheses.

Discussion

In 2014, the pattern of consumption of antibacterials for systemic use (ATC group J01) in the hospital sector was the same as in 2013. In contrast to consumption in the community (primary care), consumption in the hospital sector does not show a clear geographical gradient, and the mean consumption has remained at about the same level since 2004. In line with this observation is the finding that only two countries showed a statistically significant trend over the five-year period 2010–2014.

Distribution of consumption of antibacterials for systemic use (ATC group J01) between subgroups at the third ATC group level did not change from 2013 to 2014. Consumption of penicillins (ATC group J01C) and other beta-lactam antibacterials (ATC group J01D, including cephalosporins) accounted for two thirds of the total consumption of antibacterials for systemic use (ATC group J01).

However, a substantial number of countries showed a statistically significant increase in the consumption of last-line antibacterials such as carbapenems (ATC group J01DH) or glycopeptides (ATC group J01XA) between 2010 and 2014. At EU/EEA level this statistically significant increasing trend in the EU/EEA population-weighted mean was observed for the last-line antibacterials - carbapenems.

In Finland, data from the hospital sector include consumption in remote primary healthcare centres and nursing homes, which results in a higher consumption rate than most other countries (Tables 4.1, 4.2 and A.2, and Figure 4.1).

4.2 Consumption of antibacterials for systemic use (A07, J04 and P01AB)

Results

Table 4.3 displays consumption of orally administered vancomycin (A07AA09), rifampicin (J04AB02), and oral/rectal administration of metronidazole (P01AB01) for the years 2013 and 2014.

In 2014, the hospital consumption of oral vancomycin (ATC A07AA09) reported from nine countries ranged from 0.0002 DDD per 1 000 inhabitants per day in Ireland and Malta, to a maximum of 0.01 DDD per 1 000 inhabitants per day in Denmark.

In 2014, oral and rectal nitroimidazole consumption in hospitals was reported by 20 countries ranging from <0.016 DDD per 1 000 inhabitants per day in Estonia to 0.16 in Lithuania. Metronidazole represented almost 100% of all nitroimidazole derivatives in the reporting countries.

Oral rifampicin (ATC J04AB02) consumption in 2014, reported in 21 countries, ranged from a minimum of <0.01 DDD per 1 000 inhabitants per day in the United Kingdom to a maximum of 0.19 DDD per 1 000 inhabitants per day in Latvia.

Table 4.3 Consumption of oral vancomycin* (A07AA09), rifampicin (J04AB02), and metronidazole (P01AB01) in the hospital sector, EU/EEA countries, 2013 and 2014, expressed as DDD per 1 000 inhabitants per day

Country	Vancomycin* (A07AA09)		Metronidazole (P01AB01)		Rifampicin (J04AB02)	
	2013	2014	2013	2014	2013	2014
Belgium	0	0	0.01	0	0.01	0.01
Bulgaria	0	0	<0.01	0	0.14	0.09
Croatia	0	0	0.02	0.02	0	0.03
Denmark	0.0105	0.0108	0.05	0.04	0.06	0.06
Estonia	0	0	0	0	<0.01	0.02
Finland	0.0041	0.0047	0.06	0.06	0.07	0.05
France	0	0	0.03	0.03	0.05	0.04
Greece	0	0.0031	0.01	0.02	0.01	0.01
Hungary	0	0	0.04	0.05	0.04	0.05
Ireland	0.0002	0.0002	0.02	0.02	0	0
Italy	0	0.0001	0.01	0.01	0.03	0
Latvia	0	0	0.03	0.03	0.15	0.19
Lithuania	0	0	<0.01	<0.01	0.16	0.15
Luxembourg	0	0	0.01	0.02	0.02	0.02
Malta	0.0002	0.0003	0.04	0.03	0.01	0.02
Netherlands	0	0	0	0	N/A	N/A
Norway	0.0006	0.0006	0.02	0.02	0.01	0.01
Poland	0	0	0	0.03	0	0.03
Portugal	0	0	0.01	0.01	0.03	0.02
Slovakia	0	0	0	0.03	0.01	0.01
Slovenia	0	0	0.01	0.01	0.04	0.03
Sweden	0.0014	0.0014	0.03	0.03	0.03	0.04
United Kingdom	0.0014	0.0014	0.06	0.06	0	<0.01
EU/EEA	**0.0009**	**0.001**	**0.02**	**0.02**	**0.04**	**0.04**

** oral vancomycin (ATC A07AA09) used as a non-absorbable intra-intestinal anti-infective.*

EU/EEA refers to the corresponding population-weighted mean consumption based on the countries that provided data.

Discussion

Although these data have been collected since 1997, this is the first time they are being reported both in the community and hospital sector. As expected, consumption of oral forms of these drugs is very low and higher in the community than in hospitals (see Chapter 3.1.9)

By default, ESAC-Net reports consumption data of the ATC group J01 for comparisons between countries only down to the fourth ATC group level. The three drugs (5th ATC group level) were reported under ESAC-Net surveillance to find out if non-J01 antimicrobials are used to any extent. For 2013 and 2014, only low consumption was reported.

4.3. Consumption of antimycotics and antifungals for systemic use (ATC groups J02 and D01B)

Results

In 2014, 21 countries reported data on consumption of antimycotics and antifungals for systemic use (ATC groups J02 & D01B) in the hospital sector (Table 4.4, Figure 4.4). The Netherlands and the United Kingdom reported on the consumption of antibacterials for systemic use (ATC group J01), but not on antimycotics or antifungals.

The EU/EEA population-weighted mean consumption was 0.11 DDD per 1 000 inhabitants per day. Consumption varied by a factor of eight from 0.03 DDD per 1 000 inhabitants per day (Lithuania) to 0.24 DDD per 1 000 inhabitants per day (Ireland).

In 2014, amphotericin B (J02AA01) and fluconazole (J02AC01) accounted for 68% of the total consumption of antimycotics and antifungals for systemic use in the hospital sector in the reporting countries. Fluconazole consumption, as a proportion of the total, varied from 28% (Malta) to 84% (Latvia). It made up more than 50% of the total consumption in 17 (81%) reporting countries.

For Malta, no consumption was reported for ATC group D01B as terbinafine is not on the Government Hospital Formulary List.

Table 4.4 Consumption of antimycotics (ATC group J02) and antifungals (ATC group D01B) for systemic use in the hospital sector, EU/EEA countries, 2014, expressed as DDD per 1 000 inhabitants per day

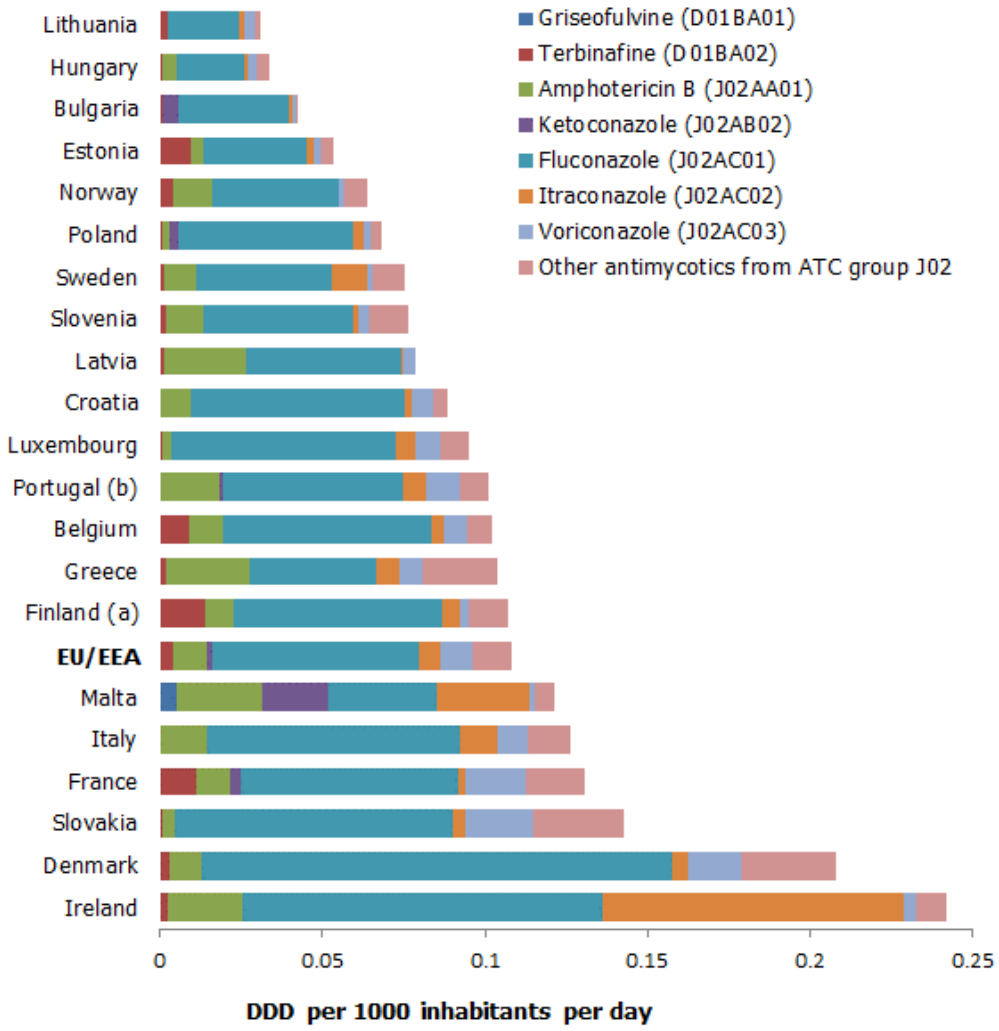
Country	Griseofulvine (D01BA01)	Terbinafine (D01BA02)	Amphotericin B (J02AA01)	Ketoconazole (J02AB02)	Fluconazole (J02AC01)	Itraconazole (J02AC02)	Voriconazole (J02AC03)	Other antimycotics for systemic use	Total (J02 & D01B)
Belgium	0	0.01	0.01	<0.01	0.06	0.00	0.01	0.01	0.10
Bulgaria	0	<0.01	0	0.01	0.03	0.00	0.00	0.00	0.04
Croatia	0	<0.01	0.01	0	0.07	0.00	0.01	0.00	0.09
Denmark	0	<0.01	0.01	0	0.14	0.01	0.02	0.03	0.21
Estonia	<0.01	0.01	0.00	0	0.03	0.00	0.00	0.00	0.05
Finland (a)	0	0.01	0.01	0	0.06	0.01	0.00	0.01	0.11
France	0	0.01	0.01	0.00	0.07	0.00	0.02	0.02	0.13
Greece	0	<0.01	0.03	0.00	0.04	0.01	0.01	0.02	0.10
Hungary	0	<0.01	0.00	0	0.02	0.00	0.00	0.00	0.03
Ireland	0	<0.01	0.02	<0.01	0.11	0.09	0.00	0.01	0.24
Italy	<0.01	<0.01	0.01	0	0.08	0.01	0.01	0.01	0.13
Latvia	0	<0.01	0.03	0	0.05	0.00	0.00	0.00	0.08
Lithuania	0	<0.01	0	0	0.02	0.00	0.00	0.00	0.03
Luxembourg	0	<0.01	0.00	0	0.07	0.01	0.01	0.01	0.10
Malta	<0.01	0.00	0.03	0.02	0.03	0.03	0.00	0.01	0.12
Norway	0	<0.01	0.01	<0.01	0.04	<0.01	0.00	0.01	0.06
Poland	0	<0.01	0.00	0.00	0.05	0.00	0.00	0.00	0.07
Portugal (b)	0	<0.01	0.02	0.00	0.06	0.01	0.01	0.01	0.10
Slovakia	0	<0.01	0.00	0	0.09	0.00	0.02	0.03	0.14
Slovenia	0	<0.01	0.01	0	0.05	0.00	0.00	0.01	0.08
Sweden	0	<0.01	0.01	0	0.04	0.01	0.00	0.01	0.08
EU/EEA	**<0.01**	**<0.01**	**0.01**	**0.00**	**0.06**	**0.01**	**0.01**	**0.01**	**0.11**

(a) Finland: data include consumption in remote primary healthcare centres and nursing homes.

(b) Portugal: data refer to public hospitals. Population was adjusted accordingly based on hospital catchment area information provided by the country.

EU/EEA refers to the corresponding population-weighted mean consumption based on the 21 countries that provided data.

Figure 4.4 Consumption of antimycotics and antifungals for systemic use (ATC groups J02 & D01B) in the hospital sector, EU/EEA countries, 2014, expressed as DDD per 1 000 inhabitants per day



(a) Finland: data include consumption in remote primary health care centres and nursing homes.

(b) Portugal: data refer to public hospitals. Population was adjusted accordingly based on hospital catchment area information provided by the country.

EU/EEA refers to the corresponding population-weighted mean consumption based on the 21 countries that provided data.

Trends

The analysis of trends in hospital consumption of antimycotics and antifungals for systemic use (ATC groups J02 & D01B) during 2010–2014 included 16 countries. The EU/EEA population-weighted mean consumption showed no statistically significant trend during the period. Consumption showed a statistically significant increasing trend for Bulgaria and Norway and a statistically significant decreasing trend for Belgium and Luxembourg.

Discussion

The pattern of consumption of antimycotics and antifungals for systemic use in the hospital sector was different from the community pattern. In the hospital sector, the prevailing substance was fluconazole, as opposed to terbinafine in the community.

In 2014, ketoconazole consumption in the hospital sector decreased and more than 50% of the countries did not report any consumption following the recommendation from EMA's CHMP in 2013 that the marketing authorisations of oral medicinal products containing ketoconazole should be suspended throughout the EU (see Chapter 3.2).

The number of substances consumed in the hospital sector was also higher than in the community, probably due to a broader diversity of infections and pathogens and a different case mix of patients. However, the ratio of antimycotics and antifungals for systemic use over antibacterials for systemic use were similar (5% for the hospital sector and 6% for the community sector).

5. Consumption of antivirals for systemic use (ATC group J05) in both the community and the hospital sector

Results

Twenty-six countries reported data on antivirals for systemic use (ATC group J05). The data are presented together for the community and the hospital sector (Tables 5.1, 5.2, and Figure 5.1). Austria, the Czech Republic, Germany, Iceland and the Netherlands only reported data on consumption of antivirals for systemic use (ATC group J05) in the community.

The total EU/EEA population-weighted mean consumption of antivirals for systemic use (ATC group J05) was 2.40 DDD per 1 000 inhabitants per day. Consumption showed a 34-fold difference, from 0.15 DDD per 1 000 inhabitants per day (Croatia) to 5.19 DDD per 1 000 inhabitants per day (Portugal).

The EU/EEA population-weighted mean consumption in the reporting countries was highest for antivirals for treatment of HIV infections, combinations (ATC group J05AR) (0.77 DDD per 1 000 inhabitants per day). Nucleosides and nucleotides excluding reverse transcriptase inhibitors (ATC group J05AB) and nucleoside and nucleotide reverse transcriptase inhibitors (ATC group J05AF) were the second most commonly used groups, accounting for 0.32 and 0.44 DDD per 1 000 inhabitants per day, respectively.

Table 5.2 and Figure 5.1 show the distribution of total consumption of antivirals for systemic use (ATC group J05) into seven categories based on their main indication: 'HIV/AIDS antivirals' 'HIV/hepatitis B antivirals', 'hepatitis B antivirals', 'hepatitis C antivirals', 'herpes antivirals', 'influenza antivirals', and one group for remaining substances (see Annex 1).

The EU/EEA population-weighted mean consumption of HIV/AIDS antivirals accounted for 63% of the total consumption of antivirals for systemic use (ATC group J05) in the reporting countries. The relative consumption of HIV/AIDS antivirals out of the total antiviral consumption ranged from 2% (Malta) to 88.6% (Estonia).

Cyprus reported the highest proportion of HIV/hepatitis B antivirals consumed (27.2%) and Greece reported the highest proportion of hepatitis B antivirals (18.5%) consumed.

The proportion of hepatitis C antivirals consumed of the total consumption of antivirals for systemic use (ATC group J05) ranged from 0.3% (the Netherlands) to 12.3% (Latvia). In 2014, direct acting antivirals (DAA) were under surveillance within this group and half of the countries reported consumption.

For herpes antivirals, the proportion of total consumption of antivirals for systemic use (ATC group J05) ranged from 0.03% (Italy) to 97.5% (Iceland).

In 2014, the EU/EEA population-weighted mean consumption for oseltamivir (ATC code J05AH02) was 0.009 DDD per 1 000 inhabitants per day. The highest consumption of oseltamivir was 0.04 DDD per 1 000 inhabitants per day in Finland, where it accounted for 3.5% of the total consumption of antivirals for systemic use (ATC J05).

Bulgaria, Hungary, Poland and Romania showed a different pattern, with the highest consumption being of other antivirals (ATC groups J05AC, J05AD, J05AX).

Table 5.1 Total consumption of antivirals for systemic use (ATC group J05) in both sectors (community and hospital sector), EU/EEA countries, 2014, expressed as DDD per 1 000 inhabitants per day

Country	Nucleosides and nucleotides excl. reverse transcriptase inhibitors (ATC group J05AB)	Protease inhibitors (ATC group J05AE)	Nucleoside and nucleotide reverse transcriptase inhibitors (ATC group J05AF)	Non-nucleoside reverse transcriptase inhibitors (ATC group J05AG)	Neura-minidase inhibitors (ATC group J05AH)	Antivirals for treatment of HIV infections, combinations (ATC group J05AR)	Other antivirals (ATC groups J05AC, J05AD, J05AX)	Total (ATC group J05)
Austria (a)	0.40	0.16	0.21	0.11	0.03	0.22	0.14	1.27
Belgium	0.12	0.39	0.21	0.23	0.01	0.93	0.10	1.98
Bulgaria	0.10	0.04	0.22	0.02	0.04	0.11	0.60	1.13
Croatia	0.12	<0.01	0.03	0	<0.01	<0.01	<0.01	0.15
Cyprus	0.22	0.12	0.38	0.11	0.01	0.26	0.03	1.12
Czech Republic(a)	0.28	0.03	0.14	0.02	<0.01	0.12	0.11	0.71
Denmark	0.55	0.27	0.41	0.18	<0.01	0.26	0.11	1.78
Estonia	0.32	0.55	0.02	0.79	0.02	1.49	0.08	3.26
Finland	0.47	0.12	0.06	0.06	0.04	0.38	0.07	1.22
France	0.71	0.59	0.48	0.34	0.02	1.46	0.36	3.95
Germany (a)	0.24	0.18	0.29	0.14	<0.01	0.64	0.18	1.68
Greece	0.30	0.20	0.98	0.06	0.04	0.50	0.09	2.15
Hungary	0.19	0.05	0.15	0.04	<0.01	0.08	0.24	0.76
Iceland (a)	0.44	0	0	0	0.01	0	0	0.45
Italy	0	0.52	0.63	0.24	<0.01	0.89	<0.01	2.28
Latvia	0.29	0.14	0.18	0.27	0.01	0.49	0.35	1.73
Lithuania	0.14	0.01	0.07	0.05	0.02	0.22	<0.01	0.51
Luxembourg	0.37	0.22	0.30	0.16	<0.01	1.04	0.19	2.27
Malta	0.21	0	0.03	<0.01	<0.01	<0.01	0	0.24
Netherlands (a)	0.25	0.27	0.28	0.30	0	1.00	0.09	2.18
Norway	0.28	0.25	0.12	0.06	0.01	0.63	0.10	1.44
Poland	0.29	0.04	0.21	0.01	<0.01	<0.01	0.79	1.34
Portugal	0.32	1.05	0.82	0.96	<0.01	1.67	0.35	5.19
Romania	0.27	0.31	0.61	0.12	<0.01	0.48	0.23	2.03
Slovenia	0.23	0.06	0.15	0.07	0.02	0.08	0.02	0.63
Sweden	0.45	0.21	0.16	0.12	<0.01	0.53	0.11	1.60
EU/EEA	**0.32**	**0.38**	**0.44**	**0.21**	**0.01**	**0.77**	**0.27**	**2.40**

(a) Austria, the Czech Republic, Germany, Iceland and the Netherlands only reported consumption data from the community.

EU/EEA refers to the corresponding population-weighted mean consumption based on the 26 countries that provided data.

Table 5.2 Total consumption of antivirals for systemic use (ATC group J05) from both sectors (community and hospital sector), EU/EEA countries, grouped by main indication, adapted from [3] (see Annex 1), 2014, expressed as DDD per 1 000 inhabitants per day

Country	HIV/AIDS antivirals	HIV/hepatitis B antivirals	Hepatitis B antivirals	Hepatitis C antivirals	Herpes antivirals	Influenza antivirals	Other antivirals	Total (ATC group J05)
Austria (a)	0.61	0.16	0.04	0.06	0.36	0.03	0	1.27
Belgium	1.66	0.13	0.05	0.01	0.10	0.01	<0.01	1.98
Bulgaria	0.19	0.17	0.05	0.03	0.07	0.04	0.59	1.13
Croatia	0	0.03	<0.01	0.01	0.11	<0.01	<0.01	0.15
Cyprus	0.55	0.31	0.04	0.03	0.19	0.01	0	1.12
Czech Republic (a)	0.20	0.09	0.05	0.08	0.20	<0.01	0.09	0.71
Denmark	0.81	0.35	0.04	0.03	0.54	<0.01	0	1.78
Estonia	2.89	0.01	<0.01	0.16	0.18	0.02	0	3.26
Finland	0.65	0.05	<0.01	0.03	0.45	0.04	0	1.22
France	2.80	0.26	0.16	0.05	0.66	0.02	0.01	3.95
Germany (a)	1.13	0.17	0.10	0.06	0.21	<0.01	0	1.68
Greece	0.86	0.56	0.40	0.06	0.24	0.04	0	2.15
Hungary	0.17	0.12	0.03	0.09	0.13	<0.01	0.22	0.76
Iceland (a)	0	0	0	0	0.44	0.01	0	0.45
Italy	1.66	0.34	0.26	0.02	0.00	<0.01	0	2.28
Latvia	0.99	0.10	<0.01	0.21	0.08	0.34	0.01	1.73
Lithuania	0.28	0.03	0.05	0.03	0.11	0.02	<0.01	0.51
Luxembourg	1.60	0.16	0.11	0.07	0.33	<0.01	0.01	2.27
Malta	0.01	0.03		0.02	0.19	<0.01	0	0.24
Netherlands (a)	1.68	0.16	0.10	0.01	0.24	0	0	2.18
Norway	1.02	0.06	0.04	0.07	0.24	0.01	<0.01	1.44
Poland	0.04	0.05	0.16	0.03	0.27	<0.01	0.78	1.34
Portugal	4.22	0.47	0.16	0.09	0.24	<0.01	<0.01	5.19
Romania	1.02	0.18	0.37	0.17	0.10	<0.01	0.18	2.03
Slovenia	0.23	0.04	0.11	0.04	0.20	0.02	0	0.63
Sweden	0.96	0.09	0.06	0.05	0.43	<0.01	0	1.60
EU/EEA	**1.51**	**0.23**	**0.18**	**0.05**	**0.28**	**0.01**	**0.15**	**2.40**

(a) Austria, the Czech Republic, Germany, Iceland and the Netherlands only reported consumption data from the community.

EU/EEA refers to the corresponding population-weighted mean consumption based on the 26 countries that provided data.

Discussion

In contrast to the consumption of antibacterials for systemic use (ATC group J01) and antimycotics and antifungals for systemic use (ATC groups J02 & D01B), for which results are presented separately for each of the two healthcare sectors, consumption of antivirals for systemic use (ATC group J05) is presented for both sectors grouped together. A comparison of the European consumption of antivirals within one single sector would be less useful as the patterns of distribution for total consumption of antivirals differ considerably among countries [17]. In some countries, the dispensing of certain antiviral classes is limited to the hospital sector. The reported total consumption of antivirals for systemic use (ATC group J05) in Austria, the Czech Republic, Germany, Iceland and the Netherlands is an underestimate since these countries did not report data on consumption in the hospital sector.

Within the ATC groups of antimicrobials for systemic use (ATC groups J01, J02 & D01B, and J05), antivirals for systemic use (ATC group J05) showed the highest variation between countries. As shown with antibacterials for systemic use (ATC group J01), future data analysis may highlight certain socioeconomic or structural determinants that would explain these variations [18].

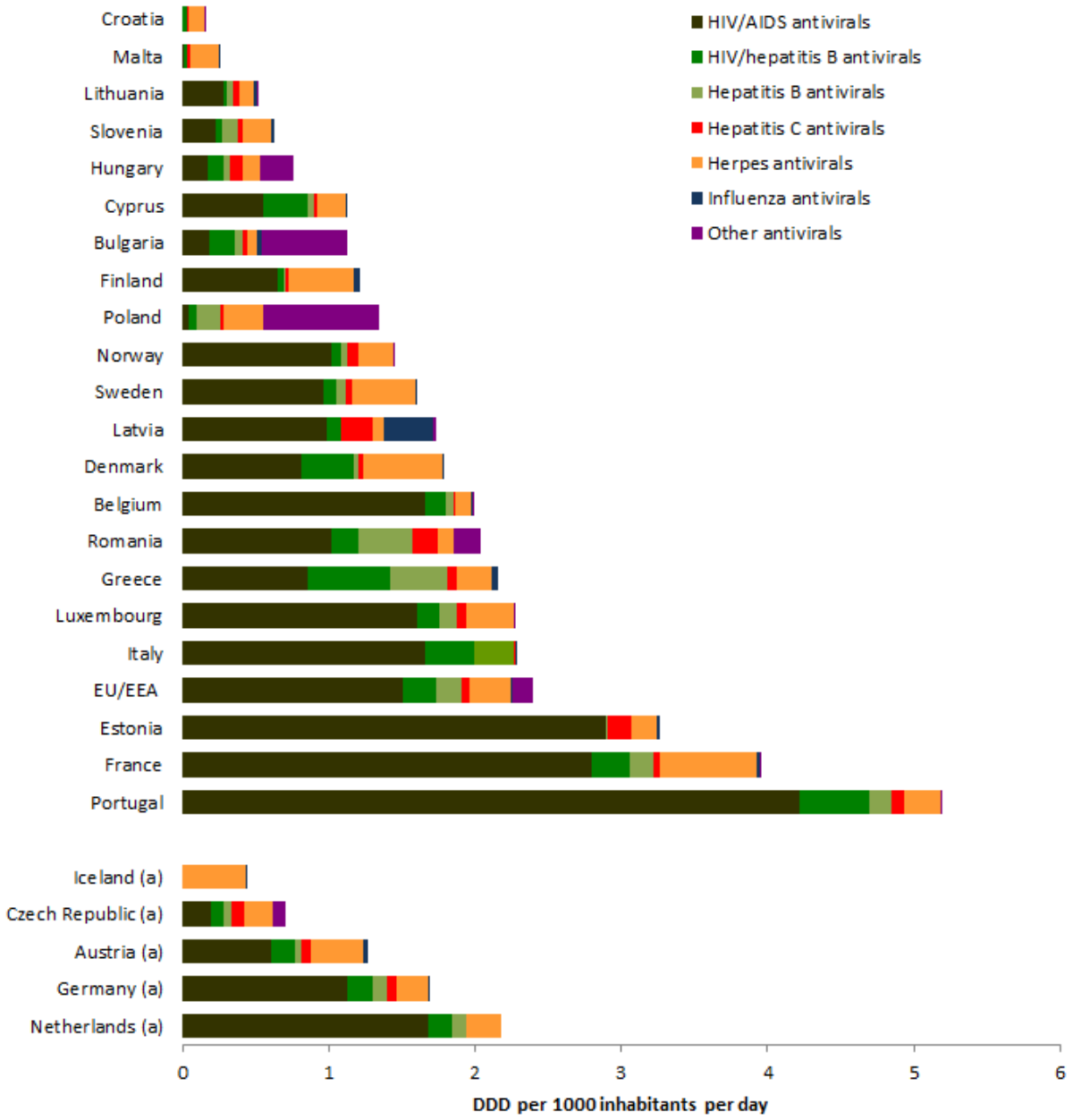
Following a suggestion from the ESAC project [3] to allocate the actual substances from the ATC classification into seven groups according to their main indication, this proposed classification was adopted by ESAC-Net to allow a more clinically relevant description of the consumption of antivirals for systemic use (Annex 1). The group 'HIV/AIDS antivirals' accounted for more than half of the total European consumption of antivirals for systemic use (ATC J05) and therefore consumption of this group is a major determinant of inter-country variations.

In 2014, new direct-acting antivirals (DAAs) (i.e. simeprevir (J05AE14), daclatasvir (J05AX14) and sofosbuvir (J05AX15)) to treat HCV infections were licensed for use in Europe and consumption has already been reported from half of the countries reporting antiviral consumption of DAAs for the first time.

A different pattern in the consumption of antivirals for systemic use is reported in four countries (Bulgaria, Hungary, Poland and Romania). High consumption of Inosine pranobex (ATC group J05AX05), prescribed for the treatment of influenza-like syndrome or acute viral respiratory infections, could explain the high proportion of consumption from the other antivirals group for these countries.

Since antivirals are often used for the treatment of long-lasting infections similar to chronic diseases, data on consumption of antivirals may be interpreted differently to data on consumption of antibacterials. The large inter-country variation in the total consumption of antivirals for systemic use (ATC group J05) may reflect the burden of viral infections rather than overuse or misuse, as might be the case for antibacterials. For example, using data from 2008, the ESAC project showed a significant correlation between consumption of HIV/AIDS antivirals and the number of HIV/AIDS patients [3]. However, further analysis is needed to better understand variations in consumption of HIV/AIDS antivirals across Member States. High consumption of antivirals could also be due to the successful implementation of national strategies to improve the identification and treatment of patients with viral infections such as HIV.

Figure 5.1 Total consumption of antivirals for systemic use from both sectors (A) (community and hospital sector) and from the community only (B) (ATC group J05), EU/EEA countries, grouped into categories according to their main indication, 2014, expressed as DDD per 1 000 inhabitants per day



EU/EEA refers to the corresponding population-weighted mean consumption based on the 26 countries that provided data, adapted from [3] (see Annex 1).

6. General discussion and perspectives

European countries have increasingly implemented actions to control antimicrobial resistance in the community and in hospitals through rational use of antimicrobials, including awareness campaigns on the prudent use of antibiotics. Data provided by ESAC-Net reports for EU/EEA countries have been instrumental in the evaluation of such campaigns at national level [11, 19, 23].

ESAC-Net encourages all network participants to report national antimicrobial consumption data at the medicinal product level by providing national registry data and the number of sold or reimbursed packages for each product. This is the preferred format for reporting data to ESAC-Net as it allows for internal data validation and further analyses. For instance, the national registries include information on the number of individual products available on the market, which has been shown to be associated with the level of consumption [20]. In this report, as in the two previous reports, two thirds of the reporting countries used this preferred format to report data. In addition, four countries (Croatia, Denmark, Iceland and Slovenia) provided data on community consumption stratified by age group and number of packages consumed [17]. If more EU/EEA countries reported data stratified by age and number of packages consumed, it would be possible to identify the high consumers of certain antimicrobials in subgroups of the population. Such differences and trends could provide targets for more specific interventions aimed at a more prudent use of antimicrobials in particular age groups.

Quality of antimicrobial consumption data also depends on the type of data available for a given sector. For ESAC-Net, countries provide sales and/or reimbursement data with advantages and limitations. The major limitation of reimbursement data is the lack of information on antimicrobials dispensed without a prescription and antimicrobials that are prescribed but not reimbursed [12]. For this reason, countries that report reimbursement data and are known to have a substantial proportion of antimicrobials dispensed without a prescription or prescribed but not reimbursed, are indicated as such in the tables and figures in this report. ESAC-Net will continue the joint analysis of sales and reimbursement data. A change of data provider and/or type of data could also introduce bias in the consumption rates reported. However, the number of countries changing data provider and/or types of data each year is small. In 2013 and 2014, there was only one such change for the community: Portugal changed from sales to reimbursement data. There were no changes in reporting from data sources for the hospital sector or total care.

A standardised reporting protocol is essential to ensure comparability, not only between countries within ESAC-Net, but also for comparisons with other multinational surveillance networks. The ESAC-Net reporting protocol was built upon the former ESAC project. WHO's Regional Office for Europe established an antimicrobial consumption network collecting total care data (community and hospital sector combined) from non-EU/EEA, southern and eastern European countries (including Switzerland and Russia) [21]. These countries applied the same reporting protocol as ESAC-Net, thus enabling comparisons of antimicrobial consumption with the EU/EEA. Additionally, WHO's Essential Medicines and Health Products Department at WHO Headquarters, Geneva recently developed the first version of a simplified antimicrobial consumption surveillance protocol [24]. This protocol is to be implemented within the framework of the Global Action Plan on Antimicrobial Resistance [7] in countries which do not have appropriate surveillance in place. The protocol largely uses the structure of the ESAC-Net protocol and may help to generate comparable antimicrobial consumption data from outside the EU in the future.

In 2014, consumption of antibacterials for systemic use (ATC group J01) in the community in Europe varied considerably among countries with a north-to-south gradient. There are many reasons for these large differences, some of them cultural [22]. According to this report, the EU/EEA population-weighted mean consumption of antibacterials for systemic use (ATC group J01) in the community did not increase significantly during the period 2010–2014. During the five-year period only one country showed a significant increasing trend and two countries showed a significant decreasing trend. However, the trend analyses of subgroups of antibacterials for systemic use revealed significant trends in the consumption of penicillins in more than half of the countries included in the analyses. This may indicate a shift in consumption of beta-lactamase-sensitive penicillins towards consumption of broad-spectrum antimicrobials – i.e. combinations of penicillins including beta-lactamase inhibitors (ATC group J01CR).

A second antimicrobial consumption indicator - 'packages per 1 000 inhabitants per day' - is applied to community consumption of orally administered antibacterials for systemic use (ATC group J01) in 21 countries. The changes in the ranking positions of some countries compared with their ranking when reporting 'DDD per 1 000 per inhabitants per day' indicate the usefulness of having more than one indicator to describe antimicrobial consumption in EU/EEA countries. For countries dispensing complete packages for community prescriptions, consumption data expressed in 'packages per 1 000 inhabitants per day' might be a valuable measurement unit to assess national trends in prescribed antibacterial agents when prescription data are not available. The measurement is also useful for assessing the impact of antibiotic awareness campaigns on antimicrobial consumption [4].

The former ESAC project developed and published 12 quality indicators for antimicrobial consumption in the community, based on a consensus of European antimicrobial surveillance experts [2]. Data on these consensus-based quality indicators are reported by ESAC-Net but, as stated in the report summary, comparisons between

countries should be made with caution. Nevertheless, healthcare professionals and policy makers could use these indicators to monitor progress towards a more prudent use of antibiotics in the community.

Reliable national data on antimicrobial consumption are paramount for our understanding of the epidemiology of antimicrobial resistance because they provide information on the ecological selection pressure due to antimicrobial use. Settings (i.e. countries, regions or hospitals) reporting high consumption generally also have a higher level of antimicrobial resistance than settings reporting low consumption. Healthcare-associated infections with gram-negative bacteria that have become resistant to multiple agents, including last-line antimicrobials such as carbapenems and polymyxins, are now prevalent within hospitals in some EU/EEA countries. At individual hospital level, specific antimicrobial resistance problems are reported depending on the patient case-mix, varying infection prevention and control practices, and antimicrobial prescribing practices. There is a need to improve surveillance of antimicrobial consumption at the individual hospital level in EU/EEA countries.

For the time being, ESAC-Net uses the same metric (i.e. DDD per 1 000 inhabitants per day) to report antimicrobial consumption in the community and in the hospital sector. Development of a specific module for hospital-level surveillance of antimicrobial consumption is the next challenge for ESAC-Net. A protocol to collect consumption data at hospital level by using additional denominators for hospital consumption is currently being pilot tested. Such developments should enable the identification of areas for improvement, which could be addressed by national, regional and local antimicrobial stewardship programmes. The introduction of a unique hospital identifier for data reporting would allow hospital antimicrobial consumption data from ESAC-Net to be linked with antimicrobial resistance data from the European Antimicrobial Resistance Surveillance Network (EARS-Net), as well as data on healthcare-associated infections from the Healthcare-Associated Infections Surveillance Network (HAI-Net).

Since the beginning of antimicrobial consumption surveillance in Europe, the ESAC project and later ESAC-Net have collected consumption data for antimicrobials belonging to other ATC groups. For the first time in 2013 and 2014, consumption data were reported for rifampicin (ATC group J04AB02). Rifampicin is assigned to the ATC group for the treatment of tuberculosis but also used for the treatment and prophylaxis of bacterial infections, consumption of oral and rectal nitroimidazole derivates as antiprotozoals (ATC group P01AB), and oral vancomycin (ATC A07AA09) used as a non-absorbable intra-intestinal anti-infective. The results show that these groups are mostly used in the community. Consumption rates are still very low, but due to the specific indications (i.e. *Clostridium difficile* infections), it is still relevant to monitor their use.

Unlike the consumption of antibacterials for systemic use (ATC group J01) and antimycotics and antifungals for systemic use (ATC groups J02 & D01B), for which results are stratified by patient care sector, consumption of antivirals for systemic use (ATC group J05) was reported for both sectors grouped together. While the majority of antimicrobials in the ATC groups J01 and J02 & D01B are consumed in the community, the largest consumption of antivirals may take place in the community or in the hospital sector, depending on the country. In several countries, the dispensing of certain groups of antivirals is limited to the hospital sector, although patients may be treated in the community. To some extent, there is an essential difference between surveillance of antiviral consumption and antibacterial consumption, as antivirals are often used for the treatment of long-lasting infections similar to chronic diseases. In 2014, consumption of antivirals showed the highest inter-country variation of all three main antimicrobial groups under surveillance. This may reflect the burden of viral diseases rather than being a target for more prudent use of antiviral agents. For some viral diseases - e.g. HCV infection where new drugs were introduced in 2014 - consumption patterns may offer opportunities to monitor changes following recent treatment guidelines.

This ESAC-Net report only presents antimicrobial consumption by humans. Data on the sales of veterinary antimicrobial agents used in animals are produced by the European Surveillance of Veterinary Antimicrobial Consumption (ESVAC) network [25]. Consumption of antimicrobials in both humans and animals is associated with the development and spread of antimicrobial resistance. A recent second Joint Interagency Antimicrobial Consumption and Resistance Analysis (JIACRA) report with integrated data analyses on antimicrobial consumption and resistance in humans and animals in 28 EU/EEA countries (including ESAC-Net data reported for 2013–2015) was published in 2017 at the request of the European Commission [26]. A comparison between the consumption of antimicrobials by humans and by food-producing animals reveals that the average consumption expressed in milligrams per kilogram of estimated biomass was lower in humans. The analyses showed that, in all countries, consumption of third- and fourth-generation cephalosporins was much higher in humans than in food-producing animals. Multivariate analyses demonstrated that third- and fourth-generation cephalosporin and fluoroquinolone resistance in *E. coli* from humans was associated with corresponding antimicrobial consumption in humans.

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Annex 1. Further sub-classification of macrolides, quinolones and antivirals

Classification of macrolides into short-, intermediate- and long-acting macrolides*

Short-acting		Intermediate-acting		Long-acting	
ATC code	**Substance**	**ATC code**	**Substance**	**ATC code**	**Substance**
J01FA01	erythromycin	J01FA06	roxithromycin	J01FA10	azithromycin
J01FA02	spiramycin	J01FA07	josamycin	J01FA13	dirithromycin
J01FA03	midecamycin	J01FA09	clarithromycin		
J01FA05	oleandomycin	J01FA14	flurithromycin		
J01FA08	troleandomycin	J01FA15	telithromycin		
J01FA11	miocamycin				
J01FA12	rokitamycin				

**Macrolides subdivided into short-acting (half-life <4h), intermediate-acting (half-life 4–24h) and long-acting (half-life >24h) macrolides. Adapted from [8].*

Classification of quinolones into three generations*

First generation		Second generation		Third generation	
J01MA06	norfloxacin	J01MA01	ofloxacin	J01MA05	temafloxacin
J01MB01	rosoxacin	J01MA02	ciprofloxacin	J01MA13	trovafloxacin
J01MB02	nalidixic acid	J01MA03	pefloxacin	J01MA14	moxifloxacin
J01MB03	piromidic acid	J01MA04	enoxacin	J01MA15	gemifloxacin
J01MB04	pipemidic acid	J01MA07	lomefloxacin	J01MA16	gatifloxacin
J01MB05	oxolinic acid	J01MA08	fleroxacin	J01MA17	prulifloxacin
J01MB06	cinoxacin	J01MA09	sparfloxacin	J01MA18	pazufloxacin
J01MB07	flumequine	J01MA10	rufloxacin	J01MA19	garenoxacin
		J01MA11	grepafloxacin	J01MA21	sitafloxacin
		J01MA12	levofloxacin		

** Classification of quinolones is based on their chemical structure and antimicrobial activity. Adapted from [7].*

Classification of antivirals into seven groups based on their main indication*

Substances used for the treatment of influenza: 'influenza antivirals'

J05AC02	rimantadine	J05AH02	oseltamivir	J05AX13[a]	umifenovir
J05AH01	zanamivir				

Substances used for the treatment of hepatitis C: 'hepatitis C antivirals'

J05AB04	ribavirin	J05AE13[a]	faldaprevir	J05AX14	daclatasvir
J05AE11[)]	telaprevir	J05AE14	simeprevir	J05AX15	sofosbuvir
J05AE12	Boceprevir	J05AE15[a]	asunaprevir		

Substances used for the treatment of herpetic infections: 'herpes antivirals'

J05AB01	aciclovir	J05AB09	famciclovir	J05AB14	valganciclovir
J05AB02	idoxuridine	J05AB11	valaciclovir	J05AB15	brivudine
J05AB03	vidarabine	J05AB12	cidofovir	J05AC03	tromantadine
J05AB06	ganciclovir	J05AB13	penciclovir	J05AD01	foscarnet

Substances used for the treatment of HIV/AIDS: 'HIV/AIDS antivirals'

J05AE01	saquinavir	J05AG01	nevirapine	J05AR09	emtricitabine, tenofovir disoproxil, elvitegravir and cobicistat
J05AE02	indinavir	J05AG01	nevirapine	J05AR10	lopinavir and ritonavir
J05AE03	ritonavir	J05AG02	delavirdine	J05AR11	lamivudine, tenofovir disoproxil and efavirenz
J05AE04	nelfinavir	J05AG03	efavirenz	J05AR12	lamivudine and tenofovir disoproxil
J05AE05	amprenavir	J05AG04	etravirine	J05AR13	lamivudine, abacavir and dolutegravir
J05AE07	fosamprenavir	J05AG05	rilpirivine	J05AR14	darunavir and cobicistat
J05AE08	atazanavir	J05AR01	zidovudine and lamivudine	J05AX07	enfuvirtide
J05AE09	tipranavir	J05AR02	lamivudine and abacavir	J05AX08[)]	raltegravir
J05AE10	darunavir	J05AR03	tenofovir disoproxil and emtricitabine	J05AX09[)]	maraviroc
J05AF01	zidovudine	J05AR04	zidovudine, lamivudine and abacavir	J05AX11[a]	elvitegravir
J05AF02	didanosine	J05AR05[a]	zidovudine, lamivudine and nevirapine	J05AX12[)]	dolutegravir
J05AF03	zalcitabine	J05AR06	emtricitabine, tenofovir disoproxil and efavirenz	J05AX12[)]	dolutegravir
J05AF04	stavudine	J05AR07[a]	stavudine, lamivudine and nevirapine		
J05AF06	abacavir	J05AR08	emtricitabine, tenofovir disoproxil and rilpivirine		

Substances used for the treatment of hepatitis B: 'hepatitis B antivirals'

J05AF08	adefovir dipivoxil	J05AF11	telbivudine
J05AF10	entecavir	J05AF12	clevudine

Substances used for both HIV and hepatitis B treatment: 'HIV/hepatitis B antivirals'

J05AF05	lamivudine	J05AF07	tenofovir disoproxil	J05AF09	emtricitabine

'Other antivirals'

J05AA01[a]	metisazone	J05AX02	lysozyme	J05AX10[a]	maribavir
J05AD02[a]	fosfonet	J05AX05	inosine pranobex		
J05AX01	moroxydine	J05AX06	pleconaril		

* Adapted from [3];

(a) zero consumption reported from all ESAC-Net participants.

This classification is not part of that determined by WHO's Collaborating Centre for Drug Statistics Methodology.

Annex 2. Additional data for trends in consumption of antimicrobials for systemic use, ATC group J01

Table A1. Consumption of antibacterials for systemic use (ATC group J01) in the community, EU/EEA countries, 1997–2014, expressed as DDD per 1 000 inhabitants per day

Country	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Austria		12.6	13.1	12.3	11.8	11.8	12.5	12.6	14.5	14.3	14.7	15.1	15.5	15.0	14.5	14.0	16.3	13.9
Belgium	25.4	26.4	26.2	25.3	23.7	23.8	23.8	22.8	24.3	24.2	25.2	27.6	27.3	28.2	28.8	29.5	29.7	28.4
Bulgaria			15.1*	20.2*	22.7*	17.3*	15.5*	16.4*	18.0*	17.7	19.4	20.3	18.4	18.3	19.5	18.5	19.9	21.2
Croatia (a)				18.0	19.3	23.6	24.4	23.9	24.9	22.6	24.0	24.4	22.7	20.1	19.5	21.7	21.1	21.4
Cyprus										31.9*	33.9*	33.7*	34.4*	31.1*	32.0*	29.7*	28.3*	26.1*
Czech Republic		18.2	18.6				16.7	15.9	17.3	15.9	16.5	17.5	18.4	17.9	18.5	17.7	19.0	19.2
Denmark	12.2	12.7	12.1	12.3	12.8	13.2	13.5	14.1	14.6	15.2	15.9	15.6	15.6	16.5	17.4	16.4	16.4	15.9
Estonia					14.4*	11.7	11.1	10.4	11.7	11.4	12.2	11.9	11.1	11.1	12.1	11.7	11.7	11.7
Finland	19.4	18.4	18.4	19.1	19.8	17.9	18.7	17.3	18.1	17.4	18.3	17.8	17.9	18.5	20.1	19.5	18.3	18.1
France	33.1	33.6	34.1	33.3	33.2	32.2	28.9	27.1	28.9	27.9	28.6	28.1	29.6	28.2	28.7	29.7	30.1	29.0
Germany	13.0	13.3	13.6	13.7	12.8	12.7	13.9	13.0	14.6	13.6	14.5	14.6	14.5	14.1	14.9	14.8	15.6	14.6
Greece	25.1	24.9	28.5	29.5	29.6	30.6	31.3	33.1*	34.7*	41.0*	43.2*	45.4*	38.6	39.9*	35.7	32.5	32.2	35.1
Hungary		18.3	23.5	18.6	18.6	17.1	19.1	18.2	19.5	17.2	15.5	15.2	16.0	15.7	16.2	15.1	15.6	16.2
Iceland	22.2*	23.1*	21.7*	20.5*	20.0*	20.6*	20.3*	21.5*	23.2*	20.0	19.2	20.7	19.4	22.3*	22.3*	22.1*	21.9*	19.3
Ireland		16.5	18.0	17.6	18.7	18.7	20.1	20.3	20.5	21.2	22.9	22.5	20.8	20.3	22.6	23.0	23.8	23.1
Italy			24.5	24.0	25.5	24.3	25.6	24.8	26.2	26.7	27.6	28.5	28.7	27.9	28.2	27.6	28.6	27.8
Latvia						11.2		12.0	12.5	11.5	12.4	11.4	10.9	11.9	12.8	13.0	13.5	12.6
Lithuania										22.7*	24.1*	25.2*	19.5*	17.8*	19.0*	16.2	18.5	16.0
Luxembourg	27.2	26.9	28.2	27.2	27.6	27.5	28.6	25.0	26.3	25.0	27.2	27.1	28.1	27.6	27.8	27.7	27.7	25.8
Malta											17.9	20.9	21.6	21.3	23.4	22.5	23.8	23.7
Netherlands	10.1	9.9	10.0	9.8	9.9	9.8	9.8	9.8	10.5	10.8	11.0	11.2	11.4	11.2	11.4	11.3	10.8	10.6
Norway		15.3			15.6	15.7	15.6	15.7	16.8	14.8	15.5	15.6	15.2	15.8	16.5	16.9	16.2	15.9
Poland		20.7	22.2	22.7	24.8	21.4		19.1	19.6		22.2	20.7	23.6	21.1	21.1	19.8	23.6	22.8
Portugal	23.1	23.3	25.2	24.9	24.5	26.5	25.1	23.8	24.5	22.7		22.7	22.9	22.4	23.2	22.7	19.6	20.3
Romania													10.2		30.9*	30.4*	31.6*	31.2*
Slovakia			25.7	27.7	29.1	26.7	27.6	22.6	25.1	22.5	24.8	23.2	23.8		23.8*	20.0	23.6	20.9
Slovenia	17.5	19.3	19.8	18.1	17.4	16.3	17.0	16.8	16.3	14.7	15.9	14.3	14.3	14.4	14.4	14.3	14.5	14.2
Spain (b)	21.3	20.6	20.0	19.0	18.0	18.0	18.9	18.6	19.3	18.7	19.9	19.8	19.7	20.3	20.9	20.9	20.3	21.6
Sweden	14.6	15.5	15.8	15.6	15.8	15.2	14.7	14.5	14.9	15.4	15.5	14.6	14.1	14.2	14.3	14.1	13.0	13.0
United Kingdom	17.0	16.2	14.8	14.3	14.8	14.8	15.1	15.0	15.4	15.3	16.5	17.0	17.3	18.7	18.8	20.1	20.6	20.9
EU/EEA	**20.0**	**10.7**	**20.6**	**20.4**	**20.5**	**19.8**	**19.5**	**18.9**	**20.0**	**19.7**	**20.7**	**20.8**	**20.8**	**20.7**	**21.6**	**21.7**	**22.3**	**21.9**

**Total care data - i.e. including the hospital sector*

(a) Croatia uploaded historical data for 2000–2009

(b) Spain provided reimbursement data - i.e. not including consumption without a prescription and other non-reimbursed courses.

EU/EEA refers to the corresponding population-weighted mean consumption.

Table A2. Consumption of antibacterials for systemic use (ATC group J01) in the hospital sector, EU/EEA countries, 1997–2014, expressed as DDD per 1 000 inhabitants per day

Country	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Belgium	2.0	2.0	2.2	2.2	2.2	2.2	2.3	2.1	1.9	1.9	1.9	1.7		2.0	2.0	1.7	1.7	1.6
Bulgaria										1.4	1.4	1.5	1.6	1.5	1.5	1.4	1.4	1.5
Croatia				2.1	2.1	2.6	2.9	1.9	1.9	1.7	1.6	1.5	1.4	1.8	1.9	2.0	1.8	1.9
Denmark	1.3	1.3	1.3	1.4	1.4	1.5	1.5	1.6	1.6	1.7	1.8	1.8	1.8	1.8	1.7	1.8	2.0	2.1
Estonia						2.1	2.4	2.3	2.5	1.9	1.8	2.0	1.6	1.9	1.9	2.1	1.9	1.9
Finland (a)	3.5	3.7	3.7	3.8	3.9	3.9	3.6	3.4	3.5	3.4	3.2	3.1	3.2	2.8	3.1	2.8	2.8	2.6
France	3.3	3.0	3.1	3.2	2.9	3.9	2.8	2.5	2.6	2.3	2.2	2.2	2.2	2.2	2.1	2.1	2.2	2.2
Greece	2.1	2.1	2.2	2.3	2.2	2.2	2.3						3.3		2.2	2.1	2.0	2.1
Hungary					1.2	1.3	1.5	1.3	1.4	1.4	1.2	1.2	1.3	1.4	1.2	1.2	1.2	1.2
Ireland								0.7	0.7	1.9	1.1	1.6	1.4	1.8	1.8	1.8	1.8	1.7
Italy									0.2		1.5	2.3		2.2	2.3	2.5	2.2	2.2
Latvia						6.3		4.8	3.9	3.2	3.6	2.9	2.3	3.2	2.4	2.3	2.3	2.2
Lithuania																2.4	2.4	2.3
Luxembourg	2.1	2.0	2.3	2.3	2.1	2.5	2.5	2.1	2.2	2.1	2.2	2.2	2.1	2.1	2.0	2.0	2.0	1.8
Malta	1.6	2.5	2.6	2.4	1.9	1.7	2.0	1.8	1.4	1.7	1.3	1.4	1.4	2.0	1.7	1.4	1.8	2.2
Netherlands	0.6	0.6	0.7	0.6	0.6	0.7								1.1	1.0	1.0	1.0	1.0
Norway		1.1			1.1	1.3	1.4	1.3	1.3	1.5	1.5	1.7	1.5	1.4	1.5	1.4	1.4	1.4
Poland		3.0	3.4	2.4	2.4	1.7												1.4
Portugal (b)													1.4	1.4	1.5	1.5	1.6	1.5
Romania													2.6					
Slovakia			1.3	1.2	1.4	1.5	1.4	1.6	1.9	1.7	1.9	1.8	1.9			2.0	2.3	2.5
Slovenia	0.5	1.6	1.7	1.8	1.7	1.8	1.8	1.6	1.7	1.7	1.7	1.7	1.8	1.7	1.7	1.6	1.6	1.6
Sweden	1.3	1.3	1.3	1.3	1.3	1.3	1.4	1.4	1.5	1.5	1.3	1.5	1.5	1.5	1.6	1.7	1.7	1.6
United Kingdom																	2.5	2.6
EU/EEA	**2.4**	**2.5**	**2.6**	**2.4**	**2.2**	**2.4**	**2.4**	**2.2**	**1.6**	**2.1**	**1.8**	**2.0**	**2.1**	**1.9**	**2.0**	**2.0**	**2.1**	**2.0**

(a) Finland: data include consumption in remote primary healthcare centres and nursing homes.

(b) Portugal: data refer to public hospitals; the population size was adjusted accordingly.

EU/EEA refers to the corresponding population-weighted mean consumption.

Annex 3. Additional data, 2014

Table A3. Trends in consumption of antibacterials for systemic use (ATC group J01) in the community, EU/EEA countries, 2010–2014, expressed as packages per 1 000 inhabitants per day

Country	2010	2011	2012	2013	2014	Trends in consumption of antibiotics, 2010–2014	Average annual change 2010–2014	Statistically significant trend
Sweden	1.19	1.18	1.14	1.05	1.00		-0.05	↓
Denmark	1.79	1.85	1.70	1.67	1.62		-0.05	↓
Latvia	1.59	1.73	1.70	1.76	1.65		0.01	
Estonia	1.70	1.82	1.77	1.74	1.68		-0.01	
Austria	1.88	1.81	1.76	2.03	1.73		-0.01	
Finland	1.96	2.13	2.04	1.91	1.89		-0.04	
Slovenia	2.06	2.02	1.96	1.97	1.91		-0.03	↓
Spain	2.13†	2.17†	2.01†	1.99†	1.93†		-0.06	↓
Slovakia			2.53	3.02	1.94		N/A	
Lithuania			1.99	2.24	1.95		N/A	
Czech Republic	1.93	1.94	1.84	1.99	1.98		0.01	
Portugal	2.34	2.38	2.33	1.99†	2.04†		N/A	
Iceland					2.06		N/A	
Ireland	2.32	2.49	2.53	2.55	2.36		0.02	
Belgium	2.51	2.53	2.54	2.51	2.41		-0.02	
Luxembourg	2.83	2.74	2.68	2.67	2.53		-0.07	↓
Croatia	2.58	2.48	2.67	2.61	2.64		0.03	
Bulgaria	2.77	2.92	2.78	2.90	3.04		0.05	
EU/EEA	**3.03**	**3.14**	**3.15**	**3.18**	**3.05**		**-0.04**	
Greece		3.86	3.48	3.52	3.61		N/A	
Italy	3.84	3.78	3.70	3.83	3.70		-0.03	
France	4.82	4.86	4.86	4.85	4.59		-0.05	

EU/EEA refers to the corresponding population-weighted mean consumption.

† Reimbursement data (i.e. not including consumption without a prescription and other non-reimbursed courses).

N/A = not applicable; linear regression was not applied due to missing data, changes in the type of data or changes of sector for which data were reported (community versus total care data) between 2010 and 2014.

The symbol ↓ indicates a statistically significant decreasing trend.

Annex 4. Additional data, 2013

Table A4. Consumption of antibacterials for systemic use (ATC group J01) at ATC group level 3 in the community, EU/EEA countries, 2013, expressed as DDD per 1 000 inhabitants per day

Country	Tetra-cyclines (J01A)	Beta-lactams, penicillins (J01C)	Other beta-lactam antibac-terials (J01D)	Sulfonamides and trimethoprim (J01E)	Macrolides, lincosamides and strepto-gramins (J01F)	Quino-lones (J01M)	Other antibac-terials (J01X)	Sum (J01B, J01G, and J01R)*	Total (ATC group J01)
Austria	1.3	7.4	2.0	0.2	3.6	1.5	0.4	<0.1	16.3
Belgium	2.2	16.9	1.5	0.3	3.4	2.6	2.7	0.1	29.7
Bulgaria	1.8	8.5	2.8	0.8	3.3	2.5	<0.1	0.2	19.9
Croatia	1.2	11.3	3.0	0.7	2.8	1.5	0.7	0	21.1
Cyprus (a)	2.8	12.9	4.9	0.3	2.7	4.0	0.6	0.1	28.3
Czech Republic	2.3	8.1	1.8	0.8	3.7	0.9	1.3	0.1	19.0
Denmark	2.0	10.6	0.0	0.8	1.8	0.5	0.8	<0.1	16.4
Estonia	1.6	4.5	1.1	0.4	2.5	0.9	0.8	<0.1	11.7
Finland	4.3	6.2	2.3	1.4	1.3	0.8	2.0	<0.1	18.3
France	3.4	18.4	2.2	0.3	3.5	1.8	0.5	<0.1	30.1
Germany	2.3	4.8	3.2	0.5	2.8	1.4	0.5	<0.1	15.7
Greece	1.8	12.6	7.4	0.3	7.2	2.1	0.7	<0.1	32.2
Hungary	1.2	6.8	1.8	0.5	2.8	2.1	0.3	<0.1	15.6
Iceland	4.7	11.6	0.8	0.8	1.7	1.1	1.1	<0.1	21.9
Ireland	3.0	13.1	1.4	1.0	4.4	0.9	0.1	<0.1	23.8
Italy	0.6	16.1	2.5	0.4	4.8	3.6	0.7	0.1	28.6
Latvia	2.4	6.6	0.5	1.0	1.7	1.1	0.3	<0.1	13.5
Lithuania	1.5	10.6	1.2	0.4	2.4	1.0	1.4	<0.1	18.5
Luxembourg	1.9	13.8	3.8	0.3	3.9	2.6	1.3	<0.1	27.7
Malta	1.0	9.5	5.5	0.2	4.0	2.9	0.4	0.3	23.8
Netherlands	2.3	4.4	<0.1	0.5	1.4	0.8	1.4	<0.1	10.8
Norway	3.2	6.6	0.1	0.7	1.7	0.5	3.4	<0.1	16.2
Poland	2.5	9.5	2.5	0.6	3.9	1.2	3.5	<0.1	23.6
Portugal	0.8	11.1	1.4	0.4	2.7	2.2	1.0	<0.1	19.6
Romania (a)	1.2	17.9	4.8	0.9	2.8	3.5	0.2	0.4	31.6
Slovakia	1.6	9.0	4.5	0.4	5.9	2.2	0.1	<0.1	23.6
Slovenia	0.5	9.8	0.3	0.9	1.8	1.1	0.2	<0.1	14.5
Spain (b)	0.7	12.8	1.6	0.3	1.9	2.4	0.4	0.2	20.3
Sweden	2.8	6.6	0.2	0.4	0.6	0.7	1.6	<0.1	13.0
United Kingdom	4.9	9.2	0.3	1.5	3.2	0.5	1.0	0.04	20.6
EU/EEA	2.3	11.1	2.2	0.6	3.2	1.8	0.9	0.07	22.3

(a) Cyprus and Romania provided total care data - i.e. including the hospital sector.

(b) Spain provided reimbursement data - i.e. not including consumption without a prescription and other non-reimbursed courses.

**J01B: amphenicols; J01G: aminoglycoside antibacterials; J01R: combinations of antibacterials.*

EU/EEA refers to the corresponding population-weighted mean consumption based on the 20 countries that provided data.

Table A5. Consumption of packages of antibacterials for systemic use (ATC group J01, oral administration) in the community, EU/EEA countries, 2013, expressed as packages per 1 000 inhabitants per day

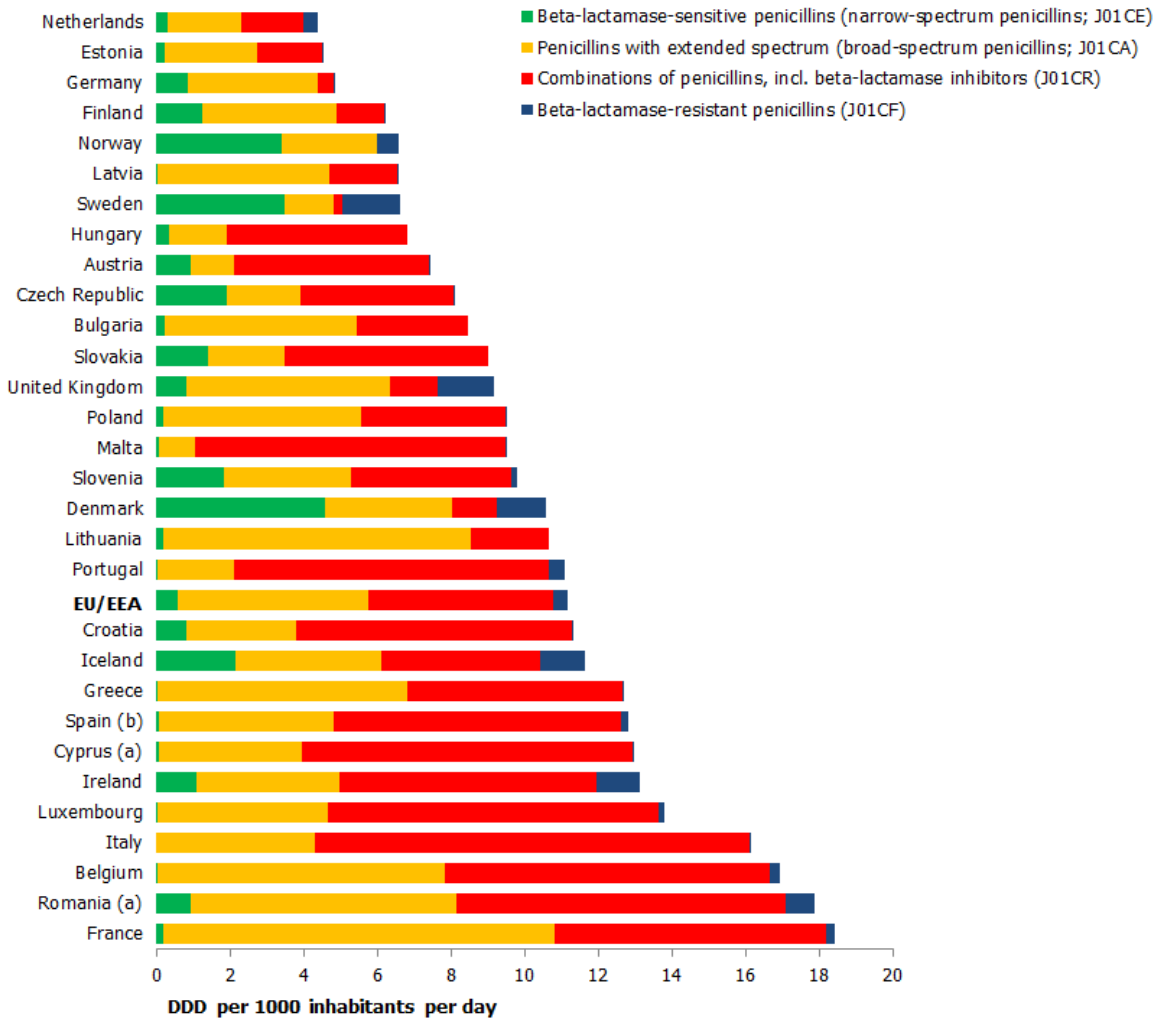
Country	Tetra-cyclines (J01A)	Beta-lactams, penicillins (J01C)	Other beta-lactam antibac-terials (J01D)	Sulfonamides and trimethoprim (J01E)	Macrolides, lincosamides and strepto-gramins (J01F)	Quino-lones (J01M)	Other antibacterials (J01X)	Sum (J01B, J01G, and J01R)*	Total (ATC group J01)
Austria	0.09	0.76	0.31	0.03	0.56	0.23	0.06	0	2.03
Belgium	0.13	1.24	0.11	0.04	0.43	0.30	0.25	0	2.51
Bulgaria	0.24	0.85	0.48	0.23	0.63	0.43	0	0.02	2.90
Croatia	0.10	1.13	0.44	0.13	0.51	0.19	0.10	0	2.61
Czech Republic	0.18	0.68	0.22	0.15	0.52	0.15	0.09	0	1.99
Denmark	0.08	1.12	<0.01	0.11	0.25	0.07	0.04	0	1.67
Estonia	0.17	0.61	0.18	0.06	0.37	0.16	0.19	0	1.74
Finland	0.23	0.74	0.40	0.14	0.21	0.11	0.08	0	1.91
France	0.16	2.55	0.77	0.06	0.70	0.37	0.23	<0.01	4.85
Greece	0.25	1.32	0.78	0.06	0.67	0.38	0.05	0	3.52
Ireland	0.25	1.36	0.26	0.04	0.51	0.13	<0.01	<0.01	2.55
Italy	0.07	1.56	0.42	0.05	0.65	0.82	0.25	<0.01	3.83
Latvia	0.22	0.74	0.11	0.16	0.28	0.20	0.05	0	1.76
Lithuania	0.16	1.13	0.19	0.06	0.34	0.18	0.18	0	2.24
Luxembourg	0.12	1.13	0.29	0.06	0.59	0.34	0.14	0	2.67
Portugal	0.05	0.93	0.13	0.06	0.42	0.26	0.12	0	1.99
Slovakia	0.11	0.79	0.68	0.08	0.92	0.40	0.02	0	3.02
Slovenia	0.02	1.19	0.04	0.19	0.33	0.19	0.02	0	1.97
Spain (a)	0.04	0.96	0.16	0.02	0.33	0.29	0.16	0.03	1.99
Sweden	0.13	0.59	0.03	0.05	0.08	0.08	0.10	0	1.05
EU/EEA	**0.12**	**1.47**	**0.41**	**0.06**	**0.54**	**0.40**	**0.17**	**0.01**	**3.18**

(a) *Spain provided reimbursement data - i.e. not including consumption without a prescription and other non-reimbursed courses.*

**J01B: amphenicols; J01G: aminoglycoside antibacterials; J01R: combinations of antibacterials*

EU/EEA refers to the corresponding population-weighted mean consumption based on the 20 countries that provided data.

Figure A1. Consumption of broad- and narrow-spectrum penicillins (ATC group J01C) in the community, EU/EEA countries, 2013, expressed as DDD per 1 000 inhabitants per day

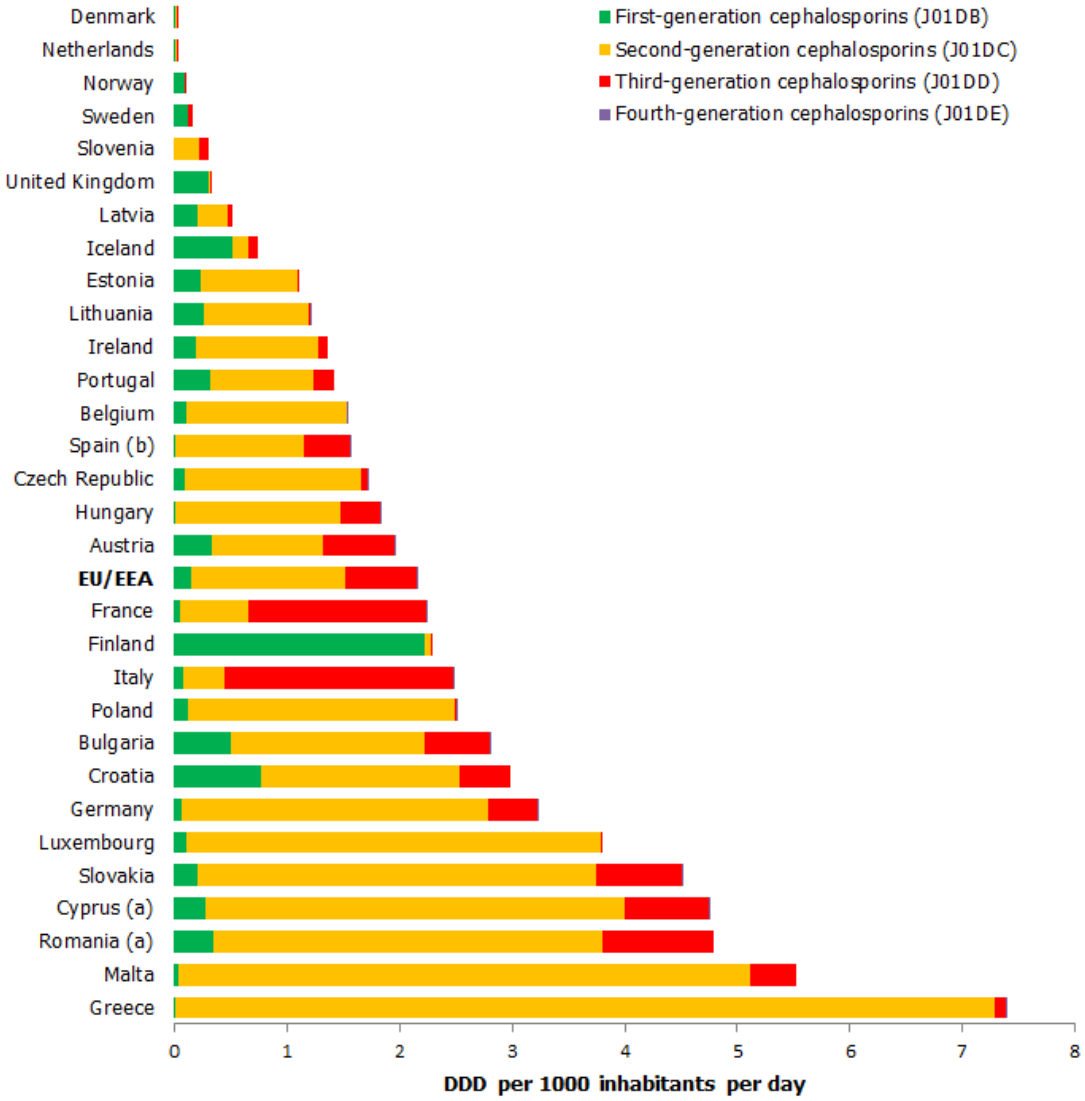


(a) Cyprus and Romania provided total care data - i.e. including the hospital sector.

(b) Spain provided reimbursement data - i.e. not including consumption without a prescription and other non-reimbursed courses.

EU/EEA refers to the corresponding population-weighted mean consumption.

Figure A2. Consumption of first-, second-, third- and fourth-generation cephalosporins (ATC groups J01DB–DE) in the community, EU/EEA countries, 2013, expressed as DDD per 1 000 inhabitants per day



(a) Cyprus and Romania provided total care data - i.e. including the hospital sector.

(b) Spain provided reimbursement data - i.e. not including consumption without a prescription and other non-reimbursed courses.

EU/EEA refers to the corresponding population-weighted mean consumption.

Table A6. Consumption of short-, intermediate- and long-acting macrolides (ATC group J01F) for systemic use in the community, EU/EEA countries, 2013, expressed as DDD per 1 000 inhabitants per day

Country	Short-acting macrolides	Intermediate-acting macrolides	Long-acting macrolides	Total
Austria	0.01	2.01	0.76	2.78
Belgium	0.06	1.62	1.35	3.03
Bulgaria	0	1.62	1.00	2.62
Croatia	0.02	0.91	1.58	2.52
Cyprus (a)	0.10	1.67	0.83	2.60
Czech Republic	0.10	2.57	0.81	3.48
Denmark	0.16	1.16	0.47	1.79
Estonia	0.01	1.74	0.57	2.32
Finland	0.07	0.51	0.46	1.04
France	0.13	1.66	0.62	2.41
Germany	0.19	1.28	0.57	2.04
Greece	0.06	5.88	1.00	6.94
Hungary	0.03	1.09	1.12	2.23
Iceland	0.24	0.28	1.01	1.53
Ireland	0.79	2.92	0.63	4.34
Italy	0.15	3.05	1.56	4.76
Latvia	0.11	0.97	0.53	1.61
Lithuania	0.04	1.73	0.59	2.35
Luxembourg	0.23	2.24	1.04	3.51
Malta	0.21	2.67	0.90	3.78
Netherlands	0.07	0.45	0.70	1.22
Norway	0.75	0.28	0.37	1.41
Poland	0.34	1.70	1.24	3.29
Portugal	0.05	1.37	1.29	2.71
Romania (a)	0.26	1.84	0.53	2.63
Slovakia	0.21	2.83	2.42	5.45
Slovenia	0.10	0.52	0.96	1.58
Spain (b)	0.10	0.60	1.15	1.85
Sweden	0.14	0.06	0.10	0.30
United Kingdom	1.14	1.64	0.37	3.15
EU/EEA	**0.28**	**1.68**	**0.86**	**2.82**

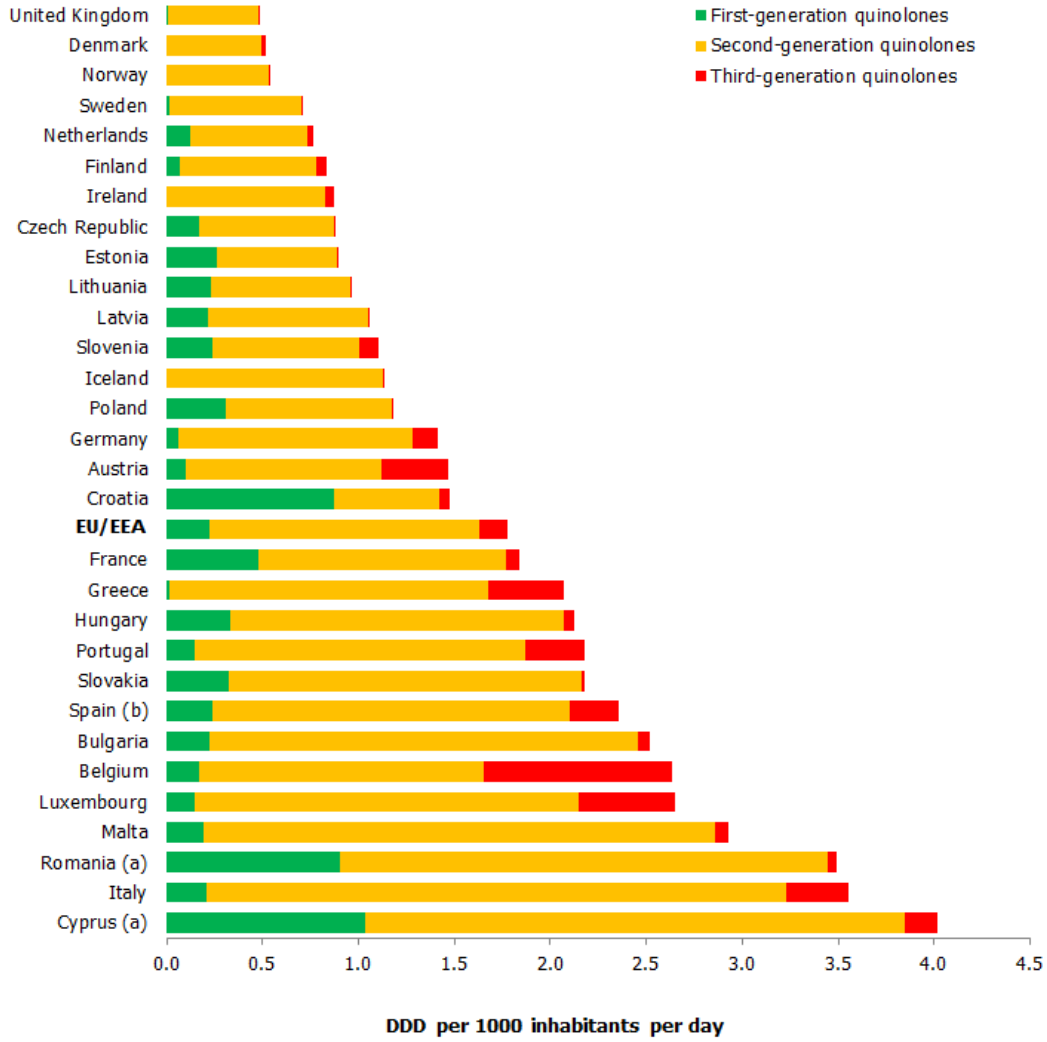
A classification of macrolides is used as described by the ESAC project [9], according to the mean plasma elimination (Annex 1).

(a) Cyprus and Romania provided total care data - i.e. including the hospital sector.

(b) Spain provided reimbursement data - i.e. not including consumption without a prescription and other non-reimbursed courses.

EU/EEA refers to the corresponding population-weighted mean consumption.

Figure A3. Consumption of first-, second- and third-generation quinolones (ATC group J01M) for systemic use in the community, EU/EEA countries, 2013, expressed as DDD per 1 000 inhabitants per day



A classification of quinolone antibacterials into three generations is used based on their chemical structure and antimicrobial activity, as described by the ESAC project [8] (Annex 1).

(a) Cyprus and Romania provided total care data - i.e. including the hospital sector.

(b) Spain provided reimbursement data - i.e. not including consumption without a prescription and other non-reimbursed courses.

EU/EEA refers to the corresponding population-weighted mean consumption.

Table A7. Consumption of other antibacterials (ATC group J01X) at ATC group level 4 in the community, EU/EEA countries, 2013, expressed as DDD per 1 000 inhabitants per day

Country	Glycopeptide antibacterials (J01XA)	Polymyxins (J01XB)	Steroid antibacterials (J01XC)	Imidazole derivatives (J01XD)	Nitrofuran derivatives (J01XE)	Other antibacterials (J01XX)	Total (ATC group J01X)
Austria	<0.01	0.01	0.04	<0.01	0.27	0.04	0.36
Belgium	<0.01	0.02	0	0	2.54	0.15	2.71
Bulgaria	<0.01	0	0	<0.01	0	<0.01	<0.01
Croatia	0	0	0	0	0.72	0	0.72
Cyprus (a)	0.05	0.02	0	0.14	0.36	0.02	0.59
Czech Republic	0.01	0.01	0	0.04	1.28	<0.01	1.34
Denmark	<0.01	0.02	0.01	<0.01	0.49	0.24	0.76
Estonia	<0.01	<0.01	<0.01	0.23	0.52	0.00	0.75
Finland	<0.01	0	<0.01	<0.01	0.52	1.52	2.04
France	0	0.02	0.08	0	0.22	0.15	0.46
Germany	<0.01	0.01	0	<0.01	0.43	0.08	0.52
Greece	0.02	0.03	0.02	0.03	0.57	0.01	0.68
Hungary	<0.01	<0.01	0	<0.01	0.19	0.06	0.25
Iceland	0.03	0	0	0.05	0.66	0.38	1.12
Ireland	<0.01	0.06	0.01	<0.01	<0.01	0.01	0.08
Italy	<0.01	<0.01	0	<0.01	0.22	0.48	0.70
Latvia	<0.01	<0.01	0	0.01	0.24	0.04	0.29
Lithuania	<0.01	0	0	0.01	1.33	0.03	1.37
Luxembourg	<0.01	<0.01	0	0	1.22	0.09	1.31
Malta	0	0.01	0	0.04	0.36	0	0.41
Netherlands	<0.01	<0.01	<0.01	<0.01	1.37	0.05	1.43
Norway	<0.01	<0.01	<0.01	<0.01	0.31	3.08	3.40
Poland *	<0.01	<0.01	0	0.22	3.21	0.02	3.46
Portugal	0	0	0.03	0	0.82	0.15	0.99
Romania (a)	0.02	0.03	0	0.03	0.07	0.01	0.16
Slovakia	<0.01	0.01	0	<0.01	0	0.05	0.06
Slovenia	0	<0.01	0	<0.01	0.18	<0.01	0.19
Spain (b)	<0.01	0	0.01	0	0.13	0.31	0.44
Sweden	<0.01	<0.01	0.01	<0.01	0.37	1.23	1.61
United Kingdom	0.01	0.07	0.01	0.03	0.86	0.03	1.00
EU/EEA	**<0.01**	**0.02**	**0.01**	**0.02**	**0.69**	**0.20**	**0.95**

(a) Cyprus and Romania provided total care data - i.e. including the hospital sector.

(b) Spain provided reimbursement data, i.e. not including consumption without a prescription and other non-reimbursed courses.

** Poland reported consumption of furazidin, a nitrofurantoin analogue without an ATC code or DDD.*

EU/EEA refers to the corresponding population-weighted mean consumption based on the 20 countries that provided data.

Table A8. Consumption of antimycotics (ATC group J02) and antifungals (ATC group D01B) for systemic use in the community, EU/EEA countries, 2013, expressed as DDD per 1 000 inhabitants per day

Country	Griseofulvine (D01BA01)	Terbinafine (D01BA02)	Amphotericin B (J02AA01)	Ketoconazole (J02AB02)	Fluconazole (J02AC01)	Itraconazole (J02AC02)	Voriconazole (J02AC03)	Other antimycotics for systemic use	Total (J02 & D01B)
Austria	0	0.73	<0.01	0	0.10	0.20	0.01	<0.01	1.04
Belgium	0	1.87	0	0.05	0.72	0.61	0.01	<0.01	3.26
Bulgaria	0	0.27	0	0.22	0.26	0.05	0	0	0.81
Cyprus (a)	0.11	0.96	0.02	0.03	0.22	0.24	0.01	0.01	1.59
Czech Republic	0	0.44	0.01	0.10	0.11	0.09	0.01	<0.01	0.75
Denmark	0	1.82	0	0.01	0.37	0.15	<0.01	0	2.35
Estonia	<0.01	1.17	0	0.07	0.12	0.14	<0.01	<0.01	1.51
Finland	0	1.68	0	0.02	0.30	0.10	0.01	<0.01	2.11
France	0.12	1.12	0	0	0.18	0.04	0	<0.01	1.45
Germany	0.01	0.67	<0.01	0.01	0.09	0.09	0.01	<0.01	0.88
Greece	0	0.35	<0.01	0.02	0.73	0.41	<0.01	<0.01	1.51
Hungary	0	0.54	0	0.10	0.17	0.11	<0.01	<0.01	0.92
Iceland	0	2.14	<0.01	0.06	0.35	0.06	0.01	<0.01	2.63
Italy	0.04	0.18	0	0	0.48	0.38	0	<0.01	1.08
Latvia	0	0.31	0.09	0.08	0.11	0.12	<0.01	0	0.71
Lithuania	0	0.47	0	0.07	0.11	0.05	0	0	0.70
Luxembourg	0	0.33	0	0.07	0.57	0.71	0	0	1.68
Malta	0.01	0.40	0	<0.01	0.06	0.20	0	0	0.66
Netherlands	<0.01	1.07	<0.01	0.02	0.11	0.29	0.01	<0.01	1.51
Norway	<0.01	1.10	0	0.02	0.15	0.01	<0.01	<0.01	1.28
Portugal	0	1.57	0	0.04	0.26	0.38	0	0	2.26
Romania (a)	0	0.20	<0.01	0.27	0.27	0.12	0.01	0.01	0.88
Slovakia	0	0	0	0.19	0.19	0.07	0.01	0.07	0.53
Slovenia	0	0.75	0	0	0.09	0.15	0.01	<0.01	1.01
Sweden	<0.01	0.56	0.00	0.02	0.20	0.02	0.01	0.01	0.80
EU/EEA	**0.03**	**0.73**	**<0.01**	**0.04**	**0.25**	**0.18**	**<0.01**	**<0.01**	**1.23**

(a) Cyprus and Romania provided total care data - i.e. including the hospital sector.

EU/EEA refers to the corresponding population-weighted mean consumption based on the 20 countries that provided data.

Table A9. Consumption of antibacterials for systemic use (ATC group J01) by ATC group level 3 in the hospital sector, EU/EEA countries, 2013, expressed as DDD per 1 000 inhabitants per day

Country	Tetra-cyclines (J01A)	Beta-lactams, penicillins (J01C)	Other beta-lactam antibac-terials (J01D)	Sulfonamides and trimethoprim (J01E)	Macrolides, lincosamides and strepto-gramins (J01F)	Quino-lones (J01M)	Other antibac-terials (J01X)	Sum (J01B, J01G, and J01R)*	Total (ATC group J01)
Belgium	0.02	0.84	0.36	0.03	0.08	0.19	0.12	0.03	1.67
Bulgaria	0.02	0.17	0.76	0.01	0.13	0.13	0.08	0.11	1.41
Croatia	0.05	0.60	0.51	0.04	0.15	0.22	0.13	0.10	1.80
Denmark	0.03	1.03	0.38	0.10	0.09	0.21	0.14	0.04	2.02
Estonia	0.08	0.65	0.56	0.05	0.16	0.21	0.16	0.05	1.91
Finland (a)	0.22	0.65	0.94	0.12	0.14	0.30	0.39	0.01	2.77
France	0.02	1.24	0.31	0.05	0.10	0.26	0.14	0.06	2.17
Greece	0.05	0.55	0.57	0.02	0.18	0.23	0.33	0.07	2.00
Ireland	0.03	0.40	0.31	0.03	0.11	0.22	0.07	0.03	1.20
Hungary	0.03	0.82	0.19	0.05	0.28	0.13	0.22	0.07	1.79
Italy	0.02	0.90	0.44	0.04	0.19	0.43	0.15	0.06	2.23
Latvia	0.12	0.63	0.67	0.08	0.15	0.41	0.17	0.07	2.30
Lithuania	0.07	1.10	0.62	0.06	0.07	0.17	0.19	0.11	2.38
Luxembourg	0.01	0.69	0.65	0.07	0.16	0.25	0.13	0.04	2.00
Malta	0.07	0.67	0.26	0.03	0.22	0.27	0.14	0.08	1.75
Netherlands	0.02	0.42	0.18	0.03	0.07	0.12	0.07	0.04	0.95
Norway	0.06	0.65	0.31	0.05	0.08	0.08	0.11	0.05	1.39
Portugal (b)	0.02	0.54	0.44	0.07	0.16	0.18	0.16	0.07	1.64
Slovakia	0.03	0.81	0.65	0.04	0.15	0.32	0.24	0.07	2.30
Slovenia	0.01	0.70	0.31	0.05	0.12	0.23	0.10	0.04	1.55
Sweden	0.19	0.87	0.21	0.06	0.07	0.16	0.09	0.02	1.67
United Kingdom	0.21	1.29	0.16	0.16	0.29	0.10	0.17	0.09	2.45
EU/EEA	**0.07**	**0.95**	**0.35**	**0.07**	**0.16**	**0.23**	**0.15**	**0.06**	**2.05**

(a) Finland: data include consumption in remote primary healthcare centres and nursing homes.

(b) Portugal: data refer to public hospitals; the population size was adjusted accordingly.

EU/EEA refers to the corresponding population-weighted mean consumption based on the 20 countries that provided data.

**J01B: amphenicols; J01G: aminoglycoside antibacterials; J01R: combinations of antibacterials*

Table A10. Consumption of antimycotics (ATC group J02) and antifungals (ATC group D01B) for systemic use in the hospital sector, EU/EEA countries, 2013, expressed as DDD per 1 000 inhabitants per day

Country	Griseofulvine (D01BA01)	Terbinafine (D01BA02)	Amphotericin B (J02AA01)	Ketoconazole (J02AB02)	Fluconazole (J02AC01)	Itraconazole (J02AC02)	Voriconazole (J02AC03)	Other antimycotics for systemic use	Total (J02 & D01B)
Belgium	0	0.01	0.01	<0.01	0.07	<0.01	0.01	0.01	0.10
Bulgaria	0	<0.01	0	0.01	0.03	<0.01	<0.01	<0.01	0.04
Denmark	0	<0.01	0.01	<0.01	0.15	0.01	0.02	0.02	0.22
Estonia	<0.01	0.01	0.01	0.01	0.03	<0.01	<0.01	<0.01	0.06
Finland (a)	0	0.02	0.01	0.01	0.07	0.01	0.01	0.01	0.13
France	0	0.01	0.01	0.01	0.05	<0.01	0.02	0.02	0.11
Greece	0	<0.01	0.03	<0.01	0.03	0.01	0.02	0.02	0.11
Hungary	0	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	0.03
Ireland	0	<0.01	0.03	0	0.12	0.05	0.01	0.01	0.20
Italy	0	<0.01	0.01	0	0.08	0.01	0.01	0.01	0.13
Latvia	0	<0.01	0.05	<0.01	0.03	<0.01	<0.01	<0.01	0.09
Lithuania	0	<0.01	0	0.01	0.02	<0.01	<0.01	<0.01	0.03
Luxembourg	0	<0.01	<0.01	0	0.08	0.01	0.01	0.01	0.11
Malta	<0.01	<0.01	0.01	<0.01	0.02	0.02	<0.01	<0.01	0.06
Norway	0	<0.01	0.01	<0.01	0.04	<0.01	<0.01	0.01	0.06
Portugal (b)	0	<0.01	0.02	<0.01	0.06	0.01	0.01	0.01	0.10
Slovakia	0	0	<0.01	0.04	0.06	<0.01	0.02	0.04	0.16
Slovenia	0	<0.01	0.01	0	0.03	<0.01	<0.01	0.01	0.07
Sweden	0	<0.01	0.01	<0.01	0.04	<0.01	<0.01	0.01	0.06
EU/EEA	**<0.01**	**<0.01**	**0.01**	**<0.01**	**0.06**	**0.01**	**0.01**	**0.01**	**0.11**

(a) Finland: data include consumption in remote primary healthcare centres and nursing homes.

(b) Portugal: data refer to public hospitals; the population size was adjusted accordingly.

EU/EEA refers to the corresponding population-weighted mean consumption based on the 19 countries that provided data.

Table A11. Total consumption of antivirals for systemic use (ATC group J05) in both sectors (community and hospital sector), EU/EEA countries, 2013, expressed as DDD per 1 000 inhabitants per day

Country	Nucleosides and nucleotides excl. reverse transcriptase inhibitors (ATC group J05AB)	Protease inhibitors (ATC group J05AE)	Nucleoside and nucleotide reverse transcriptase inhibitors (ATC group J05AF)	Non-nucleoside reverse transcriptase inhibitors (ATC group J05AG)	Neura-minidase inhibitors (ATC group J05AH)	Antivirals for treatment of HIV infections, combinations (ATC group J05AR)	Other antivirals (ATC groups J05AC, J05AD, J05AX)	Total (ATC group J05)
Austria (a)	0.47	0.21	0.23	0.13	0.36	0.27	0.08	1.75
Belgium	0.13	0.41	0.21	0.24	0.02	0.86	0.08	1.95
Bulgaria	0.10	0.04	0.25	0.02	0.03	0.12	0.50	1.05
Cyprus	0.22	0.15	0.39	0.12	0.01	0.27	0.02	1.18
Czech Republic (a)	0.23	0.02	0.15	0.02	0.00	0.11	0.11	0.64
Denmark	0.52	0.29	0.27	0.18	0.01	0.64	0.06	1.99
Estonia	0.30	0.42	0.02	0.75	0.03	1.29	0.07	2.88
Finland	0.45	0.13	0.06	0.06	0.04	0.37	0.05	1.16
France	0.68	0.76	0.50	0.35	0.05	1.33	0.30	3.96
Germany (a)	0.25	0.20	0.28	0.15	0.01	0.61	0.11	1.61
Greece	1.14	0.21	0.93	0.06	0.01	0.54	0.07	2.95
Hungary	0.21	0.04	0.12	0.03	0.01	0.06	0.21	0.68
Iceland	0.53	0.12	0.04	0.03	0.03	0.34	0.03	1.12
Italy	0.44	0.54	0.63	0.24	0.00	0.88	0.00	2.74
Latvia	0.27	0.09	0.13	0.22	0.05	0.37	0.58	1.71
Lithuania	0.13	0.00	0.27	0.04	0.19	0.15	0.00	0.78
Luxembourg	0.38	0.23	0.27	0.17	0.00	0.99	0.17	2.22
Malta	0.12	0.00	0.01	0.00	0.00	0.00	0	0.14
Netherlands (a)	0.24	0.26	0.28	0.30	0	0.93	0.08	2.09
Norway	0.27	0.27	0.10	0.07	0.02	0.59	0.06	1.37
Portugal	0.32	1.03	0.85	0.85	0.00	1.64	0.28	4.98
Romania	0.44	0.32	0.47	0.12	0.00	0.47	0.21	2.04
Slovenia	0.24	0.06	0.15	0.06	0.01	0.08	0.02	0.61
Sweden	0.44	0.23	0.14	0.13	0.01	0.57	0.05	1.58
EU/EEA	**0.49**	**0.49**	**0.47**	**0.25**	**0.02**	**0.87**	**0.16**	**2.76**

(a) Austria, the Czech Republic, Germany and the Netherlands only reported consumption data from the community.

EU/EEA refers to the corresponding population-weighted mean consumption based on the 24 countries that provided data.

Table A12. Total consumption of antivirals for systemic use (ATC group J05) from both sectors (community and hospital sector), EU/EEA countries, grouped into categories according to their main indication (adapted from [3] (see Annex 1), 2013, expressed as DDD per 1 000 inhabitants per day

Country	HIV/AIDS antivirals	HIV/hepatitis B antivirals	Hepatitis B antivirals	Hepatitis C antivirals	Herpes antivirals	Influenza antivirals	Other antivirals	Total (ATC group J05)
Austria (a)	0.69	0.18	0.04	0.07	0.41	0.36	0	1.75
Belgium	1.60	0.14	0.05	0.04	0.10	0.02	<0.01	1.95
Bulgaria	0.18	0.15	0.09	0.03	0.07	0.03	0.49	1.05
Cyprus	0.48	0.29	0.06	0.16	0.18	0.01	0.00	1.18
Czech Republic (a)	0.17	0.10	0.05	0.06	0.17	0.00	0.09	0.64
Denmark	1.21	0.21	0.04	0.01	0.51	0.01	0.00	1.99
Estonia	2.53	0.01	0.00	0.15	0.16	0.03	0.00	2.88
Finland	0.63	0.04	0.00	0.03	0.42	0.04	0.00	1.16
France	2.80	0.28	0.14	0.08	0.61	0.05	0.00	3.96
Germany (a)	1.08	0.16	0.10	0.06	0.20	0.01	0	1.61
Greece	0.90	0.50	0.40	0.04	1.10	0.01	0	2.95
Hungary	0.13	0.08	0.04	0.10	0.12	0.01	0.20	0.68
Iceland	0.52	0.03	<0.01	0.07	0.46	0.03	0	1.12
Italy	1.68	0.34	0.26	0.12	0.33	<0.01	0	2.74
Latvia	0.75	0.07	<0.01	0.20	0.07	0.62	<0.01	1.71
Lithuania	0.19	0.03	0.25	0.04	0.09	0.19	0	0.78
Luxembourg	1.58	0.14	0.10	0.05	0.33	<0.01	0.02	2.22
Malta	<0.01	0.01	0	0.02	0.10	<0.01	0	0.14
Netherlands (a)	1.59	0.16	0.10	0.02	0.22	0	0	2.09
Norway	0.98	0.06	0.03	0.07	0.21	0.02	<0.01	1.37
Portugal	4.02	0.48	0.15	0.11	0.22	<0.01	0	4.98
Romania	1.02	0.17	0.24	0.34	0.09	<0.01	0.17	2.04
Slovenia	0.22	0.03	0.11	0.05	0.20	0.01	0	0.61
Sweden	0.99	0.08	0.05	0.04	0.40	0.01	0	1.58
EU/EEA	**1.77**	**0.26**	**0.17**	**0.11**	**0.39**	**0.03**	**0.04**	**2.76**

(a) Austria, the Czech Republic, Germany and the Netherlands only reported consumption data from the community.

EU/EEA refers to the corresponding population-weighted mean consumption based on the 24 countries that provided data.

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