ecdc
EUROPEAN CENTRE FOR DISEASE PREVENTION AND CONTROL

SURVEILLANCE REPORT

Point prevalence survey of healthcare-associated infections and antimicrobial use in European long-term care facilities

May–September 2010

www.ecdc.europa.eu

ECDC SURVEILLANCE REPORT

Point prevalence survey of healthcare-associated infections and antimicrobial use in European long-term care facilities

May–September 2010

This report was commissioned by the European Centre for Disease Prevention and Control (ECDC) and coordinated by Carl Suetens. The HALT project (ECDC Grant/2008/04) was awarded to a consortium led by the Université Claude Bernard Lyon in collaboration with the Belgian Scientific Institute of Public Health, the Agenzia Sanitaria e Sociale Regionale Bologna and Public Health England, London.

Authors

Katrien Latour, Béatrice Jans, Barry Cookson, Maria Luisa Moro, Enrico Ricchizzi, Dorothy MacKenzie, Vincent Ronin, Monique Van de Mortel, Jacques Fabry.

Acknowledgements

We would like to thank our advisory board members (Gaëtan Gavazzi, Hanne Merete Eriksen, Abigail Mullings, Constanze Wendt and Rolanda Valinteliene) for their contribution to this report in particular and to the project in general. Moreover, we are extremely grateful to all national representatives and all their participating long-term care facilities. Without them this survey would not have been so successful. HALT would not have been possible without their contribution.

Austria: Alexander Blacky (Medical University Vienna); Belgium: Béatrice Jans (Scientific Institute of Public Health); Bulgaria: Rossitza Vatcheva-Dobrevska (National Centre of Infectious and Parasitic Diseases, Sofia); Croatia: Smilja Kalenić (University Hospital Centre, Zagreb); Cyprus: Stavroula Michael (Ministry of Health, Nicosia); Czech Republic: Dana Hedlová (Central Military Hospital Prague); Denmark: Christian Stab Jensen (Statens Serum Institut, Copenhagen); Estonia: Annika Lemetsar (Health Board, Tallinn); Finland: Tommi Kärki, Outi Lyytikäinen (National Institute for Health and Welfare, Helsinki); France: Benoist Lejeune (Faculté de Médecine, Brest); Germany: Nicoletta Wischnewski (Robert Koch Institute, Berlin); Greece: Helena Maltezou (Hellenic Center for Disease Control and Prevention, Athens); Hungary: Rita Szabó (National Center for Epidemiology, Budapest); Ireland: Fidelma Fitzpatrick (Health Protection Surveillance Centre, Dublin); Italy: Maria Luisa Moro (Agenzia Sanitaria e Sociale Regionale Emilia – Romagna, Bologna); Lithuania: Ruta Markevice (Institute of Hygiene, Vilnius); Luxembourg: Elisabeth Heisbourg (Ministry of Health, Luxembourg); Malta: Rudolph Cini (St Vincent De Paul Residence, Luqa); The Netherlands:Marie-José Veldman-Ariesen (National Institute for Public Health and the Environment, Bilthoven); Poland: Piotr Heczko (University Medical School, Kraków); Portugal: Ana Cristina Costa (General Department for Health, Lisbon); Slovenia: Božena Kotnik Kevorkijan (University Medical Centre Maribor); Spain: Xavier Rojano Luque (University of Barcelona); Sweden: Johan Struwe (Swedish Institute for Infectious Disease Control, Solna); United Kingdom – England: Barry Cookson (Health Protection Agency, London); United Kingdom – Northern Ireland: Gerard McIlvenny (Public Health Agency, Health and Social Care Northern Ireland, Belfast); United Kingdom – Scotland: Fiona Murdoch (Health Protection Scotland, Glasgow); United Kingdom – Wales: Dafydd Williams (Public Health Wales, Welsh Healthcare Associated Infection Programme, Cardiff).

Errata:

Page 46. On 14 May 2014, figure 21 was corrected. Previously, subcategories of antibacterials for systemic use (ATC J01) had been incorrectly paired with their respective pie chart segments.

Page 24. On 15 June 2016, Table 9 was corrected. Previously the data for 'Residents with at least one HAI' had been mistakenly exchanged with that for 'Residents receiving at least one antimicrobial agent'.

Suggested citation: European Centre for Disease Prevention and Control. Point prevalence survey of healthcare-associated infections and antimicrobial use in European long-term care facilities. May–September 2010. Stockholm: ECDC; 2014.

Stockholm, May 2014

ISBN 978-92-9193-567-3

doi 10.2900/22606

Catalogue number TQ-01-14-325-EN-N

Contents

Figures

Tables

Abbreviations

ATC	Anatomical Therapeutic Chemical
AMR	Antimicrobial resistance
CI	Confidence interval
CP	Coordinating physician
EEA	European Economic Area
ESAC	European Surveillance of Antimicrobial Consumption Project
GP	General Practitioner
GI	Gastrointestinal infection
HAI	Healthcare-associated infection
HALT	Healthcare-Associated Infections in European Long-Term Care Facilities Project
IPC	Infection prevention and control
IM	Intramuscular
IPSE WP7	Improving Patient Safety in Europe Project – Work Package 7
IV	Intravenous
LTCF	Long-term care facility
MDRO	Multidrug-resistant organism
MRSA	Meticillin-resistant Staphylococcus aureus
NH	Nursing home
PPS	Point prevalence survey
RH	Residential home
RTI	Respiratory tract infection
s/s	Signs and/or symptoms
UTI	Urinary tract infection

Executive summary

Healthcare-associated infections (HAIs) and antimicrobial resistance (AMR) in long-term care facilities (LTCFs) are important to public health, even only when considered in the light of Europe's aging population. In LTCFs, HAIs result in a high morbidity and mortality in those who are already more commonly susceptible due to chronic health problems.

To quantify the magnitude of HAIs in LTCFs at the European level, the European Centre for Disease Prevention and Control (ECDC) provided funding for the Healthcare-Associated infections in Long-Term care facilities (HALT) project.

The project developed a sustainable methodology based on a repeated Point Prevalence Survey (PPS) design to study the prevalence of HAIs and antimicrobial use in European LTCFs and to explore related infection prevention and control (IPC) structures and process indicators in the same group of LTCFs.

The first EU-wide PPS in LTCFs was organised between May to September 2010. Data were collected on one single day by either a local data collector (e.g. designated physician, IPC doctor/nurse, head nurse, etc.) or an external data collector recruited by the national representative (e.g. IPC doctor/nurse). Two types of paper questionnaires were used to collect data: 1) an institutional questionnaire collecting general information and denominator data and 2) a resident questionnaire for each eligible resident using antimicrobial agents and/or presenting signs/symptoms of HAI on the PPS day.

Twenty-eight European countries (including four UK administrations) and a total of 722 LTCFs participated in the PPS. For a large majority, these LTCFs were general nursing homes (NHs; n=542), mixed LTCFs (n=107) and residential homes (RHs; n=47). Other types of participating facilities were psychiatric LTCFs (n=4), LTCFs for mentally (n=7) or physically (n=2) disabled persons, rehabilitation (n=8) and palliative care centres (n=2) and 'other LTCFs' (n=3). To increase the homogeneity, and therefore also the comparability of data as much as possible, data in this report are presented for a pooled subset of LTCFs, i.e. general NHs, RHs and mixed LTCFs (n=694, 96.1%; two LTCFs were excluded due to late data delivery).

In total, 61 932 residents met the eligibility criteria, i.e. living in the LTCF for at least 24 hours and present at 8:00 am on the day of the PPS. The majority (70.6%) of all eligible residents were female and 44.8% were older than 85 years. Three care load indicators were investigated among the eligible population and were found to be high: 63.3% had faecal and/or urinary incontinence, 52.4% were disoriented in time and/or in space and 47.5% had an impaired mobility, i.e. wheelchair bound or bedridden. In total, 7.2% of the eligible residents had a urinary catheter, 4.5% a pressure sore and 6.7% a wound other than a pressure sore. Vascular catheter use and recent surgery (<30 days prior to the PPS) were relatively uncommon (0.8% and 1.2%, respectively).

Medical care in LTCFs was either provided by general practitioners (61.2%), employed medical staff (15.7%), or both (23.1%). In nearly half of all included LTCFs (45.9%) there was no medical doctor in charge of the coordination of medical activities.

The presence of an IPC practitioner, an IPC committee and/or IPC advice in the LTCFs was explored. The combination of an IPC practitioner and access to IPC advice was present in 27.0% of the LTCFs, while 21.1% of the LTCFs had all three IPC structures (21.1%). The majority of the LTCFs could only access IPC advice (30.0%). Importantly, 9.0% of the LTCFs had none of the explored IPC structures in place.

On the day of the PPS, 2 495 residents presented at least one sign/symptom of an infection. According to the modified McGeer criteria that were applied during analysis, only 1 488 of these had an HAI (59.6%). The crude prevalence of residents with at least one HAI was 2.4%.

In total, 1 549 infections were confirmed by the modified McGeer criteria. Respiratory tract infections (RTIs) were reported most frequently (33.6%), followed by urinary tract infections (UTIs; 22.3%) and skin infections (21.4%). Respiratory tract infections were mainly 'lower RTIs other than pneumonia' (50.4%), common colds/pharyngitis (26.5%) and pneumonia (22.1%); and five cases of influenza-like illness were reported (1.0%). Skin infections (n=332) mainly included cellulitis/soft tissue/wound infections (86.4%) and fungal infections (9.3%).

The crude prevalence of residents receiving at least one antimicrobial agent was 4.3%. In total, 2 819 antimicrobial agents were received by 2 679 eligible residents on the day of the PPS.

The majority of the antimicrobial agents were administered orally (89.3%) and were mainly prescribed for the treatment of an infection (72.3%). A considerable number of antimicrobial agents were prescribed prophylactically (27.7%).

Antibacterials for systemic use (Anatomical Therapeutic Chemical (ATC) class J01) represented 96.2% of all antimicrobial agents prescribed on the day of the PPS. Beta-lactams and penicillins (J01C; 28.7%), 'other antibacterials' (J01X; 19.4%), quinolones (J01M: 15.5%) and 'other beta-lactams' (J01D; 14.1%) were the most frequently prescribed ATC group.

This was the first time that a Europe-wide PPS was organised to explore HAIs, antimicrobial use and AMR in LTCFs using a standardised methodology. This methodology, based on a PPS design proved to be feasible for use in chronic care facilities where workloads are often very high and levels of expertise in and available resources for IPC can be found to be scarce.

The results contained in this report are, however, subject to limitations. Incomplete reporting of signs and symptoms by local data collector with limited knowledge of HAI definitions could have led to the under-reporting of HAIs. Data were collected in a very heterogeneous group of LTCFs. Despite the amalgamation of the results from general NHs, RHs and mixed LTCFs, the case mix of the residents living in the selected LTCFs still varied tremendously. Moreover, the results presented in this report must be carefully interpreted as the data cannot be considered as representative for Europe nor for the participating countries. Large differences in participation rates were observed between countries. Also, most countries selected LTCFs based on a convenience sample (e.g. proximity to the national coordinating centre, public institutions, and voluntary participation). Despite these limitations, the project delivered interesting and valuable insights into the occurrence of HAIs, antimicrobial use and AMR in LTCFs.

The following recommendations can be made for future PPSs in LTCFs:

- continue the monitoring of HAIs and antimicrobial use using a standardised methodology based on repeated PPSs in LTCFs across EU Member States
- improve data quality by increasing the level of controlled data entry in the software tool for repeated PPS in LTCFs, by developing standardised training material and by providing a train-the-trainers course
- propose and validate case definitions of HAI in LTCFs and develop a protocol for field validation of data collected during the repeated PPSs in LTCFs
- explore the different types of LTCFs in EU Member States and collect information on the number of LTCFs and LTCF beds by category
- encourage EU Member States to participate in the PPS and recommend that they draw a representative sample of each country's LTCFs.

Background and objectives

The European population is ageing and healthcare needs for the elderly population are increasing. As a consequence, an increasing number of long-term care facilities (LTCFs) will be needed in European countries to meet these needs.

Promotion of effective infection prevention and control (IPC) measures faces many specific constraints in LTCFs. The lack of sufficient certified nurses, heavy workload for healthcare personnel, insufficient time for training and the organisation of medical care - often provided by an individual 'General Practitioner (GP)-to-patient' relationship and with insufficient attention to public health aspects - are some examples of these constraints. Furthermore, the 'homelike' character of LTCFs represents a challenge for the prevention and control of healthcare-associated infections (HAIs) and antimicrobial resistance (AMR) as LTCFs cannot be considered as hospitals and do not have the same resources at their disposal to combat these threats. Tackling HAIs and AMR in LTCFs represents an important challenge for Europe.

In 2009, ECDC funded the Healthcare-Associated infections in Long-Term care facilities (HALT) project. HALT continued the efforts of the Improving Patient Safety in Europe project (IPSE) Work Package 7 (a feasibility study of HAI surveillance in European nursing homes) and integrated variables from the European Surveillance of Antimicrobial Consumption in Nursing Homes (ESAC-NH) subproject into a protocol for repeated PPS of HAI and antimicrobial use in a European wide network of LTCFs [1,2].

In November 2009, thirteen countries agreed to test the repeated PPS methodology and together enrolled 117 high-skilled nursing homes (definition IPSE project, Work Package 7) for participation in a pilot PPS [1]. Based on this experience, the methodology was adapted slightly (see further).

The overall aim of the HALT project was to support the prevention and control of HAIs, antimicrobial use and AMR in the 27 EU Member States, three EEA countries (Iceland, Liechtenstein and Norway) and three EU candidate countries (Croatia, the former Yugoslav Republic of Macedonia and Turkey).

The specific objectives of HALT were:

- to develop a comprehensive European network of networks of LTCFs in participating European countries
- to develop, implement and promote a sustainable methodology based on a repeated PPS design to study the prevalence of HAIs and antimicrobial use in European LTCFs, and related IPC structure and process indicators in the same group of LTCFs

It was anticipated that data from the HALT project will be useful:

- to quantify the prevalence of infections and antimicrobial use in LTCFs in European countries
- to obtain an initial data point to follow trends in these infections and antimicrobial use in LTCFs in European countries
- to identify the needs for intervention, training and/or additional IPC resources
- to design policies to cope in a timely way with HAI issues which might arise in LTCFs or have an impact on other related healthcare sectors
- to foster safety of healthcare for LTCF residents and, more generally, the ageing population in Europe.

Methodology

The results presented in this report must be interpreted with caution as the data cannot be considered as representative of neither Europe, nor of the participating countries. Large differences in participation rates were observed between countries (range: from 2 to 111 participating LTCFs per country). Moreover, most countries selected LTCFs based on a convenience sample, e.g. proximity to the national coordinating centre, public institutions, and voluntary participation.

To increase homogeneity, and therefore also the comparability of data, results are presented for only a subset of LTCFs, i.e. general nursing homes, residential homes and mixed LTCFs.

National participation

After a pilot survey in November 2009, a first EU-wide point prevalence survey (PPS) was organised. All the countries among the 27 EU Member States, three EEA countries and three candidate countries were invited and encouraged to join the HALT project. A minimum enrolment of two LTCFs per country was required for participation and the PPS had to be performed between May and September 2010.

Twenty-eight national representatives coordinated the PPS in their country. Data were collected independently for the four UK administrations and are therefore reported separately. For simplicity, UK administrations are considered as countries in this report.

Long-term care facilities participation

In contrast to the pilot PPS, not only high-skilled nursing homes could participate but also other types of LTCFs. The definition of a 'high-skilled nursing home' used in the IPSE project (WP7) was adapted to include LTCFs in which residents [1]:

- need 'high-skilled nursing care' (i.e. more than 'basic' nursing care and assistance for the activities of daily living)
- are medically stable and do not need constant 'specialised medical care' (i.e. care administered by specialised physicians
- do not need invasive medical procedures* (e.g. ventilation)

** Invasive medical procedures: in the HALT project, ambulatory treatments (e.g. haemodialysis, peritoneal dialysis and chemotherapy) are not considered to be invasive medical procedures.*

In these LTCFs:

- registered nursing staff are mostly present at all times of the day and night, every day of the week (24/7)
- different types of residents are resident in the LTCF, even if some of the wards are more specialised than others, e.g. dementia care.

The following facility types were excluded:

- hospital long-term care wards; residential care (hotel; without any kind of nursing care), sheltered care houses, day centres, home-based centres, resident flat and protected living.

After the PPS, national representatives were requested to classify participating LTCFs according to the type of LTCF, average length of stay in the facility and type of resident population. Minimal definitions were given; and classification depended on the judgement of the national representative, not on the LTCF itself.

Ten categories of LTCF type were provided: general nursing home (NH), residential home (RH), psychiatric LTCF, LTCF for mentally disabled persons, LTCF for physically disabled persons, rehabilitation centre, palliative care facility, sanatorium, mixed LTCF (all or some of the above) and 'other' type of LTCF. 'Length of stay' was classified within five groups: temporary short (<3 months), temporary medium (3–12 months), temporary long (>12 months, not definitive), definitive stay (i.e. until the end of life) and 'other'. Representatives had to assign each LTCF to one of the following eight groups of 'type of resident population': mentally disabled persons only, physically disabled persons only, psychiatric residents only, rehabilitation only, convalescent only, intensive care only, all or some of the above, and 'other' resident population.

Data collection at long-term care facilities

Date of the point prevalence survey

The PPS had to be performed between 1 May and 30 September 2010. Data had to be collected on one single day, with the exception of large LTCFs who could perform the PPS on two or more consecutive days on the condition that all beds in one ward were surveyed on the same day.

Eligibility of residents

A resident was considered eligible for the PPS if they lived 24/7 in the LTCF, had resided there for at least 24 hours and were present at 8:00 am on the day of the PPS. Residents receiving chronic ambulatory care on a regular basis in the acute care hospital (e.g. haemodialysis, chemotherapy) were included in the PPS as long as they were not hospitalised (i.e. inpatient in an acute care hospital with hospital stay for at least 24 hours) on the day of the PPS.

Protocol, data collectors and tools

Based on the experience of the pilot PPS (November 2009), the methodology for repeated PPSs in LTCFs was slightly adapted.

Data were collected by either a local data collector (e.g. designated physician, IPC doctor/nurse, head nurse, etc.) or an external data collector recruited by the national representative (e.g. IPC doctor/nurse).

Two types of paper questionnaires were used to collect data:

- An **institutional questionnaire**: general data, denominator data and information on medical care and coordination, IPC structures and antimicrobial policies in the LTCF [10]. A ward list was offered to aid in the collection of denominator data for the entire LTCF eligible population.
- A **resident questionnaire** for each eligible resident using antimicrobial agents and/or presenting signs/symptoms of HAI on the PPS day [10].

A light version of the PPS protocol was offered to the national representatives that only collected limited denominator data, i.e. number of eligible residents, residents with signs/symptoms of an infection and residents receiving at least one antimicrobial on the day of the PPS. Only Estonia used this light version.

Data had to be entered in stand-alone software consisting of two applications, one for national centres and one for LTCFs. The national centre's application allowed national coordinators to import or enter data from LTCFs. It also included a tool that generated the LTCF application. The LTCF application could be used by local data collectors to enter their PPS data, generate a summary report and export the data to their national centres.

Local performance indicators

One aim of the HALT project was to develop national and local structure and process indicators (performance indicators; PI) in IPC and antimicrobial stewardship in participating countries and LTCFs. Indicators to measure current IPC practices in LTCF, available IPC resources and infrastructure were collected by the institutional questionnaire.

Antimicrobial consumption data

The Anatomical Therapeutic Chemical (ATC) classification system of the World Health Organization Collaborating Centre for Drug Statistics Methodology was used to classify substances [3].

All oral, rectal, intramuscular and intravenous treatments with antibacterials and antimycotics for systemic use, drugs for the treatment of tuberculosis and antibiotic treatment by inhalation (aerosol therapy) were included. Antiseptics, antivirals and antimicrobial agents for topical use were excluded from the PPS. The use of local antibiotics was only explored (as a yes/no question) for residents with signs/symptoms of a skin or wound infection or of conjunctivitis.

Antimicrobial resistance data

In contrast with the pilot PPS, the questions on AMR included in the resident questionnaire were no longer optional. If a microbiological culture was performed to guide antimicrobial prescription, the three 'most important' isolated microorganisms had to be recorded. A mandatory microorganism code list was provided to help with this reporting [10]. Eight multidrug-resistant microorganisms were included in this code list: carbapenem-resistant *Acinetobacter baumannii*, third-generation cephalosporin-resistant *Enterobacter* spp., glycopeptide-resistant *Enterococcus* spp., third-generation cephalosporin-resistant *Escherichia coli*, third-generation cephalosporin-resistant *Klebsiella pneumoniae*, third-generation cephalosporin-resistant *Proteus mirabilis*, carbapenem-resistant *Pseudomonas aeruginosa*, and meticillin-resistant *Staphylococcus aureus* (MRSA).

Healthcare-associated infections

As LTCFs are often not familiar with the application of definitions for infections and often lack staff with adequate levels of expertise in the field of IPC, a checklist with signs and symptoms (s/s) based on McGeer criteria was used to collect information on HAIs [4, 10]. These definitions were adapted by adding a field to the resident questionnaire 'diagnosed by the attending physician' in order to avoid an underestimation of the infection rate due to the lack of on-site diagnostic testing (X-ray, microbiological sampling and other diagnostic confirmation tools). This criterion had to be accompanied by other relevant s/s of an infection [10].

Only infections not already present or in incubation at the time of (re)admission could be included. Signs and symptoms had to be reported if they were present on the day of the PPS or if they were present in the past and the resident was (still) receiving treatment for that infection on the day of the PPS.

Data analysis

Data were processed and analysed using Stata/SE 10.1 (StataCorp, 2009. Texas: StataCorp LP.). Boxes in horizontal box plots present the median and interquartile range. Their adjacent lines indicate the boundary 1.5 times above/below the upper/lower quartiles. Values outside of these boundaries (i.e. outliers), when included, are plotted as individual values.

Definitions

The criteria defining 'eligible residents' are listed above (see Eligibility of residents). Selected LTCFs were defined as all LTCFs from general nursing homes, residential homes, or mixed LTCFs. For the purposes of this report, a 'country' is defined as an EU/EEA Member State, or one of the four UK administrations.

The crude prevalence of HAIs was defined as the total number of residents with at least one HAI detected in eligible residents on the day of the PPS, per 100 residents. Similarly, the crude prevalence of antimicrobial use was defined as the total number of eligible residents receiving at least one antimicrobial agent on the day of the PPS, per 100 residents. The 'median' of an indicator is the 50th percentile (i.e. P50) for that indicator in all selected LTCFs in entire dataset, e.g. the median HAI prevalence is the median of the HAI prevalences detected in all selected LTCFs.

Results

Participation

Between May and September 2010, 28 European countries (including four UK administrations, considered as separate countries for the purpose of this report) participated in HALT. Together they enrolled 722 LTCFs, of which the majority were general nursing homes (NHs; 75.1%), mixed LTCFs (14.8%) and residential homes (RHs; 6.5%).

Table 1 provides an overview of the enrolled countries and the distribution of their participating LTCFs according to the LTCF type. No sanatoria participated in this survey.

Table 1. Number and type of LTCFs that performed the PPS by country, HALT, 2010 (n=722)

Country	General nursing homes	Residential homes	Mixed LTCFs	Psychiatric LTCFs	LTCFs for the mentally disabled	LTCFs for the physically disabled	Rehabilitation centres	Palliative care centres	Other LTCFs	Total LTCFs
	n	n	n	n	n	n	n	n	n	n
Austria	3									3
Belgium	107		1	1			2			111
Bulgaria	11									11
Croatia		2								2
Cyprus			2							2
Czech Republic	1	1	2					1	1	6
Denmark	5									5
Estonia	5					1				6
Finland	9									9
France	65									65
Germany	73									73
Greece			3							3
Hungary		24	18							42
Ireland	27	1	27	3	7	1	1	1	1	69
Italy	60	11	19				2			92
Lithuania	38		12							50
Luxembourg	4		1							5
Malta	3	1					1			5
The Netherlands	10									10
Poland	1	2								3
Portugal			4				2		2	8
Slovenia			4							4
Spain	1		1							2
Sweden	1		5							6
UK - England	4		6							10
UK - Northern Ireland	13	5								18
UK - Scotland	83									83
UK - Wales	18								1	19
Total	**542**	**47**	**105**	**4**	**7**	**2**	**8**	**2**	**5**	**722**
	75.1%	**6.5%**	**14.5%**	**0.6%**	**1.0%**	**0.3%**	**1.1%**	**0.3%**	**0.7%**	**100%**

LTCF categories that were pooled for further analyses are highlighted in green. LTCFs that are not included in further analyses are greyed out.

Characteristics of general nursing homes, residential homes and mixed long-term care facilities

The results from 542 general NHs, 105 mixed LTCFs and 47 RHs were used for detailed analysis (n=694 or 96.1% of all participating LTCFs).

The greater majority of the selected LTCFs (86.3%) had a mixed resident population, i.e. a combination of mentally, physically and/or psychiatrically disabled residents with residents in need of rehabilitation, convalescent and/or intensive care. The length of stay in the LTCFs was mainly definitive (until the end of life) or temporary long (>12 months, but not definitive): 74.1% and 20.6%, respectively.

Table 2 provides an overview of the number of selected LTCFs, eligible residents and beds per country.

Table 2. Number of included LTCFs, size of LTCFs, eligible residents, ownership of LTCFs, bed occupancy and percentage of hospitalised residents, by country

Country	Included LTCFs	Size of LTCFs (n of beds)				Eligible residents	Public LTCFs	LTCFs with a 24/7 nurse	Median bed occupancy rate	Median percentage of hospitalised residents
	n	n	Min	Mean	Max	n	%	%	%	%
Austria	3	413	86	137.7	192	400	33.3	100.0	99.5	1.6
Belgium	108	12 468	25	115.4	302	12 041	35.2	97.2	98.1	1.2
Bulgaria	11	272	13	24.7	40	200	9.1	100.0	66.7	11.1
Croatia	2	550	172	275.0	378	546	100.0	100.0	98.8	0.3
Cyprus	2	81	39	40.5	42	64	100.0	100.0	79.6	0.0
Czech Republic	4	592	54	148.0	359	549	50.0	100.0	88.7	1.3
Denmark	5	345	54	69.0	76	313	100.0	20.0	90.7	0.0
Estonia	5	858	29	171.6	344	784	80.0	80.0	100.0	10.3
Finland	9	2 344	60	260.4	695	2 320	100.0	55.6	99.4	0.2
France	65	6 610	38	101.7	330	6 255	82.3	41.5	96.8	1.1
Germany	73	6 998	9	95.9	301	6 496	60.6	100.0	96.7	2.0
Greece	3	657	81	219.0	340	636	66.7	100.0	98.2	0.0
Hungary	42	4 908	10	116.9	489	4 839	71.4	97.6	100.0	0.0
Ireland	55	3 594	10	65.3	382	3 282	85.5	100.0	93.3	0.0
Italy	90	9 512	20	105.7	631	9 203	58.9	94.4	98.3	0.4
Lithuania	50	2 859	11	57.2	265	2 519	83.7	90.0	95.0	0.0
Luxembourg	5	524	42	104.8	213	508	80.0	100.0	97.6	1.9
Malta	4	549	68	137.3	234	495	50.0	25.0	95.9	1.1
The Netherlands	10	1 479	76	147.9	214	1 429	100.0	90.0	97.3	0.0
Poland	3	313	55	104.3	168	313	100.0	33.3	100.0	0.0
Portugal	4	180	12	45.0	78	163	0.0	100.0	96.1	2.8
Slovenia	4	1 424	206	356.0	503	1 396	100.0	100.0	99.5	1.1
Spain	2	132	42	66.0	90	126	100.0	50.0	95.4	3.6
Sweden	6	286	30	47.7	87	281	83.3	83.3	100.0	0.0
UK - England	10	492	30	49.2	85	466	0.0	100.0	94.3	0.0
UK - Northern Ireland	18	731	25	40.6	57	642	16.7	83.3	90.1	1.0
UK - Scotland	83	5 390	16	64.9	180	4 870	0.0	100.0	95.0	0.0
UK - Wales	18	865	24	48.1	99	796	0.0	100.0	91.9	0.0
Total	**694**	**65 426**	**9**	**94.3**	**695**	**61 932**	**53.0**	**89.6**	**97.2**	**0.5**

Large differences in the total number of included beds were observed between countries: from 81 beds in two Cypriot LTCFs to 12 468 beds in 108 Belgian LTCFs. The mean number of beds per LTCF was low in Bulgaria (24.7 beds), Cyprus (40.5), UK-Northern Ireland (40.6), Portugal (45.0), Sweden (47.7), UK-Wales (48.1) and UK-England (49.2) and highest in Greece (219.0), Finland (260.4) and Croatia (275.0). The participating RHs (112.6 beds) and mixed LTCFs (105.8) were on average larger than the enrolled NHs (90.5 beds).

Due to these differences, the number of eligible residents (i.e. residents present at 8:00 am on the day of the PPS, living full-time in the LTCF since at least 24h) varied greatly between countries: from 64 eligible residents in Cyprus to 12 041 residents in Belgium. The participating NHs counted 46 221 eligible residents. Mixed LTCFs and RHs had 10 519 and 5 192 eligible residents, respectively.

In general, the number of private LTCFs was almost equal to the number of publically owned LTCFs (53.0%). All included LTCFs in Portugal, UK-England, UK-Scotland and UK-Wales were privately owned, while included LTCFs in Croatia, Cyprus, Denmark, Finland, the Netherlands, Poland, Slovenia and Spain were public ones.

Most RHs (72.3%) and mixed LTCFs (74.3%) were publically owned, while a slight majority of NHs were privately owned (52.9%).

Nurse availability (24/24h) was high except in Denmark (20.0%), Malta (25.0%), Poland (33.3%) and France (41.5%).

The median bed occupancy rate was above 90% in all countries, except Bulgaria (66.7%), Cyprus (79.6%) and the Czech Republic (88.7%).

Bulgaria (11.1%) and Estonia (10.3%) reported a high percentage of patients that were hospitalised at the time of the survey. These last figures are important when interpreting the prevalence of antimicrobial use and infections as these could both be underestimated if residents had been transferred to a hospital quickly when sick.

Characteristics of the eligible long-term care facilities population

Age and gender

More than 44% of the residents were older than 85 years. LTCF residents in Poland, Bulgaria and Portugal were relatively younger, (14.8%, 23.0% and 23.9% older than 85 years, respectively). The eldest eligible populations were reported from LTCFs in Sweden (58.3%) and the Czech Republic (59.7%) (Table 3). The proportion of residents ≥85 years was larger in NHs (mean: 47.5%) compared to RHs (34.5%) and mixed LTCFs (35.9%).

The majority of eligible residents were female (mean: 70.6%). The Greek and Czech LTCFs' population had slightly more male residents: on average 47% and 41% males, respectively. Germany had LTCFs with only male or with only female residents. NHs and RHs had comparable mean percentages of female residents (71.9% and 69.9%, respectively) whereas mixed LTCFs had a slightly lower percentage (64.4%) of female residents.

Table 3. Gender and age distribution in the eligible LTCF population by country, HALT, 2010

Country	Female residents (%)			Residents >85 years (%)		
	Min	Mean	Max	Min	Mean	Max
Austria	74.9	80.1	82.8	45.5	51.4	55.5
Belgium	44.8	74.7	91.0	8.8	53.4	82.4
Bulgaria	44.4	62.4	93.3	0.0	23.0	36.4
Croatia	70.1	73.7	77.4	36.9	37.5	38.1
Cyprus	66.6	69.8	72.9	18.9	50.2	81.5
Czech Republic	40.0	59.0	73.9	42.6	59.7	83.3
Denmark	60.0	67.3	73.7	36.4	51.2	73.7
Estonia*	NA	NA	NA	NA	NA	NA
Finland	57.3	73.8	82.3	26.7	45.8	59.7
France	48.5	70.9	86.4	12.7	53.1	83.6
Germany	0.0	73.2	100.0	0.0	49.4	88.9
Greece	24.7	53.0	74.9	19.9	36.7	65.4
Hungary	31.8	68.8	96.6	0.8	26.8	60.3
Ireland	21.9	61.9	100.0	0.0	41.5	92.6
Italy	0.0	73.0	99.8	2.5	46.6	82.8
Lithuania	41.1	68.9	100.0	0.0	28.4	100.0
Luxembourg	57.0	69.2	78.9	33.3	46.6	57.7
Malta	50.9	70.5	87.1	35.3	47.2	61.4
The Netherlands	62.6	68.4	75.6	29.6	38.7	60.5
Poland	55.6	66.6	74.5	3.6	14.8	21.1
Portugal	54.5	62.6	69.2	18.2	23.9	38.5
Slovenia	36.7	68.0	83.4	2.2	42.8	87.6
Spain	52.5	64.6	76.7	25.0	42.7	60.5
Sweden	52.9	65.8	72.4	33.3	58.3	77.5
UK - England	40.5	68.3	83.7	2.4	40.9	63.3
UK - Northern Ireland	32.4	71.1	91.7	0.0	49.7	100.0
UK - Scotland	36.0	71.9	90.8	0.0	44.6	100.0
UK - Wales	39.6	69.6	95.8	0.0	49.4	93.8
Total	**0.0**	**70.6**	**100.0**	**0.0**	**44.8**	**100.0**

**Estonia participated in the PPS using the light version of the protocol. NA: not applicable*

Care load indicators

The mean percentage of residents with faecal and/or urinary incontinence was 63.3% (median: 68.2%). The lowest mean rate of incontinence (1.9%) was reported by Cyprus' LTCFs, in which of all 64 eligible residents, only one was incontinent. Included LTCFs in Finland had the highest percentage of incontinent residents (range: 60.2 to 95.0%; mean: 82.3%) (Table 4 and Figure 1).

The percentage of incontinence was lower in RHs (mean: 53.5%, median: 48.3%) compared to NHs (mean: 64.6%, median: 68.4%) and mixed LTCFs (mean: 61.4%, median: 67.7%).

Disorientation in time and/or in space scored just above 50% (mean: 52.4%). Vary large variations in disorientation rates between the included LTCFs of one country could be seen. The mean percentage of disorientation was low in the included LTCFs in Croatia, Malta and Lithuania: 12.1%, 17.4% and 21.3% (Table 4 and Figure 2).

RHs reported lower percentages for disorientation (mean: 41.4%, median: 34.1%) compared to NHs (mean: 53.7%, median: 56.3%) and mixed LTCFs (mean: 50.6%, median: 51.4%).

Table 4. Care load indicators and risk factors in the eligible LTCF population by country, HALT, 2010

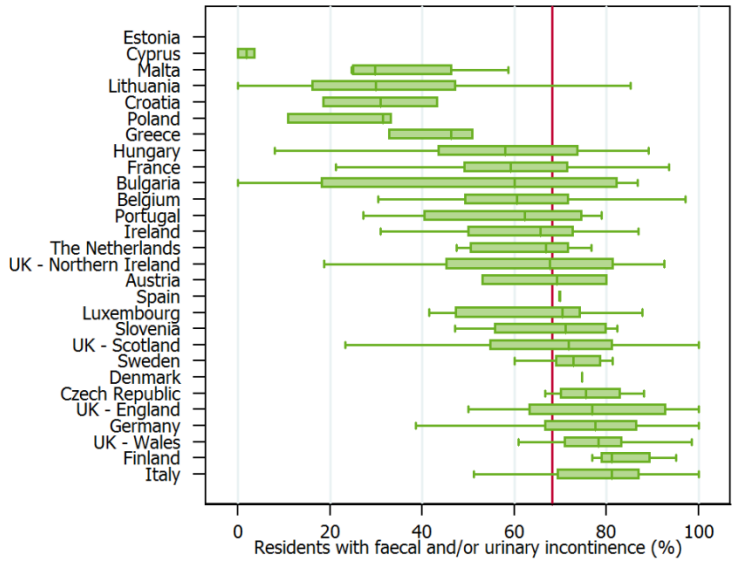
Country	Care load indicators			Risk factors				
	Incontinence	Disorientation	Impaired mobility	Urinary catheter	Vascular catheter	Pressure sores	Other wounds	Surgery (<30 days)
	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean
Austria	67.5	61.8	53.6	7.1	1.1	3.3	13.4	2.0
Belgium	60.8	49.3	42.1	2.6	0.2	3.5	8.2	1.2
Bulgaria	51.2	41.8	65.5	23.4	8.6	9.0	4.7	8.7
Croatia	31.0	12.1	25.4	3.3	0.0	1.1	3.9	0.3
Cyprus	1.9	44.2	56.0	6.4	0.0	0.0	1.4	3.2
Czech Republic	76.5	53.6	67.8	21.1	7.0	13.6	9.9	2.7
Denmark	74.6	53.0	31.4	12.1	0.0	1.6	8.6	0.0
Estonia*	NA	NA	NA	NA	NA	NA	NA	NA
Finland	82.3	73.9	52.7	3.3	0.0	3.2	5.5	0.5
France	58.7	57.1	43.8	1.4	0.2	4.4	9.5	0.8
Germany	75.0	56.7	44.8	10.2	0.2	3.8	5.1	1.8
Greece	43.4	39.2	43.4	10.3	1.4	8.1	0.4	0.6
Hungary	56.8	42.4	30.1	2.1	0.1	2.6	5.4	0.9
Ireland	61.1	47.8	51.6	6.6	0.2	3.1	10.4	1.3
Italy	76.7	65.8	67.7	15.1	3.6	9.4	7.8	1.4
Lithuania	33.2	21.3	36.8	1.4	0.0	1.7	1.8	0.5
Luxembourg	64.3	58.0	50.5	6.2	0.0	7.6	11.7	2.4
Malta	35.7	17.4	31.0	4.6	0.0	2.6	2.6	1.3
The Netherlands	63.0	60.2	56.5	11.1	0.0	5.3	7.1	3.1
Poland	25.3	31.9	13.2	18.8	1.0	2.6	1.6	0.0
Portugal	57.6	30.9	67.6	20.8	4.2	10.8	5.8	0.7
Slovenia	67.9	50.9	42.8	2.8	0.0	3.4	5.3	0.2
Spain	69.9	68.7	58.8	12.4	1.3	18.1	9.1	0.0
Sweden	72.4	75.5	38.1	7.7	0.0	2.7	7.1	0.8
UK - England	76.9	63.5	62.6	11.9	0.0	5.8	13.3	0.4
UK - Northern Ireland	63.0	49.8	48.2	5.7	0.1	3.6	6.3	0.0
UK - Scotland	68.1	62.4	39.9	8.3	0.1	3.5	4.5	0.4
UK - Wales	76.6	51.8	73.2	10.4	0.2	4.7	3.5	1.0
Total	**63.3**	**52.4**	**47.5**	**7.2**	**0.80**	**4.5**	**6.7**	**1.2**

**Estonia participated in the PPS using the light version of the protocol*

On average, 47.5% of the eligible population had an impaired mobility, i.e. either wheelchair bound or bedridden. However, great variations were observed between countries. Low impaired mobility rates were observed in participating Poland's LTCFs (mean: 13.2%, median: 5.5%) and Croatia's LTCFs (mean and median: 25.4%). The highest mean score for this care load indicator was observed in UK-Wales (73.2%), but with a large variation between their included LTCFs (range: 23.1-100%) (Table 4 and Figure 3).

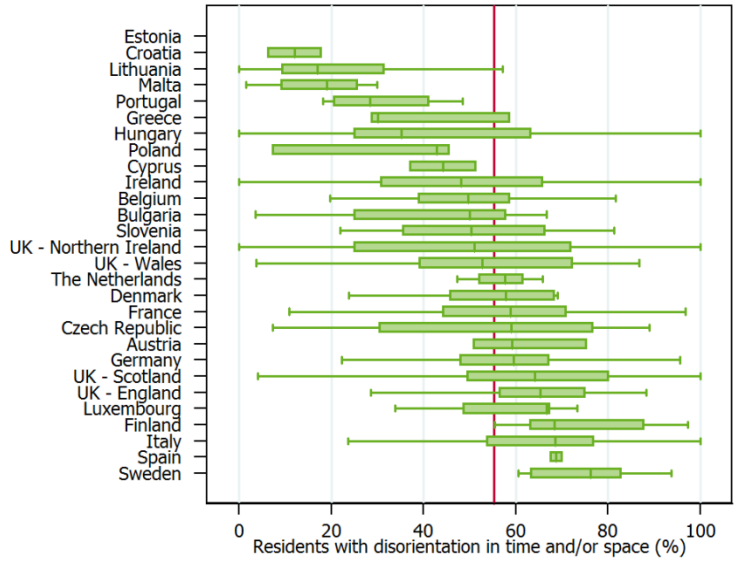
Overall, RHs reported the lowest percentages of impaired mobility (mean: 34.1%, median: 30.1%), but the figures were only slightly higher in NHs (mean: 48.5%, median: 47.7%) and mixed LTCFs (mean: 48.2%, median: 50.0%).

Figure 1. Prevalence of incontinence (faecal and/or urine) in the eligible LTCF population by country, HALT, 2010



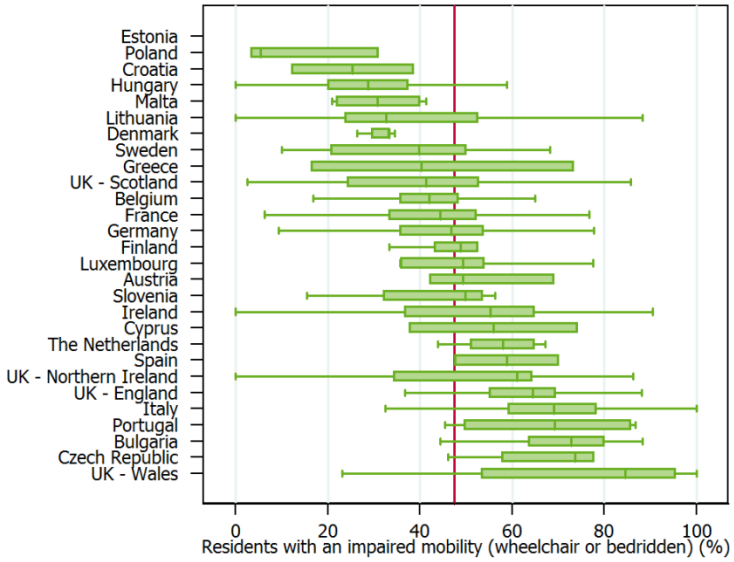
Red vertical line: crude median (68.2%), no outliers

Figure 2. Prevalence of disorientation (in time and/or space) in the eligible LTCF population by country, HALT, 2010



Red vertical line: crude median (55.3%), no outliers

Figure 3. Prevalence of impaired mobility (wheelchair bound or bedridden) in the eligible LTCF population by country, HALT, 2010



Red vertical line: crude median (47.4%), no outliers

Risk factors

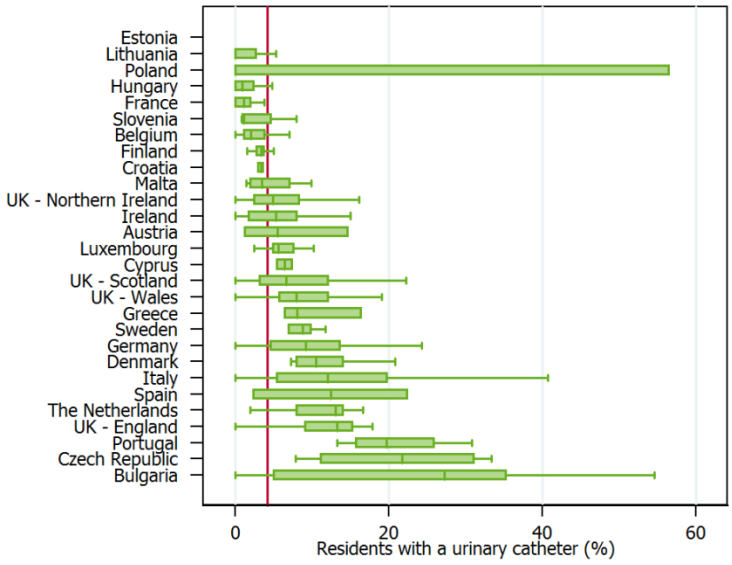
During the PPS five risk factors for the acquisition of HAIs and for the use of antimicrobial agents were explored: urinary catheters, vascular catheters, pressure sores, other wounds and surgery (within 30 days prior to the PPS).

The overall mean percentage of urinary catheter use was low (7.2%; median: 4.0%). Higher mean rates for this risk factor were reported in Portugal (20.8%), the Czech Republic (21.1%) and Bulgaria (23.4%) (Table 4 and Figure 4).

Overall, 125 out of 680 LTCFs (18.4%; no data available for Estonia) reported a zero prevalence for this item. Residential Homes had a lower urinary catheter prevalence (mean: 3.6%, median: 1.7%) as opposed to NHs (mean: 7.2%, median: 4.4%) and mixed LTCFs (mean: 8.9%, median: 4.9%).

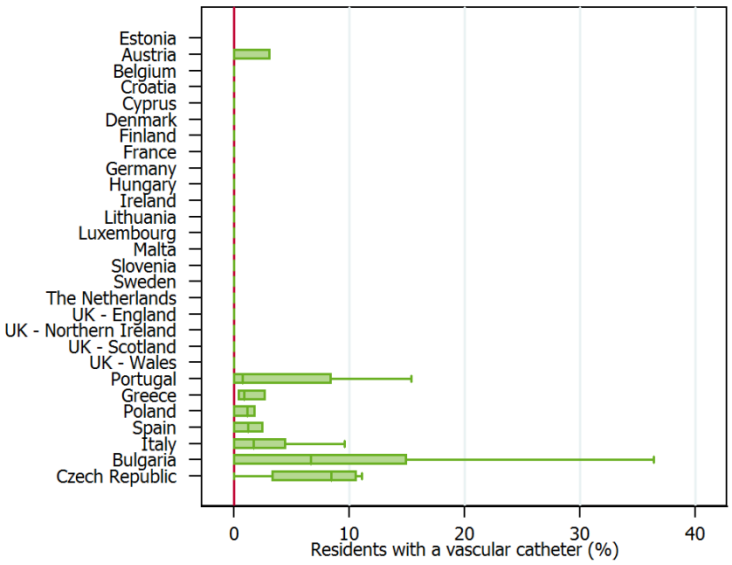
A second risk factor concerned vascular catheter use and was very uncommon in the included LTCFs. Twenty countries had a zero median prevalence. Half of them also had a mean zero prevalence: none of their eligible residents had a vascular catheter on the day of the PPS. In total, 563 LTCFs reported no vascular catheter use. The highest rates were reported in Bulgaria (mean: 8.6%, median: 6.7%) and in the Czech Republic (mean: 7.0%, median: 8.4%). The overall calculated mean percentage was 0.8% (median: 0%) (Table 4 and Figure 5). The median percentage was zero in NHs (mean: 0.8%), RHs (mean: 0.6%) and mixed LTCFs (mean: 1.1%).

Figure 4. Prevalence of urinary catheter use in the eligible LTCF population by country, HALT, 2010



Red vertical line: crude median (4.0%), no outliers

Figure 5. Prevalence of vascular catheter use in the eligible LTCF population by country, HALT, 2010



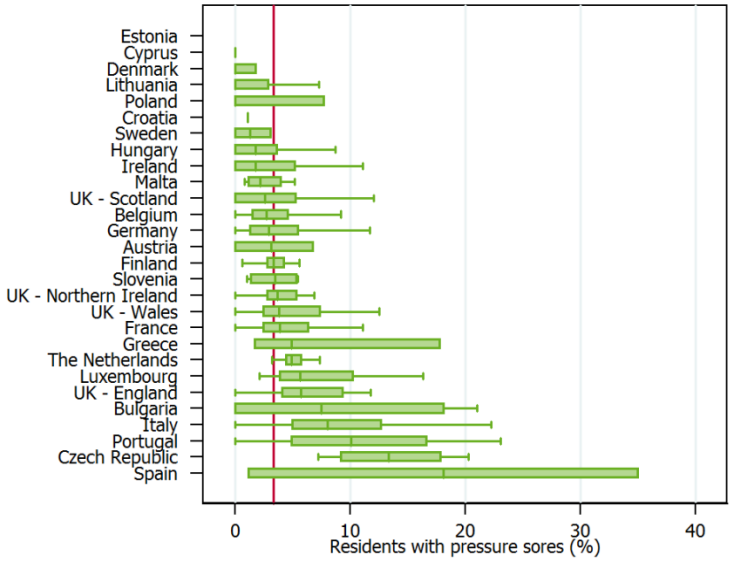
Red vertical line: crude median (0.0%), no outliers

Two distinct categories of wounds were applied as risk factors: 'pressure sores' and 'other wounds'. The latter category included all types of wounds other than pressure sores e.g. leg ulcers, traumatic or surgical wounds, insertion sites for gastrostomy, tracheostomy.

The overall mean percentage of pressure sores was 4.5% (median: 3.3%). This prevalence was the lowest in LTCFs in Cyprus (mean and median: 0%) and Croatia (mean and median: 1.1%), and the highest in the Czech Republic (mean: 13.6%, median: 13.3%) and Spain (mean and median: 18.1%) (Table 4 and Figure 6).

There was little difference in the mean prevalence rate between the three types of LTCFs: NHs 4.4%, RHs 4.3% and mixed LTCFs 5.0%.

Figure 6. Prevalence of pressure sores in the eligible LTCF population by country, HALT, 2010



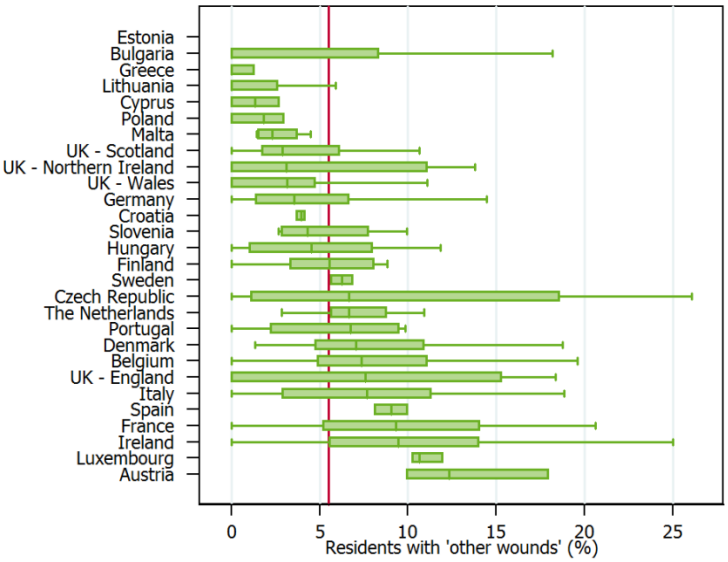
Red vertical line: crude median (3.3%), no outliers

For 'other wounds' the overall mean percentage (6.7%) scored a bit higher than pressure sores (median: 5.5%). The highest mean percentages were found in Ireland (mean: 10.4%, median: 9.5%), Luxembourg (mean: 11.7%, median: 10.6%), UK-England (mean: 13.3%, median: 7.6%) and Austria (mean: 13.4%, median: 12.3%). Three countries had a zero median prevalence: Bulgaria (mean: 4.7%), Greece (mean: 0.4%) and Lithuania (mean: 1.8%) (Table 4 and Figure 7).

A slight variation in prevalence rate was seen between NHs (mean: 6.8%, median: 5.5%), RHs (mean: 5.4%, median: 3.7%) and mixed LTCFs (mean: 7.1%, median: 6.6%).

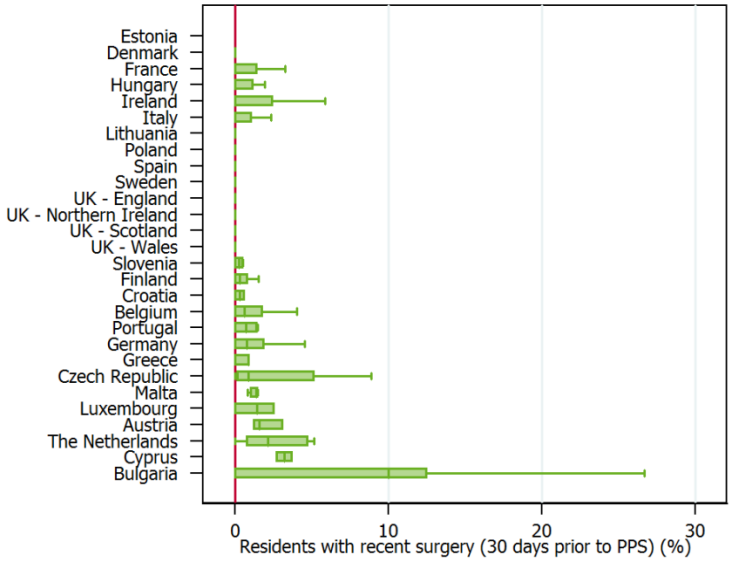
The mean prevalence of recent surgery (i.e. in the 30 days prior to the PPS) in the total eligible population was 1.2% (median: 0.0%). Thirteen countries reported a zero median prevalence: Denmark, France, Hungary, Ireland, Italy, Lithuania, Poland, Spain, Sweden and the four UK administrations. In Denmark, UK-Northern Ireland, Poland and Spain none of the eligible residents had undergone recent surgery. The highest mean percentage of recent surgery was seen in Bulgaria (8.7%, median: 10.0%) (Table 4 and Figure 8).The overall median prevalence was zero in NHs (mean: 1.2%), RHs (mean: 0.7%) and mixed LTCFs (mean: 1.2%).

Figure 7. Prevalence of other wounds in the eligible LTCF population by country, HALT, 2010



Red vertical line: crude median (5.5%), no outliers

Figure 8. Prevalence of recent surgery in the eligible LTCF population by country, HALT, 2010



Red vertical line: crude median (0.0%), no outliers

Long-term care facilities medical care and coordination

In most LTCFs, medical care was only provided by personal general practitioners (GPs; 61.2%); 15.7% LTCFs had an employed medical staff member in charge of medical resident care; and 23.1% LTCFs had both personal GPs and employed medical staff (Table 5).

Table 5. Medical care and coordination in the LTCFs by country, HALT, 2010

Country	Type of medical care			Medical coordination				Tasks of coordinating physician (CP)			
	GPs only	Employed medical staff	Both	No coordination	Yes, by a GP	Yes, by an employed physician	Yes, by an external physician	Development of:			Coordination of vaccination policy
								Antibiotic policy	Care strategies	IPC policy	
	Number of LTCFs with this type of medical care and coordination (responding LTCFs of the country)							Number of CPs reporting this task (number of CPs in the country)			
Austria	2 (3)	1 (3)	0 (3)	2 (3)	0 (3)	1 (3)	0 (3)	0 (1)	0 (1)	0 (1)	1 (1)
Belgium	91 (108)	2 (108)	15 (108)	1 (108)	84 (108)	14 (108)	9 (108)	57 (107)	68 (107)	76 (107)	85 (107)
Bulgaria	0 (11)	3 (11)	8 (11)	0 (11)	0 (11)	10 (11)	1 (11)	2 (11)	11 (11)	8 (11)	1 (11)
Croatia	2 (2)	0 (2)	0 (2)	1 (2)	1 (2)	0 (2)	0 (2)	0 (1)	0 (1)	0 (1)	0 (1)
Cyprus	0 (2)	0 (2)	2 (2)	2 (2)	0 (2)	0 (2)	0 (2)	- (-)	- (-)	- (-)	- (-)
Czech Republic	0 (4)	3 (4)	1 (4)	4 (4)	0 (4)	0 (4)	0 (4)	- (-)	- (-)	- (-)	- (-)
Denmark	5 (5)	0 (5)	0 (5)	5 (5)	0 (5)	0 (5)	0 (5)	- (-)	- (-)	- (-)	- (-)
Estonia	0 (5)	0 (5)	5 (5)	0 (5)	4 (5)	1 (5)	0 (5)	4 (5)	1 (5)	0 (5)	2 (5)
Finland	0 (9)	9 (9)	0 (9)	1 (9)	0 (9)	4 (9)	4 (9)	4 (8)	4 (8)	4 (8)	3 (8)
France	28 (65)	13 (65)	24 (65)	2 (64)	9 (64)	49 (64)	4 (64)	21 (62)	50 (62)	46 (62)	53 (62)
Germany	65 (72)	1 (72)	6 (72)	65 (72)	7 (72)	0 (72)	0 (72)	0 (7)	0 (7)	0 (7)	6 (7)
Greece	0 (3)	2 (3)	1 (3)	1 (3)	0 (3)	2 (3)	0 (3)	2 (2)	2 (2)	1 (2)	2 (2)
Hungary	21 (42)	5 (42)	16 (42)	25 (42)	8 (42)	7 (42)	2 (42)	5 (17)	6 (17)	7 (17)	15 (17)
Ireland	30 (55)	18 (55)	7 (55)	30 (54)	9 (54)	12 (54)	3 (54)	4 (24)	7 (24)	5 (24)	17 (24)
Italy	19 (90)	31 (90)	40 (90)	17 (86)	1 (86)	54 (86)	14 (86)	27 (69)	55 (69)	35 (69)	52 (69)
Lithuania	20 (50)	7 (50)	23 (50)	25 (48)	10 (48)	3 (48)	10 (48)	5 (23)	5 (23)	7 (23)	16 (23)
Luxembourg	4 (5)	0 (5)	1 (5)	3 (5)	1 (5)	1 (5)	0 (5)	1 (2)	1 (2)	1 (2)	1 (2)
Malta	3 (4)	0 (4)	1 (4)	2 (4)	0 (4)	1 (4)	1 (4)	0 (2)	0 (2)	0 (2)	0 (2)
The Netherlands	2 (10)	5 (10)	3 (10)	6 (10)	0 (10)	4 (10)	0 (10)	1 (4)	2 (4)	2 (4)	1 (4)
Poland	2 (3)	1 (3)	0 (3)	3 (3)	0 (3)	0 (3)	0 (3)	- (-)	- (-)	- (-)	- (-)
Portugal	0 (4)	4 (4)	0 (4)	0 (4)	0 (4)	4 (4)	0 (4)	2 (4)	4 (4)	2 (4)	2 (4)
Slovenia	0 (4)	1 (4)	3 (4)	3 (4)	0 (4)	1 (4)	0 (4)	0 (1)	0 (1)	0 (1)	1 (1)
Spain	0 (2)	1 (2)	1 (2)	0 (2)	0 (2)	1 (2)	1 (2)	1 (2)	2 (2)	1 (2)	1 (2)
Sweden	5 (6)	1 (6)	0 (6)	0 (6)	5 (6)	1 (6)	0 (6)	0 (6)	0 (6)	0 (6)	6 (6)
UK - England	10 (10)	0 (10)	0 (10)	5 (10)	5 (10)	0 (10)	0 (10)	1 (5)	5 (5)	1 (5)	5 (5)
UK - Northern Ireland	17 (18)	0 (18)	1 (18)	15 (18)	1 (18)	1 (18)	1 (18)	1 (3)	1 (3)	1 (3)	2 (3)
UK - Scotland	80 (83)	1 (83)	2 (83)	77 (80)	3 (80)	0 (80)	0 (80)	0 (3)	1 (3)	0 (3)	2 (3)
UK - Wales	18 (18)	0 (18)	0 (18)	18 (18)	0 (18)	0 (18)	0 (18)	- (-)	- (-)	- (-)	- (-)
Total	**424 (693)**	**109 (693)**	**160 (693)**	**313 (682)**	**148 (682)**	**171 (682)**	**50 (682)**	**138 (369)**	**225 (369)**	**197 (369)**	**274 (369)**
	61.2%	**15.7%**	**23.1%**	**45.9%**	**21.7%**	**25.1%**	**7.3%**	**37.4%**	**61.0%**	**53.4%**	**74.3%**

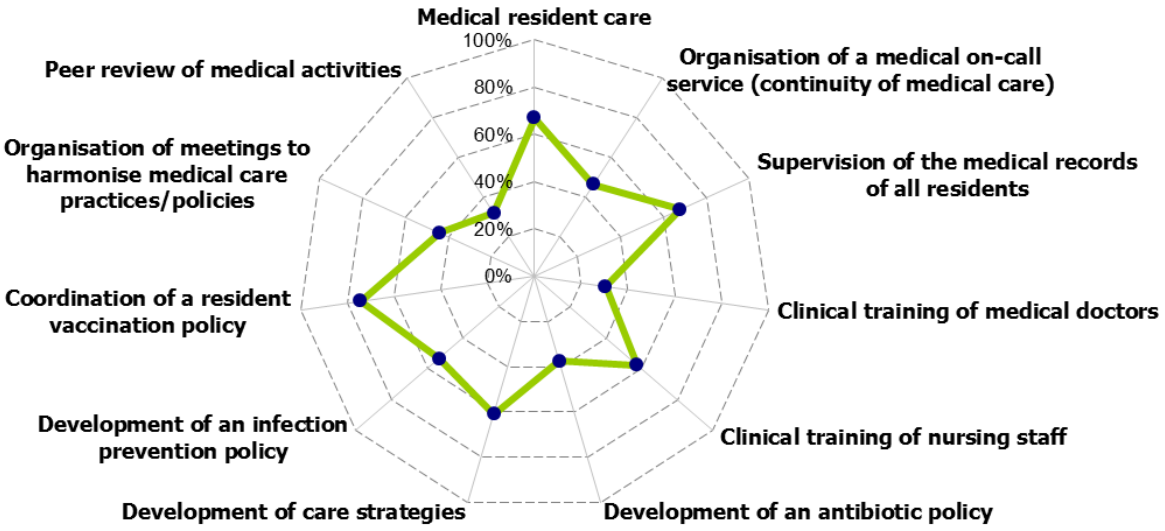
Of all included LTCFs, 45.9% had no medical doctor in charge of the coordination of medical activities (coordinating physician, CP). The difference in presence of a CP did not differ much between NHs, RHs and mixed LTCFs: 53.9%, 46.7% and 57.3%, respectively.

None of the included LTCFs in Cyprus, the Czech Republic, Denmark, Poland and UK-Wales had a CP at their disposal, while all LTCFs in Bulgaria, Estonia, Portugal, Spain and Sweden had such a person assigned (Table 5). Caution is needed however: the number of included LTCFs in these countries was generally low which hampers further generalisation of these findings.

The most frequently reported tasks performed by the CP (n=369) were 'coordination of the resident vaccination policy' (74.3%), 'supervision of the medical records of all residents' (67.8%) and 'medical resident care' (66.9%). 'Clinical training of medical doctors', 'peer review of medical activities' and 'development of an antibiotic policy' were not frequently reported: 30.4%, 31.7% and 37.4%, respectively (Figure 9).

Sixty-one per cent of the CPs were in charge of developing care strategies and 53.4% reported responsibilities relating to infection prevention policy (53.4%) (Table 5).

Figure 9. Overall frequencies of the reported tasks of the coordinating physician (n=369), HALT, 2010



Long-term care facilities infection prevention and control practices and resources

An IPC practitioner was assigned in 51.6% of the LTCFs (data missing for two LTCFs). None of the included LTCFs in Croatia, Cyprus and Greece had an IPC practitioner, while all included LTCFs in Bulgaria, Luxembourg, Portugal and Sweden had an IPC practitioner (Table 6). The IPC practitioner (n=268; 89 missing) was either a nurse (77.6%) or a doctor (22.4%). No LTCFs reported having both a nurse and a doctor as an IPC practitioner. An IPC practitioner was more frequently present in mixed LTCFs (59.1%) compared to NHs (51.3%) and RHs (38.3%).

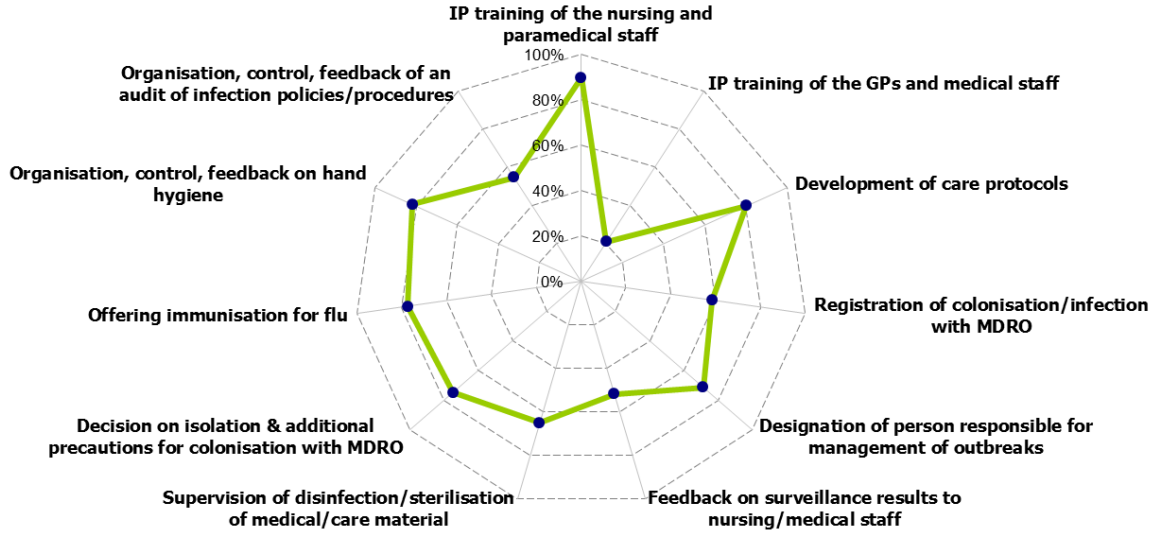
Table 6. Overview of available infection prevention and control (IPC) resources in the included LTCFs, by country, HALT, 2010

Country	IPC structures			IPC protocols					IPC activities	
	IPC practitioner	IPC committee	Expert IPC advice	MRSA	Hand hygiene	Management of			HAI surveillance	Hand hygiene training
						Urinary catheters	Venous catheters	Enteral feeding		
	Number of LTCFs with the IPC resource (responding LTCFs of the country)									
Austria	1 (3)	0 (3)	1 (3)	3 (3)	3 (3)	2 (2)	2 (2)	2 (2)	1 (3)	1 (3)
Belgium	55 (108)	28 (104)	82 (106)	105 (107)	107 (108)	63 (97)	35 (91)	47 (92)	47 (108)	81 (108)
Bulgaria	11 (11)	5 (11)	11 (11)	0 (11)	11 (11)	11 (11)	11 (11)	11 (11)	5 (11)	10 (11)
Croatia	0 (2)	0 (1)	1 (1)	2 (2)	1 (2)	0 (1)	0 (1)	0 (1)	0 (2)	1 (2)
Cyprus	0 (2)	NA	NA	2 (2)	2 (2)	2 (2)	2 (2)	2 (2)	0 (2)	2 (2)
Czech Republic	2 (4)	2 (4)	4 (4)	4 (4)	4 (4)	3 (3)	3 (3)	3 (3)	2 (4)	3 (4)
Denmark	2 (4)	0 (5)	1 (5)	5 (5)	5 (5)	5 (5)	1 (5)	2 (5)	0 (5)	3 (5)
Estonia*	3 (5)	1 (5)	0 (5)	1 (5)	4 (5)	3 (5)	2 (5)	0 (5)	0 (5)	4 (5)
Finland	7 (9)	1 (8)	9 (9)	9 (9)	9 (9)	5 (9)	1 (5)	1 (5)	2 (6)	4 (9)
France	44 (65)	35 (64)	64 (65)	30 (62)	60 (65)	43 (64)	30 (62)	14 (61)	22 (63)	49 (64)
Germany	49 (73)	17 (69)	53 (70)	73 (73)	73 (73)	73 (73)	26 (71)	70 (72)	14 (71)	68 (71)
Greece	0 (3)	0 (1)	1 (1)	0 (2)	2 (2)	2 (2)	2 (2)	2 (2)	1 (3)	2 (3)
Hungary	15 (42)	2 (15)	30 (30)	9 (42)	35 (42)	22 (42)	7 (42)	16 (42)	5 (42)	33 (42)
Ireland	45 (55)	29 (52)	48 (51)	53 (55)	54 (55)	49 (53)	37 (51)	48 (50)	12 (53)	49 (54)
Italy	36 (89)	20 (84)	52 (83)	31 (74)	78 (87)	81 (86)	68 (82)	78 (85)	21 (88)	43 (89)
Lithuania	17 (50)	2 (49)	41 (50)	1 (41)	46 (46)	19 (43)	17 (42)	8 (41)	4 (48)	30 (50)
Luxembourg	5 (5)	5 (5)	2 (5)	5 (5)	5 (5)	1 (5)	0 (4)	2 (4)	1 (5)	4 (5)
Malta	2 (4)	1 (4)	3 (4)	2 (4)	2 (4)	2 (4)	1 (4)	0 (4)	1 (4)	4 (4)
The Netherlands	4 (10)	9 (10)	10 (10)	9 (10)	10 (10)	10 (10)	2 (10)	6 (10)	1 (10)	4 (10)
Poland	1 (3)	1 (3)	3 (3)	1 (3)	3 (3)	2 (3)	2 (3)	1 (3)	1 (3)	2 (3)
Portugal	4 (4)	4 (4)	0 (4)	0 (3)	4 (4)	0 (3)	0 (3)	0 (3)	0 (4)	4 (4)
Slovenia	2 (4)	3 (4)	4 (4)	4 (4)	4 (4)	4 (4)	4 (4)	4 (4)	4 (4)	4 (4)
Spain	1 (2)	2 (2)	2 (2)	1 (1)	2 (2)	2 (2)	1 (1)	2 (2)	1 (2)	2 (2)
Sweden	6 (6)	0 (6)	6 (6)	6 (6)	6 (6)	6 (6)	6 (6)	6 (6)	6 (6)	1 (6)
UK - England	4 (10)	2 (10)	10 (10)	10 (10)	10 (10)	10 (10)	5 (9)	9 (10)	2 (10)	9 (10)
UK - Northern Ireland	12 (18)	6 (18)	18 (18)	18 (18)	18 (18)	17 (18)	5 (16)	16 (18)	4 (18)	18 (18)
UK - Scotland	14 (83)	11 (81)	73 (79)	77 (80)	80 (80)	80 (80)	35 (80)	75 (80)	8 (77)	50 (79)
UK - Wales	15 (18)	0 (18)	18 (18)	17 (17)	18 (18)	18 (18)	0 (3)	18 (18)	1 (18)	14 (18)
Total	**357 (692)**	**186 (640)**	**547 (657)**	**478 (658)**	**656 (683)**	**535 (661)**	**305 (620)**	**443 (641)**	**166 (675)**	**499 (685)**
	51.6%	**29.1%**	**83.3%**	**72.6%**	**96.1%**	**80.9%**	**49.2%**	**69.1%**	**24.6%**	**72.9%**

IPC: infection prevention and control, NA: not applicable

The three main tasks of the IPC practitioner were 'infection prevention training of the nursing and paramedical staff' (89.9%), 'organisation/control/feedback on hand hygiene' (81.8%) and 'development of care protocols' (80.1%). Infection prevention training of GPs and medical staff occurred rarely (20.7%) (Figure 10).

Figure 10. Overall frequencies of the reported tasks of the infection prevention and control (IPC) practitioner (n=357), HALT, 2010



IP: infection prevention; MDRO: multidrug-resistant organism

In 29.1% of the LTCFs, an IPC committee was established (missing n=54). All included LTCFs in Luxembourg (n=5), Portugal (n=4) and Spain (n=2) had established this type of IPC structure (Table 6).

The overall availability of expert IPC advice was high (83.3%). Fourteen countries reported that all their included LTCFs could count on expert IPC advice, while the access was low or absent in included LTCFs in Denmark (1 out of 5 included LTCFs), Estonia (0/5) and Portugal (0/4) (Table 6).

Table 7 shows the overall distribution of the included LTCFs according to the presence of an IPC practitioner, an IPC committee and/or IPC advice. Only LTCFs which responded to all three questions were included (n=630). The majority of the LTCFs could only count on IPC advice (30.0%). Second most frequently, LTCFs had the combination of an IPC practitioner and IPC advice (27.0%). Third most frequently, 21.1% of the LTCFs had access to the three IPC structures.

Fifty-seven (9.0%) LTCFs had no IPC structure available (Table 7). These included LTCFs from Austria (2 out of 3 LTCFs), Belgium (15/102), Denmark (1/4), Estonia (1/5), Germany (6/68), Ireland (1/51), Italy (19/81), Lithuania (7/49), Malta (1/4) and UK-Scotland (4/79). The LTCFs without any IPC structure were mostly NHs (n=52), followed by mixed LTCFs (n=4) and RHs (n=1).

Table 7. Overview of the availability of an infection prevention and control (IPC) practitioner, an IPC committee and IPC advice in LTCFs, HALT, 2010

	None in place	Only IPC practitioner	Only IPC committee	Only IPC advice	IPC practitioner & IPC committee	IPC practitioner & IPC advice	IPC committee & IPC advice	All in place	Total
Number of LTCFs	57	29	4	189	17	170	31	133	630*

** Only included LTCFs with complete data for all three questions were included, IPC= infection prevention and control.*

Almost all LTCFs had a written protocol on hand hygiene (96.1%). The availability of a written protocol for MRSA and on the management of enteral feeding was comparable: 72.6% and 69.1%, respectively. Written protocols for the management of urinary catheters was available in most LTCFs (80.9%), while protocols for the management of vascular catheters were only present in 49.2% of the LTCFs (Table 6). This last figure is not so surprising given the low frequency of vascular catheters (0.8%) in the LTCF population.

Surveillance of HAIs in LTCFs was uncommon. Only 24.6% of the LTCFs indicated that they performed this infection control activity. Nonetheless, this surveillance was carried out in all included LTCFs in Sweden (n=6) and Slovenia (n=4) (Table 6).

Mixed LTCFs (39.6%, 40/101) were more likely to perform HAI surveillance than NHs (22.4%, 118/527) or RHs (17.0%, 8/47).

Of all LTCFs, 72.9% had organised a hand hygiene training for all care professionals in the previous year (2009). All LTCFs of Cyprus (n=2), Malta (n=4), UK-Northern Ireland (n=18), Portugal (n=4), Slovenia (n=4) and Spain (n=2) had held such a training. A high percentage (≥80%) was also reported for Bulgaria (10/11), UK-England (9/10), Estonia (4/5), Germany (68/71), Ireland (49/54) and Luxembourg (4/5) (Table 6).

Hand hygiene training was more frequently held in mixed LTCFs (80.8%, 84/104) compared to NHs (71.4%, 381/534) and RHs (72.3%, 34/47).

Antimicrobial stewardship resources

Current antimicrobial stewardship resources in LTCFs were explored as they can optimise antimicrobial prescribing and slow down the spread of antimicrobial resistance. In the HALT software, tick boxes had to be ticked if the antimicrobial stewardship element was available. Although this data collection method was fast and easy, it had the disadvantage that we could not be absolutely sure whether a non-ticked tick box meant that the element was not present in the LTCF or whether the data collector did not know the answer to the question (i.e. missing data). For this reason, only absolute numbers (except for two 'yes/no' questions) are given.

The most frequently reported antimicrobial stewardship elements were 'taking microbiological samples for the guidance of the antibiotic choice' (n=347), 'the availability of a therapeutic formulary comprising a list of antibiotics' (n=230) and 'the availability of a pharmacist providing advice on antibiotics which were not included in the formulary' (n=154). Less available elements included 'regular training on appropriate antibiotic prescribing' (n=70), 'permission of a designated person(s) for prescribing restricted antibiotics not included in the local formulary' (n=70) and 'an antibiotic committee' (n=54) (Table 8).

'Taking microbiological samples' was the most commonly reported element with the exception of eight countries. Belgium, Finland, the Netherlands and Portugal reported 'the availability of a therapeutic formulary' more frequently. In Lithuania and Slovenia, 'feedback to the GPs on antibiotic consumption in the LTCF' was most common. No antibiotic stewardship elements were reported by the two LTCFs in Croatia (Table 8).

Microbiological samples were less frequently taken in RHs (42.6%, 20/47) compared to NHs (54.3%, 265/488) and mixed LTCFs (59.1%, 62/105).

Guidelines for wound and soft tissue infections were present in more LTCFs (n=224) than guidelines for respiratory tract infections (RTIs, n=203) and urinary tract infections (UTIs, n=202) (Table 8).

There was little difference between NHs, RHs and mixed LTCFs in terms of the availability of guidelines for wound/soft tissue infections (35.2%, 36.2% and 38.1%, respectively), RTIs (31.9%, 29.8% and 36.2%, respectively), or UTIs (31.6%, 34.0% and 34.3%, respectively).

Surveillance of antimicrobial consumption and of resistant microorganisms was uncommon in LTCFs: 13.7% and 28.7%, respectively (Table 8). Both surveillances were more frequently performed in mixed LTCFs (23.3% and 35.0%) compared to NHs (11.7% and 28.5%) and RHs (15.2% and 17.4%), respectively.

Table 8. Antimicrobial stewardship resources in the LTCFs by country, HALT, 2010

Country	Number of included LTCFs	Antimicrobial stewardship elements										Written guidelines		Surveillance		
		Antibiotic committee	Regular training of antibiotic prescribers	Written guidelines for appropriate use	Data available on annual antibiotic consumption	Microbiological samples to guide antibiotic choice	Local resistance profiles	Permission to prescribe restricted antibiotics	Pharmacist advice for non-formulary prescriptions	Therapeutic formulary	Feedback to GPs on antibiotic consumption	Respiratory tract infections	Urinary tract infections	Wound and soft tissue infections	Antimicrobial use and feedback	Antimicrobial-resistant microorganisms
		Number of LTCFs indicating availability of the antimicrobial stewardship resource (LTCFs responding to the question)														
Austria	3	0	0	1	1	1	1	1	0	1	1	1	1	1	1 (3)	1 (3)
Belgium	108	4	13	40	22	67	12	1	17	68	12	39	36	47	15 (106)	72 (107)
Bulgaria	11	0	1	0	4	11	9	2	1	3	0	2	2	2	0 (11)	1 (11)
Croatia	2	0	0	0	0	0	0	0	0	0	0	1	1	0	0 (2)	1 (2)
Cyprus	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0 (2)	0 (2)
Czech Republic	4	1	0	1	0	4	3	1	2	1	1	1	1	1	0 (4)	1 (4)
Denmark	5	0	0	0	0	1	0	0	0	0	0	0	0	0	0 (5)	0 (5)
Estonia	5	0	0	3	0	3	0	0	0	0	0	4	4	4	0 (5)	2 (4)
Finland	9	0	3	2	4	5	4	6	1	9	0	7	7	6	5 (7)	5 (6)
France	65	24	10	24	27	52	15	6	29	21	18	30	23	21	21 (63)	25 (62)
Germany	73	0	6	1	1	4	1	1	19	2	0	24	26	25	0 (71)	8 (70)
Greece	3	0	2	3	1	3	2	1	0	1	1	2	2	2	1 (2)	0 (2)
Hungary	42	2	3	4	4	14	4	0	5	1	0	10	10	15	3 (42)	3 (42)
Ireland	55	8	4	13	9	34	7	6	20	11	7	11	11	15	9 (54)	21 (54)
Italy	90	12	15	20	28	70	21	40	34	58	21	24	30	32	23 (88)	21 (89)
Lithuania	50	0	0	5	1	2	0	2	1	1	10	2	2	6	4 (50)	2 (49)
Luxembourg	5	0	0	0	0	3	0	0	0	1	0	0	0	1	0 (5)	2 (5)
Malta	4	0	0	1	1	2	0	0	1	2	0	2	2	2	0 (4)	0 (4)
The Netherlands	10	1	5	4	2	4	3	1	2	8	2	8	8	6	2 (10)	0 (10)
Poland	3	1	1	0	1	1	1	1	1	1	0	1	1	1	1 (3)	1 (3)
Portugal	4	0	0	2	0	2	2	0	1	4	2	0	0	0	0 (4)	0 (4)
Slovenia	4	0	0	0	1	1	0	0	0	1	3	1	0	0	0 (4)	4 (4)
Spain	2	1	1	1	1	2	1	1	1	1	0	1	1	1	1 (2)	1 (2)
Sweden	6	0	5	6	5	6	5	0	0	5	0	6	6	6	1 (6)	5 (6)
UK - England	10	0	0	5	0	9	0	0	2	9	0	7	7	7	0 (9)	1 (9)
UK - Northern Ireland	18	0	1	4	0	7	0	0	5	4	0	5	5	7	3 (17)	9 (17)
UK - Scotland	83	0	0	3	0	29	2	0	12	17	5	14	16	16	3 (82)	8 (82)
UK - Wales	18	0	0	0	0	8	0	0	0	0	0	0	0	0	0 (17)	0 (18)
Total	**694**	**54**	**70**	**143**	**113**	**347**	**93**	**70**	**154**	**230**	**83**	**203**	**202**	**224**	**93 (678)**	**194 (676)**

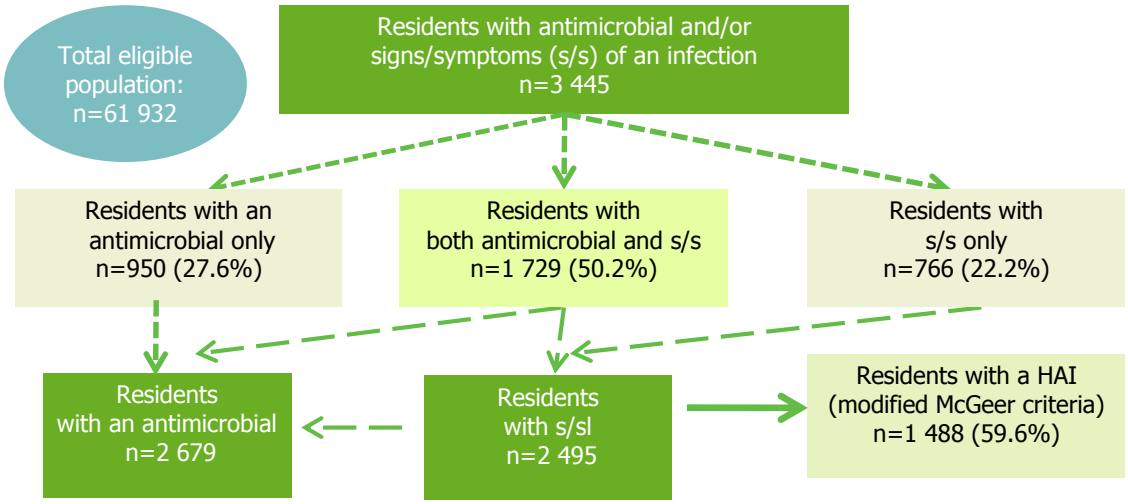
Healthcare-associated infections and antimicrobial use

Overview

Of the 61 932 eligible residents, 3 445 residents received an antimicrobial and/or presented signs/symptoms (s/s) of an infection on the day of the PPS. The majority of the residents (50.2%) received both an antimicrobial and presented s/s. Twenty-two per cent only presented s/s, while 27.6% only received an antimicrobial. Almost 6 out of 10 residents (n=1 488) with s/s had an HAI according to the used infection criteria (Figure 11).

Most residents who received an antimicrobial agent or had an HAI were resident in NHs (n=2 054 and 1 105, respectively). In mixed LTCFs and RHs, there were 494 and 131 residents receiving antimicrobial agents, respectively; and 302 and 81 residents with an HAI, respectively.

Figure 11. Overview of residents receiving an antimicrobial and/or with healthcare-associated infection(s) within the eligible LTCF population, HALT, 2010



Age and gender

The birth year was available for residents who received an antimicrobial and/or presented s/s of an infection on the day of the PPS, whereas for the total eligible population, only the proportion of residents older than 85 years (44.8%) was known. The median age of residents receiving an antimicrobial agent and of those with an HAI according to the modified McGeer criteria was identical (84 years); their mean ages were almost identical (82.5 and 82.6 years, respectively; Table 9).

The mean age of the residents receiving antimicrobial agents and the residents with an infection barely differed between and within LTCF types: 83.1 and 83.2 years in NHs, 82.4 and 81.5 years in RHs and 79.7 and 80.7 years in mixed LTCFs, respectively.

The proportion of female residents was comparable between the total eligible population and the residents receiving antimicrobial agents (70.6% and 70.1% female, respectively), and slightly lower in those with an HAI (67.1%) (Table 9).

The proportion of female residents was lower in the group of residents with an HAI compared to the residents receiving antimicrobial agents in NHs (67.7% vs. 71.6%) and RHs (59.3% vs. 67.2%), but higher in mixed LTCFs (66.9% vs. 64.8%).

Table 9. Age and gender of LTCF residents with at least one HAI (n=1 488) and of LTCF residents receiving at least one antimicrobial agent (n=2 679) by country, HALT, 2010

Country	Residents with at least one HAI (modified McGeer criteria)						Residents receiving at least one antimicrobial agent					
	N of residents	% female	Age (years)				N of residents	% female	Age (years)			
			Min	Mean	Median	Max			Min	Mean	Median	Max
Austria	28	61.5	64	82.8	83.5	99	7	28.6	60	76.0	76	94
Belgium	322	71.1	27	83.6	85.0	102	520	74.0	45	83.7	85	102
Bulgaria	5	40.0	56	73.0	75.0	84	5	40.0	56	73.0	75	84
Croatia	2	0.0	71	80.0	80.0	89	10	70.0	70	83.8	88	92
Cyprus	0	NA	NA	NA	NA	NA	1	0.0	76	76.0	76	76
Czech Republic	13	61.5	68	81.1	84.0	89	16	62.5	68	81.6	85	89
Denmark	9	66.7	62	81.1	82.0	94	34	73.5	49	82.3	83	97
Estonia	11	27.3	55	71.3	73.0	85	6	50.0	61	72.8	74	83
Finland	89	77.5	70	84.8	85.0	100	227	86.2	51	85.2	86	102
France	142	63.8	57	85.3	87.0	104	192	65.6	57	84.4	86	104
Germany	51	74.0	47	80.5	81.5	101	75	77.3	47	80.3	82	100
Greece	13	76.9	46	81.5	87.0	96	18	77.8	46	81.3	85	96
Hungary	60	65.0	46	78.1	81.5	99	75	65.3	46	77.1	80	99
Ireland	134	63.9	29	81.2	84.0	100	371	66.7	29	81.1	84	100
Italy	300	63.2	35	83.3	86.0	102	423	64.1	25	82.8	85	101
Lithuania	24	75.0	50	79.5	83.0	99	23	95.7	59	82.6	84	99
Luxembourg	12	50.0	64	83.1	83.0	96	23	65.2	66	83.3	84	96
Malta	12	66.7	51	79.0	82.5	98	14	71.4	51	81.4	86	99
The Netherlands	14	71.4	26	76.6	85.0	94	50	64.0	26	77.8	82	92
Poland	6	33.3	53	70.3	69.0	92	4	25.0	56	71.5	69	92
Portugal	12	41.7	54	75.6	77.5	93	15	40.0	56	76.5	78	93
Slovenia	29	85.2	66	83.7	85.0	97	32	80.0	66	84.6	86	97
Spain	2	50.0	73	83.5	83.5	94	1	0.0	94	94.0	94	94
Sweden	8	62.5	76	86.0	87.0	95	10	40.0	76	86.7	89	95
UK - England	15	60.0	43	80.1	81.0	102	59	61.0	23	75.4	79	103
UK – N. Ireland	21	71.4	51	78.5	81.0	101	56	66.1	51	82.0	83	101
UK - Scotland	128	70.3	32	82.3	83.0	105	360	72.8	29	83.1	85	106
UK - Wales	26	69.2	61	87.0	87.0	108	52	63.5	28	80.5	85	108
Total	**1 488**	**67.1**	**26**	**82.6**	**84.0**	**108**	**2 679**	**70.1**	**23**	**82.5**	**84**	**108**

NA: not applicable

Care load indicators, risk factors, length of stay and recent hospitalisation

The percentage of residents with a length of stay of less than one year in the LTCF was 31% in both residents receiving antimicrobial agents and residents with an HAI. The rate of recent hospitalisation (three months prior to the PPS) was also the same in both groups (20.7%; Table 10).

All care load indicators and risk factors scored higher in the two studied groups compared to the total eligible LTCF population (Figure 12). Differences between the group of residents receiving antimicrobial agents and the group of residents with an infection were small (Table 10).

The overall percentage of residents with incontinence was high, both in residents receiving an antimicrobial (76.2%) and residents with a HAI (76.5%) (Figure 12 and Table 10).

The percentage of residents with incontinence in NHs was comparable to the overall rate: 76.7% in the group of residents receiving antimicrobial agents and 76.3% among the residents with an HAI. However, the scores were lower in mixed LTCFs (71.8% and 75.8%) and higher in RHs (85.5% vs. 81.5%, respectively).

Disorientation in time and/or in space was a bit more frequent in the group of residents with an HAI (65.5%) compared to the residents receiving antimicrobial agents (62.9%) (Figure 12 and Table 10).

The percentage of residents with disorientation not only differed between the three LTCF types but also between the residents receiving antimicrobial agents and residents with HAIs: 63.3% vs. 65.6% in NHs, 70.3% vs. 67.1% in RHs and 59.2% vs. 64.7% in mixed LTCFs, respectively.

The percentage of residents with impaired mobility (wheelchair-bound or bedridden) varied from 64.9% in residents receiving antimicrobial agents to 66.3% in residents with an HAI (Figure 12 and Table 10). These figures were much higher than the impaired mobility rate found in the total eligible LTCF population (47.5%).

Impaired mobility among residents receiving antimicrobial agents was equally common in NHs (64.9%), RHs (65.4%) and mixed LTCFs (65.0%). Among the residents with an HAI the rates differed slightly: 66.1% in NHs, 61.3% in RHs and 68.5% in mixed LTCFs.

The use of urinary catheters was 7.2% in the total eligible population, 18.1% in the group of residents receiving antimicrobial agents and 20.1% in the group of residents with a HAI; large differences were also observed between countries (Figure 12 and Table 10).

The percentage of residents with a urinary catheter was higher among residents with an HAI compared to the residents receiving antimicrobial agents in NHs (19.4% vs. 17.6%) and mixed LTCFs (23.3% vs. 19.4%), but lower in RHs (18.5% vs. 20.6%).

In 14 countries, no vascular catheter use was reported among the residents receiving antimicrobial agents or residents with an HAI. The overall percentage reached 4.5% in the group of residents receiving antimicrobial agents and 6.8% in the group of residents with a HAI (Figure 12 and Table 10).

Residential homes reported the highest percentages of residents with a vascular catheter in both group: 8.4% of the residents receiving antimicrobial agents and 10.0% of the residents with an infection. The percentages drop to 4.0% vs. 5.4% in NHs and 5.7% vs. 9.0% in mixed LTCFs, respectively.

Figure 12. Prevalence of care load indicators and risk factors in the total eligible LTCF population, among LTCF residents receiving an antimicrobial and among LTCF residents with an HAI, HALT, 2010

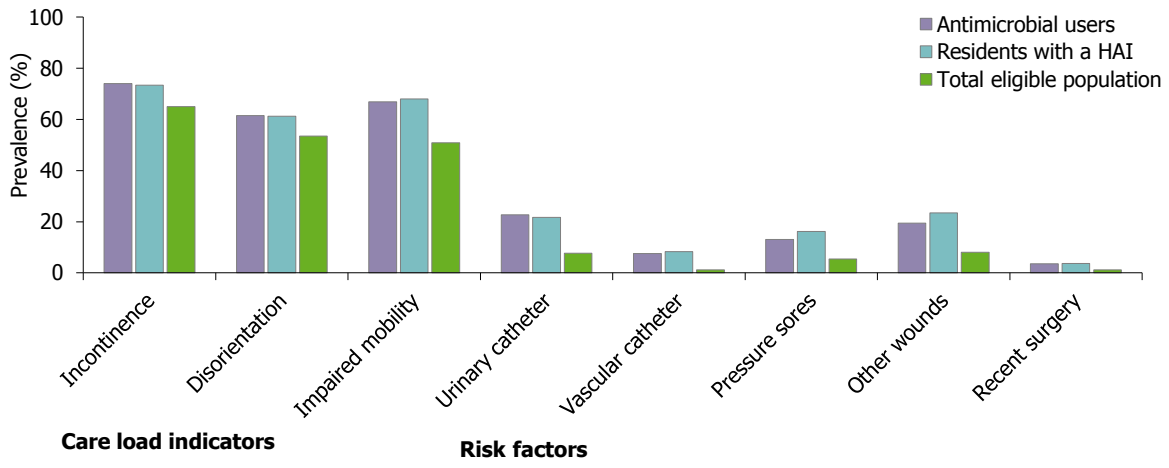


Table 10. Length of stay, recent hospitalisation, care load indicators and risk factors among LTCF residents with an HAI and/or receiving an antimicrobial by country, HALT, 2010

Country	Residents with at least one HAI										Residents receiving at least one antimicrobial agent									
			Care load			Risk factors							Care load			Risk factors				
	Length of stay (<1 year)	Recent hospitalisation (<3 months)	Incontinence (urine and/or faecal)	Disorientation (in time and/or space)	Impaired mobility	Urinary catheter	Vascular catheter	Pressure sores	Other wounds	Recent surgery (<30 days)	Length of stay (<1 year)	Recent hospitalisation (<3 months)	Incontinence (urine and/or faecal)	Disorientation (in time and/or space)	Impaired mobility	Urinary catheter	Vascular catheter	Pressure sores	Other wounds	Recent surgery (<30 days)
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Austria	25.0	3.6	78.6	85.7	75.0	21.4	7.1	3.6	7.1	3.6	57.1	28.6	42.9	85.7	85.7	14.3	14.3	0.0	42.9	28.6
Belgium	24.7	16.7	74.5	62.8	59.7	7.2	1.3	14.0	21.5	3.4	25.1	17.1	72.1	60.2	62.6	9.0	1.4	9.7	11.9	2.6
Bulgaria	100.0	40.0	0.0	40.0	60.0	60.0	40.0	0.0	20.0	20.0	100.0	40.0	0.0	40.0	60.0	60.0	40.0	0.0	20.0	20.0
Croatia	0.0	0.0	50.0	50.0	50.0	0.0	0.0	0.0	50.0	0.0	10.0	0.0	80.0	44.4	40.0	30.0	0.0	0.0	10.0	0.0
Cyprus	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	100.0	0.0	0.0	100.0	100.0	100.0	0.0	0.0	0.0	0.0
Czech Republic	100.0	61.5	100.0	69.2	92.3	69.2	38.5	30.8	15.4	0.0	93.3	62.5	100.0	75.0	93.8	62.5	31.3	37.5	12.5	6.3
Denmark	22.2	44.4	55.6	33.3	37.5	22.2	0.0	0.0	33.3	11.1	17.6	14.7	64.7	51.5	60.6	20.6	0.0	0.0	14.7	2.9
Estonia	81.8	45.5	27.3	0.0	81.8	0.0	0.0	72.7	9.1	27.3	50.0	33.3	0.0	0.0	66.7	0.0	0.0	16.7	16.7	16.7
Finland	18.0	11.8	79.8	66.7	58.8	11.2	0.0	8.0	13.6	2.4	26.9	14.9	81.9	66.2	48.4	7.9	0.0	4.4	11.1	1.8
France	19.7	24.6	70.9	68.1	62.0	7.8	0.7	19.0	25.7	3.5	24.5	26.0	75.4	59.8	64.0	6.3	2.6	14.1	20.1	3.1
Germany	29.8	41.2	90.2	64.4	80.0	35.3	0.0	9.8	20.0	8.2	33.8	47.8	89.7	59.0	76.1	35.3	1.5	11.6	25.0	10.3
Greece	38.5	30.8	69.2	69.2	69.2	46.2	15.4	15.4	7.7	7.7	38.9	22.2	72.2	55.6	61.1	33.3	11.1	16.7	5.6	5.6
Hungary	26.7	21.7	71.7	50.0	58.3	11.7	5.0	18.3	25.0	3.3	21.3	24.0	73.3	53.3	58.7	8.0	2.7	14.7	20.0	6.7
Ireland	28.6	16.4	71.4	58.3	67.7	15.7	3.8	9.2	24.4	3.8	33.0	20.1	67.0	54.3	59.5	12.0	1.6	4.4	19.5	1.6
Italy	41.3	21.2	87.3	78.4	80.1	41.8	21.4	27.2	23.6	5.7	39.5	21.9	86.5	73.4	81.2	39.7	19.2	24.3	19.5	4.3
Lithuania	0.0	12.5	29.2	50.0	58.3	4.2	0.0	8.3	16.7	8.3	4.3	13.0	43.5	40.9	60.9	0.0	0.0	8.7	8.7	4.3
Luxembourg	8.3	16.7	91.7	66.7	58.3	0.0	0.0	25.0	16.7	8.3	21.7	21.7	91.3	59.1	65.2	4.3	0.0	17.4	8.7	4.3
Malta	33.3	0.0	75.0	50.0	75.0	25.0	8.3	25.0	0.0	0.0	35.7	7.1	78.6	50.0	71.4	21.4	7.1	21.4	7.1	7.1
The Netherlands	57.1	35.7	35.7	38.5	61.5	28.6	0.0	21.4	50.0	7.1	44.0	34.0	54.0	53.1	62.0	34.0	0.0	18.0	18.0	6.0
Poland	16.7	16.7	83.3	50.0	83.3	50.0	0.0	0.0	16.7	0.0	0.0	0.0	75.0	50.0	75.0	50.0	0.0	0.0	0.0	0.0
Portugal	83.3	50.0	75.0	41.7	75.0	50.0	8.3	33.3	16.7	0.0	86.7	73.3	80.0	46.7	93.3	46.7	13.3	20.0	13.3	6.7
Slovenia	17.2	17.2	89.7	69.0	55.2	7.1	0.0	10.3	6.9	0.0	19.4	21.9	87.5	68.8	59.4	9.7	0.0	9.4	9.7	3.3
Spain	50.0	0.0	100.0	100.0	100.0	50.0	50.0	50.0	50.0	0.0	100.0	0.0	100.0	100.0	100.0	0.0	100.0	100.0	0.0	0.0
Sweden	37.5	25.0	87.5	75.0	62.5	25.0	0.0	12.5	25.0	12.5	50.0	20.0	90.0	60.0	70.0	30.0	0.0	10.0	30.0	10.0
UK - England	71.4	33.3	73.3	53.3	60.0	26.7	0.0	26.7	20.0	0.0	45.0	18.6	72.4	76.3	66.1	20.3	0.0	15.3	25.9	0.0
UK – N. Ireland	38.1	38.1	81.0	60.0	61.9	0.0	0.0	4.8	33.3	0.0	33.9	23.2	82.1	69.1	60.7	8.9	0.0	8.9	12.7	0.0
UK - Scotland	36.0	16.5	76.4	67.5	58.2	22.7	2.4	8.6	14.1	0.8	28.9	15.3	79.1	69.0	61.3	18.5	0.9	6.7	13.1	2.2
UK - Wales	34.6	24.0	76.9	66.7	61.5	7.7	0.0	7.7	12.5	0.0	32.7	19.6	80.8	58.0	80.8	23.5	0.0	9.6	2.0	0.0
Total	**31.0**	**20.7**	**76.5**	**65.5**	**66.3**	**20.1**	**6.8**	**16.3**	**20.8**	**4.0**	**31.0**	**20.7**	**76.2**	**62.9**	**64.9**	**18.1**	**4.5**	**11.4**	**15.7**	**3.1**

NA: not applicable

Healthcare-associated infections

Reported signs/symptoms of an infection

Signs and symptoms presented by the resident on the day of the PPS had to be registered per infection site. In total, 2 495 residents (4.0%) presented at least one s/s of an infection: 1 883 in the participating NHs, 131 in RHs and 481 in mixed LTCFs. Overall, s/s were crossed for 2 729 infection sites: 2 071 in NHs, 139 in RHs and 519 in mixed LTCFs.

Respiratory tract infections (32.4%), UTIs (31.7%) and skin infections (22.1%) were the main HAI types for which s/s were reported. Signs and symptoms were less frequently reported for eye/ear/nose/mouth infections (6.4%), gastrointestinal infections (3.1%) and 'other infections' (3.0%) and rarely registered for systemic infections (0.7%) and unexplained febrile episodes (0.6%) (Figure 13).

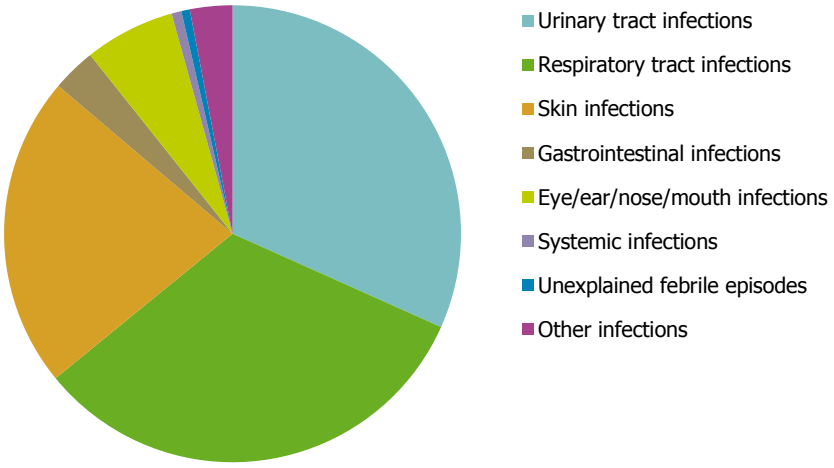
Within the group of RTIs (n=885) s/s were reported for 'pneumonia and other lower RTIs' (67.9%), 'common cold syndromes/pharyngitis' (26.0%) and influenza-like illness (6.1%).

Within the group of eye/ear/nose/mouth infections (n=175) s/s were reported for eye (68.0%), mouth (20.6%) or ear infections (10.9%) and sinusitis (0.6%).

Among the skin infection group (n=603) s/s of cellulitis/soft tissue/wound infections (86.2%), fungal skin infections (10.9%) and herpes infections (2.7%) were reported. Only one case of scabies was reported (0.2%).

In the participating NHs and mixed LTCFs the order of the three most important infections for which s/s were reported was the same: UTIs (31.7% and 33.1%, respectively), RTIs (31.5% and 32.4%) and skin infections (22.7% and 20.8%). In the selected RHs s/s were mainly reported for RTIs (46.8%), followed by UTIs (27.3%) and skin infections (18.0%).

Figure 13. Distribution of the HAI types for which signs/symptoms were reported, HALT, 2010



Prevalence of healthcare-associated infections

Modified McGeer criteria were applied to confirm infections [10]. Of the 2 495 residents for whom at least one s/s was reported, 1 488 residents (59.6%) had an HAI according the modified McGeer criteria (crude prevalence: 2.4%). Eighty-one of the residents with an HAI lived in a RH (crude prevalence: 1.6%), 1 105 in a NH (crude prevalence: 2.4%) and 302 in a mixed LTCF (crude prevalence: 2.9%).

The majority of the residents only had one HAI (n=1 431; 96.2%). For 53 residents (3.6%) two HAIs were confirmed. Four residents (0.3%) presented three infections on the day of the PPS.

In total, 1 549 infections were confirmed by the modified McGeer criteria. There were 1 149 infections in NHs, 86 in RHs and 314 in mixed LTCFs.

The crude prevalence of residents with at least one HAI varied from 0.0% in Cyprus to 7.4% in Portugal. The median prevalence of residents with at least one HAI was 1.5% overall, and varied from 0.0% in Bulgaria, Cyprus, Germany and Lithuania to 11.4% in Portugal (Table 11 and Figure 14).

Thirty-five per cent (n=244) of the included LTCFs reported no residents with a HAI.

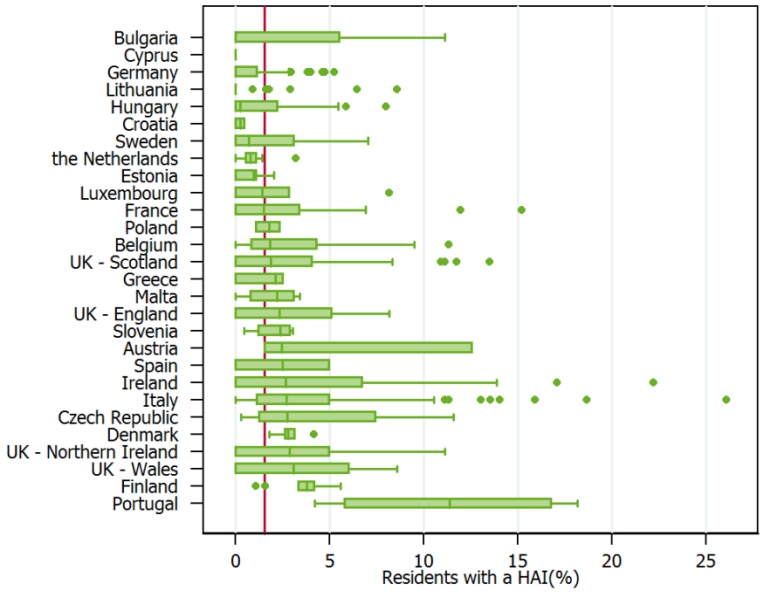
The median prevalence varied from 0.9% in RHs (min-max: 0-18.6%) to 1.5% in NHs (0-26.1%) and 2.0% in mixed LTCFs (0-18.2%).

Table 11. Number and prevalence of residents with at least one HAI on the day of the PPS by country, HALT, 2010

Country	N of eligible residents	N of included LTCFs	N of residents with at least one HAI	Prevalence (%) of residents with at least one HAI					
				HAI%	Min	P25	Median	P75	Max
Austria	400	3	28	7.0	1.6	1.6	2.5	12.6	12.6
Belgium	12 041	108	322	2.7	0.0	0.9	1.9	4.3	11.3
Bulgaria	200	11	5	2.5	0.0	0.0	0.0	5.6	11.1
Croatia	546	2	2	0.4	0.0	0.0	0.3	0.5	0.5
Cyprus	64	2	0	0.0	0.0	0.0	0.0	0.0	0.0
Czech Republic	549	4	13	2.4	0.3	1.3	2.8	7.5	11.6
Denmark	313	5	9	2.9	1.8	2.6	2.8	3.2	4.2
Estonia	784	5	11	1.4	0.0	0.0	1.0	1.1	2.0
Finland	2 320	9	89	3.8	1.1	3.3	3.8	4.2	5.6
France	6 255	65	142	2.3	0.0	0.0	1.5	3.4	15.2
Germany	6 496	73	51	0.8	0.0	0.0	0.0	1.2	5.3
Greece	636	3	13	2.0	0.0	0.0	2.1	2.5	2.5
Hungary	4 839	42	60	1.2	0.0	0.0	0.3	2.3	8.0
Ireland	3 282	55	134	4.1	0.0	0.0	2.7	6.8	22.2
Italy	9 203	90	300	3.3	0.0	1.1	2.7	5.0	26.1
Lithuania	2 519	50	24	1.0	0.0	0.0	0.0	0.0	8.6
Luxembourg	508	5	12	2.4	0.0	0.0	1.4	2.9	8.2
Malta	495	4	12	2.4	0.0	0.8	2.2	3.2	3.4
The Netherlands	1 429	10	14	1.0	0.0	0.6	0.8	1.1	3.2
Poland	313	3	6	1.9	1.1	1.1	1.8	2.4	2.4
Portugal	163	4	12	7.4	4.2	5.8	11.4	16.8	18.2
Slovenia	1 396	4	29	2.1	0.5	1.2	2.4	2.9	3.0
Spain	126	2	2	1.6	0.0	0.0	2.5	5.0	5.0
Sweden	281	6	8	2.8	0.0	0.0	0.7	3.1	7.1
UK - England	466	10	15	3.2	0.0	0.0	2.3	5.1	8.2
UK – Northern Ireland	642	18	21	3.3	0.0	0.0	2.9	5.0	11.1
UK - Scotland	4 870	83	128	2.6	0.0	0.0	1.9	4.1	13.5
UK - Wales	796	18	26	3.3	0.0	0.0	3.1	6.1	8.6
Total	**61 932**	**694**	**1 488**	**2.4**	**0.0**	**0.0**	**1.5**	**3.7**	**26.1**

HAI%: crude prevalence (((eligible residents with at least one HAI on the day of the PPS)/(eligible residents)) x 100)

Figure 14. Prevalence of residents with at least one HAI by country, HALT, 2010



Red vertical line = crude median (1.5%)

Types of healthcare-associated infections

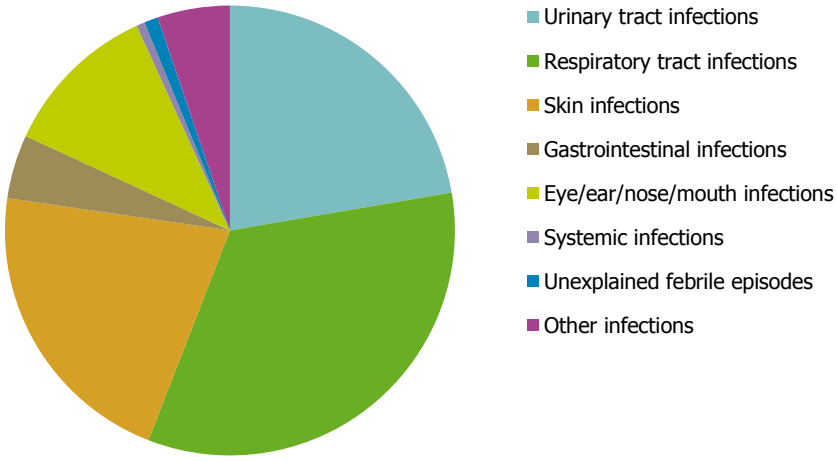
Modified McGeer definitions were applied to the s/s reported and in 56.8% (n=1 549) of the cases enough s/s were present to confirm the HAI [10].

The difference between the number of cases with s/s and infections was highest for influenza-like illness: only five of the 54 cases in which s/s were reported were considered as an HAI after application of the modified McGeer criteria (-90.7%). Secondly, a difference of 60.2% was reported for UTIs, followed by fungal skin infections (-53.0%), systemic infections (-50.0%), cellulitis/soft tissue/wound infections (-44.8%), common cold/pharyngitis (-40.0%), lower RTIs (-37.3%), herpetic infections (-18.8%) and gastrointestinal infections (-16.5%). No difference was observed for eye/ear/mouth/sinus infections, scabies (n=1), 'unexplained febrile episodes' and 'other infections'.

These differences resulted in a slight change in the percentages attributed to each infection site. Respiratory tract infections were reported most frequently (33.6%), followed by UTIs (22.3%) and skin infections (21.4%). Respiratory tract infections (n=520) were mainly lower RTIs other than pneumonia (50.4%), common colds/pharyngitis (26.5%) and pneumonia (22.1%). Only five cases of influenza-like illness (1.0%) were reported. Skin infections (n=332) were mainly cellulitis/soft tissue/wound infections (86.4%) and fungal infections (9.3%).

Eye/ear/nose/mouth infections accounted for 11.3% of all HAIs. This group primarily consisted of conjunctivitis (68.0%), mouth infections (20.6), ear infections (10.9%) and sinusitis (0.6%). 'Other infections' (mainly genital infections, dental infections (not classified under mouth infections) and bone infections) and gastrointestinal infections were less frequent (5.2% and 4.6%, respectively); 'unexplained febrile episodes' and 'systemic infections' (1.0% and 0.6%, respectively) were rare (Figure 15); Herpetic infections were also infrequent (3.9%).

Figure 15. Distribution of HAI types after application of modified McGeer definitions, HALT, 2010



Detailed information of the distribution of the HAI types overall and by country is shown in Table 12. In NHs the most common infection groups (n=1 149) were RTIs (32.5%), skin infection (22.0%), UTIs (21.5%) and eye/ear/nose/mouth infections (12.0%). Overall, the most important HAIs in NHs were UTIs (21.5%), cellulitis/soft tissue/wound infections (18.5%) and lower RTIs other than pneumonia (17.7%).

Similar to NHs, the most common infection groups in RHs (n=86) were RTIs (51.2%), skin infections (22.1%) and UTIs (14.0%). In this LTCF type lower RTIs other than pneumonia (23.3%), cellulitis/soft tissue/wound infections (20.9%), pneumonia (14.0%) and UTIs (14.0%) were most frequently present.

In mixed LTCFs, RTIs (32.8%) were also the most commonly reported HAI groups (n=314 in total). UTIs (27.4%) took the second place prior to skin infections (19.1%). At infection level, UTIs (27.4%), cellulitis/soft tissue/wound infections (17.8%) and lower RTIs (12.4%).

Table 12. Distribution of types of HAI (number and relative frequency) by country, HALT, 2010

Types of HAI	All countries		Austria		Belgium		Bulgaria		Croatia		Czech Republic		Denmark		Estonia		Finland		France	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
All types of HAI	**1 549**	**100**	28	100.0	348	100.0	5	100.0	2	100.0	16	100.0	9	100.0	11	100.0	89	100.0	149	100.0
Urinary tract infections	**345**	**22.3**	2	7.1	35	10.1	3	60.0	0	0.0	7	43.8	2	22.2	0	0.0	19	21.3	28	18.8
Respiratory tract infections	**520**	**33.6**	1	3.6	169	48.6	0	0.0	0	0.0	2	12.5	2	22.2	2	18.2	23	25.8	34	22.8
Common cold/pharyngitis	**138**	**8.9**	0	0.0	57	16.4	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	6	6.7	3	2.0
Influenza-like illness	**5**	**0.3**	0	0.0	3	0.9	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Pneumonia	**115**	**7.4**	1	3.6	18	5.2	0	0.0	0	0.0	0	0.0	2	22.2	0	0.0	7	7.9	8	5.4
Other lower RTIs	**262**	**16.9**	0	0.0	91	26.1	0	0.0	0	0.0	2	12.5	0	0.0	2	18.2	10	11.2	23	15.4
Skin infections	**332**	**21.4**	20	71.4	68	19.5	1	20.0	1	50.0	2	12.5	3	33.3	8	72.7	12	13.5	44	29.5
Cellulitis/soft tissue/ wound infection	**287**	**18.5**	3	10.7	61	17.5	1	20.0	1	50.0	2	12.5	3	33.3	8	72.7	10	11.2	35	23.5
Herpes simplex or zoster	**13**	**0.8**	5	17.9	2	0.6	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	1.1	2	1.3
Fungal skin infections	**31**	**2.0**	12	42.9	5	1.4	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	1.1	7	4.7
Scabies	**1**	**0.1**	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Gastrointestinal infections	**71**	**4.6**	0	0.0	18	5.2	0	0.0	0	0.0	4	25.0	0	0.0	1	9.1	16	18.0	4	2.7
Eye, ear, nose and mouth infections	**175**	**11.3**	4	14.3	34	9.8	0	0.0	1	50.0	0	0.0	0	0.0	0	0.0	12	13.5	30	20.1
Conjunctivitis	**119**	**7.7**	4	14.3	24	6.9	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	7	7.9	19	12.8
Ear infections	**19**	**1.2**	0	0.0	2	0.6	0	0.0	1	50.0	0	0.0	0	0.0	0	0.0	1	1.1	3	2.0
Sinusitis	**1**	**0.1**	0	0.0	1	0.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Mouth infections	**36**	**2.3**	0	0.0	7	2.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	4	4.5	8	5.4
Systemic infections	**9**	**0.6**	0	0.0	1	0.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.7
Unexplained febrile episodes	**16**	**1.0**	0	0.0	2	0.6	0	0.0	0	0.0	1	6.3	0	0.0	0	0.0	3	3.4	1	0.7
Other infections	**81**	**5.2**	1	3.6	21	6.0	1	20.0	0	0.0	0	0.0	2	22.2	0	0.0	4	4.5	7	4.7

No infections reported for Cyprus

Table 12. Distribution of types of HAI (number and relative frequency) by country, HALT, 2010 (continued)

Types of HAI	Germany		Greece		Hungary		Ireland		Italy		Lithuania		Luxembourg		Malta		The Netherlands		Poland	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
All types of HAI	51	100.0	14	100.0	60	100.0	140	100.0	316	100.0	24	100.0	12	100.0	12	100.0	15	100.0	6	100.0
Urinary tract infections	19	37.3	4	28.6	11	18.3	53	37.9	64	20.3	1	4.2	3	25.0	2	16.7	4	26.7	2	33.3
Respiratory tract infections	14	27.5	6	42.9	26	43.3	34	24.3	116	36.7	17	70.8	2	16.7	4	33.3	3	20.0	3	50.0
Common cold/pharyngitis	6	11.8	1	7.1	10	16.7	12	8.6	16	5.1	7	29.2	0	0.0	1	8.3	1	6.7	1	16.7
Influenza-like illness	0	0.0	0	0.0	1	1.7	0	0.0	0	0.0	0	0.0	0	0.0	1	8.3	0	0.0	0	0.0
Pneumonia	4	7.8	5	35.7	7	11.7	5	3.6	39	12.3	3	12.5	0	0.0	2	16.7	1	6.7	1	16.7
Other lower RTIs	4	7.8	0	0.0	8	13.3	17	12.1	61	19.3	7	29.2	2	16.7	0	0.0	1	6.7	1	16.7
Skin infections	4	7.8	3	21.4	18	30.0	28	20.0	52	16.5	4	16.7	4	33.3	4	33.3	5	33.3	1	16.7
Cellulitis/soft tissue/wound infection	4	7.8	1	7.1	16	26.7	26	18.6	49	15.5	4	16.7	4	33.3	4	33.3	4	26.7	1	16.7
Herpes simplex or zoster	0	0.0	0	0.0	2	3.3	0	0.0	1	0.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Fungal skin infections	0	0.0	1	7.1	0	0.0	2	1.4	2	0.6	0	0.0	0	0.0	0	0.0	1	6.7	0	0.0
Scabies	0	0.0	1	7.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Gastrointestinal infections	3	5.9	0	0.0	0	0.0	7	5.0	14	4.4	1	4.2	0	0.0	0	0.0	0	0.0	0	0.0
Eye, ear, nose and mouth infections	8	15.7	0	0.0	5	8.3	10	7.1	41	13.0	1	4.2	1	8.3	1	8.3	0	0.0	0	0.0
Conjunctivitis	6	11.8	0	0.0	4	6.7	6	4.3	28	8.9	0	0.0	1	8.3	1	8.3	0	0.0	0	0.0
Ear infections	0	0.0	0	0.0	0	0.0	1	0.7	7	2.2	1	4.2	0	0.0	0	0.0	0	0.0	0	0.0
Sinusitis	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Mouth infections	2	3.9	0	0.0	1	1.7	3	2.1	6	1.9	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Systemic infections	0	0.0	0	0.0	0	0.0	1	0.7	6	1.9	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Unexplained febrile episodes	0	0.0	1	7.1	0	0.0	0	0.0	8	2.5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Other infections	3	5.9	0	0.0	0	0.0	7	5.0	15	4.7	0	0.0	2	16.7	1	8.3	3	20.0	0	0.0

Table 12. Distribution of types of HAI (number and relative frequency) by country, HALT, 2010 (continued)

Types of HAI	Portugal		Slovenia		Spain		Sweden		UK - England		UK - Northern Ireland		UK - Scotland		UK - Wales	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
All types of HAI	13	100.0	29	100.0	2	100.0	8	100.0	15	100.0	21	100.0	128	100.0	26	100.0
Urinary tract infections	5	38.5	7	24.1	0	0.0	0	0.0	2	13.3	4	19.0	62	48.4	6	23.1
Respiratory tract infections	1	7.7	14	48.3	1	50.0	2	25.0	2	13.3	11	52.4	24	18.8	7	26.9
Common cold/pharyngitis	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	10	47.6	7	5.5	0	0.0
Influenza-like illness	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Pneumonia	0	0.0	9	31.0	1	50.0	2	25.0	0	0.0	0	0.0	0	0.0	0	0.0
Other lower RTIs	1	7.7	5	17.2	0	0.0	0	0.0	2	13.3	1	4.8	17	13.3	7	26.9
Skin infections	5	38.5	5	17.2	0	0.0	2	25.0	4	26.7	4	19.0	20	15.6	10	38.5
Cellulitis/soft tissue/wound infection	5	38.5	5	17.2	0	0.0	2	25.0	4	26.7	4	19.0	20	15.6	10	38.5
Herpes simplex or zoster	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Fungal skin infections	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Scabies	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Gastrointestinal infections	0	0.0	2	6.9	0	0.0	0	0.0	0	0.0	0	0.0	1	0.8	0	0.0
Eye, ear, nose and mouth infections	1	7.7	1	3.4	1	50.0	1	12.5	3	20.0	1	4.8	16	12.5	3	11.5
Conjunctivitis	1	7.7	0	0.0	0	0.0	1	12.5	3	20.0	0	0.0	11	8.6	3	11.5
Ear infections	0	0.0	1	3.4	0	0.0	0	0.0	0	0.0	1	4.8	1	0.8	0	0.0
Sinusitis	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Mouth infections	0	0.0	0	0.0	1	50.0	0	0.0	0	0.0	0	0.0	4	3.1	0	0.0
Systemic infections	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Unexplained febrile episodes	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Other infections	1	7.7	0	0.0	0	0.0	3	37.5	4	26.7	1	4.8	5	3.9	0	0.0

Antimicrobial use

Prevalence of antimicrobial use

On the day of the PPS, 2 679 out of 61 932 eligible residents received at least one antimicrobial agent (crude prevalence: 4.3%). The majority of these residents (94.9%) received one antimicrobial agent, while 4.9% received two agents. Four residents (0.1%) received three. In total, 2 819 antimicrobial agents were administered on the PPS day.

Of all residents who received an antimicrobial, 2 054 were resident in a NH (crude prevalence: 4.4%), 494 in a mixed LTCF (crude prevalence: 4.7%) and 131 in a RH (crude prevalence: 2.5%).

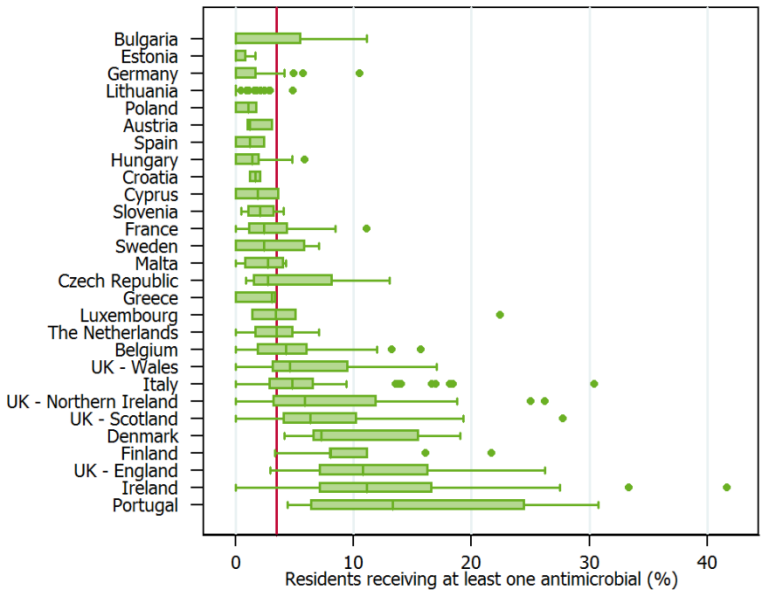
Table 13. Number and prevalence of receiving at least one antimicrobial agent on the day of the PPS by country, HALT, 2010

Country	Number of eligible residents	Number of residents receiving at least one antimicrobial agent	Number of anti-microbial agents	Prevalence (%) of residents with at least one antimicrobial agent					
				Prev AU%	Min	P25	P50	P75	Max
Austria	400	7	7	1.8	1.0	1.0	1.2	3.1	3.1
Belgium	12 041	520	540	4.3	0.0	1.9	4.3	6.0	15.7
Bulgaria	200	5	6	2.5	0.0	0.0	0.0	5.6	11.1
Croatia	546	10	10	1.8	1.2	1.2	1.7	2.1	2.1
Cyprus	64	1	1	1.6	0.0	0.0	1.9	3.7	3.7
Czech Republic	549	16	18	2.9	0.9	1.5	2.8	8.2	13.0
Denmark	313	34	34	10.9	4.2	6.6	7.3	15.5	19.0
Estonia	784	6	6	0.8	0.0	0.0	0.0	0.9	1.7
Finland	2 320	227	241	9.8	3.3	8.0	8.1	11.2	21.7
France	6 255	192	204	3.1	0.0	1.1	2.4	4.4	11.1
Germany	6 496	75	79	1.2	0.0	0.0	0.0	1.8	10.5
Greece	636	18	19	2.8	0.0	0.0	3.1	3.4	3.4
Hungary	4 839	75	75	1.5	0.0	0.0	1.4	2.0	5.9
Ireland	3 282	371	391	11.3	0.0	7.1	11.1	16.7	41.7
Italy	9 203	423	464	4.6	0.0	2.9	4.8	6.6	30.4
Lithuania	2 519	23	25	0.9	0.0	0.0	0.0	0.0	4.9
Luxembourg	508	23	24	4.5	1.4	1.4	3.4	5.1	22.4
Malta	495	14	15	2.8	0.0	0.8	2.7	4.1	4.3
The Netherlands	1 429	50	53	3.5	0.0	1.7	3.5	4.9	7.0
Poland	313	4	4	1.3	0.0	0.0	1.1	1.8	1.8
Portugal	163	15	15	9.2	4.4	6.4	13.3	24.5	30.8
Slovenia	1 396	32	33	2.3	0.5	1.1	2.1	3.3	4.1
Spain	126	1	1	0.8	0.0	0.0	1.3	2.5	2.5
Sweden	281	10	10	3.6	0.0	0.0	2.4	5.9	7.1
UK - England	466	59	61	12.7	2.9	7.1	10.8	16.3	26.2
UK - Northern Ireland	642	56	58	8.7	0.0	3.2	5.9	11.9	26.2
UK - Scotland	4 870	360	371	7.4	0.0	4.1	6.3	10.3	27.8
UK - Wales	796	52	54	6.5	0.0	3.1	4.6	9.5	17.1
Total	**61 932**	**2 679**	**2 819**	**4.3**	**0.0**	**1.1**	**3.4**	**6.9**	**41.7**

Previous AU%: crude prevalence of AU (((eligible residents receiving at least one antimicrobial agent on the day of the PPS)/(eligible residents)) x 100)

The crude prevalence of antimicrobial use varied between 0.8% in Estonia and 12.7% in UK-England. The overall median prevalence of residents receiving at least one antimicrobial was 3.4% and varied from 0.0% in four countries (Bulgaria, Germany, Estonia and Lithuania) to 13.3% in Portugal (Table 13 and Figure 16).

Figure 16. Prevalence of residents with at least one antimicrobial agent per country, HALT, 2010



Red vertical line = crude median (3.4%)

The median prevalence of residents with at least one antimicrobial agent on the day of the PPS was the highest in mixed LTCFs (3.7%, min-max: 0–41.7%) and the lowest in RHs (1.8%, min-max: 0–16.9%). In NHs, the median prevalence was 3.5% (min-max: 0–33.3%).

Characteristics of antimicrobial prescriptions

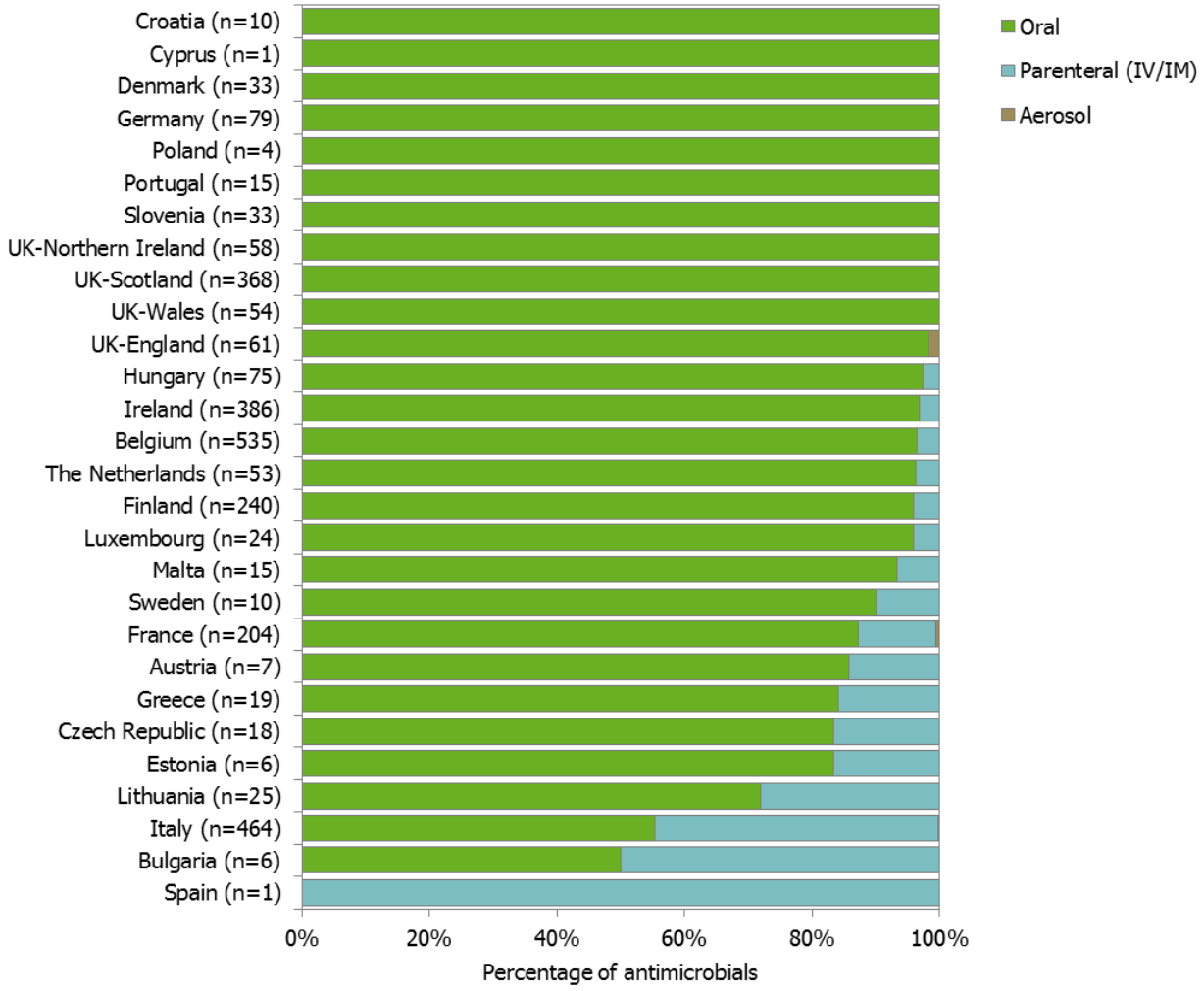
Administration route

Antimicrobial agents (n=2804; 15 missing routes) were mainly administered orally (89.3%). A parenteral route (intramuscular (IM) or intravenous (IV)) was used for 10.6% of the prescribed antimicrobial agents. Antibiotic treatment via aerosol was rare (0.1%) and rectal administration was not recorded.

Oral use of antimicrobial agents was higher in NHs (91.4%) compared to RHs (74.6%) and mixed LTCFs (84.1%). Residential homes reported the highest parenteral use (25.4%), preceding mixed LTCFs (15.7%) and NHs (8.5%).

In 10 countries, all residents who received antimicrobial agents received these orally (n=655; Figure 17). There were three reports of administration of antimicrobial agents via aerosol (UK-England: n=1/61, France: n=1/204, and Italy: n=1/464) (Figure 17).

Figure 17. Distribution of routes of administration of antimicrobial agents to LTCF residents by country, HALT, 2010



Location of prescription and type of prescriber

Antimicrobial agents (n=2 721; 98 missing values) were mainly prescribed within the LTCF themselves (88.2%), whether within NHs (87.9%), RHs (93.9%) or mixed LTCFs (88.2%). In 83.2% of the cases where an antimicrobial was prescribed within the LTCF itself (n=2 392), the prescriber was a GP (14.1% specialist, 2.8% another person). In four countries (Cyprus, Estonia, Croatia and Greece), all antimicrobial agents were prescribed within the LTCF.

The second most common prescribing location for LTCF residents were hospitals (overall: 8.7%; NHs: 9.0%, RHs: 4.6% and mixed LTCFs 8.2%, respectively). Most of the prescriptions made in the hospital (n=233) were made by a specialist (86.7%), a GP (6.9%), or another person (6.4%). If an antimicrobial was prescribed 'elsewhere' (n=82, 3.1%), this was done by a GP (58.5%), specialist (34.2%) or another person (7.3%).

General practitioners were the main prescribers of the residents' received antimicrobial agents (75.8%; n=2726; 93 missing values). The percentage of prescriptions made by a GP was 78.4% in NHs, 70.5% in mixed LTCFs, and 55.7% in RHs. Specialists were the second most frequent prescribers (20.9%) and 'another person' third most frequent (3.3%). All antimicrobial agents prescribed in Cyprus, Estonia and Croatia were prescribed by a GP, while a specialist prescribed all antimicrobial agents in Bulgaria and Greece (n=24) (Figure 19). In RHs, antimicrobial agents were commonly prescribed by a specialist (38.2%). There were no reports of antimicrobial prescribing by a pharmacist or nurse.

Figure 18. Distribution of locations of antimicrobial prescribing to LTCF residents by country, HALT, 2010

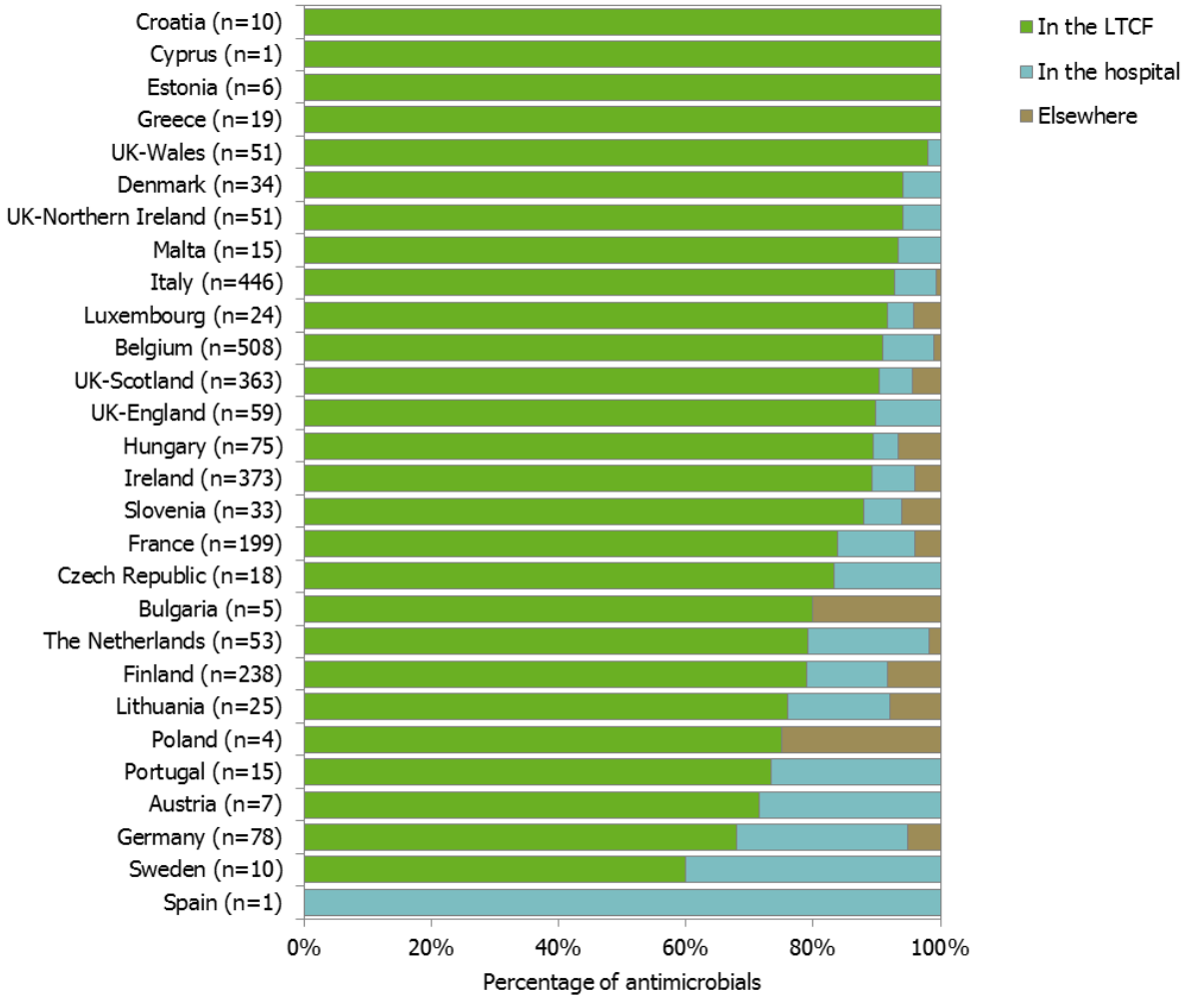
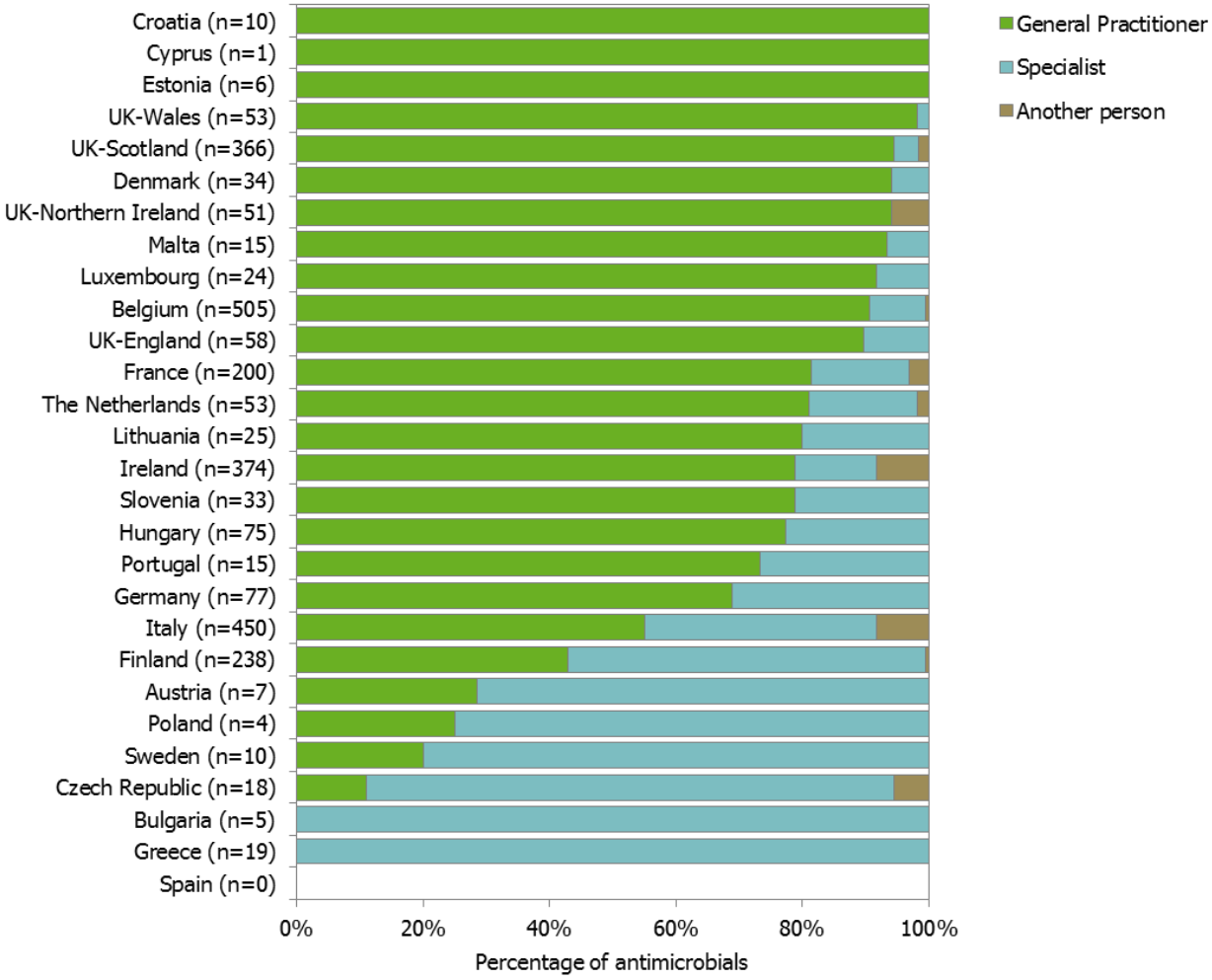


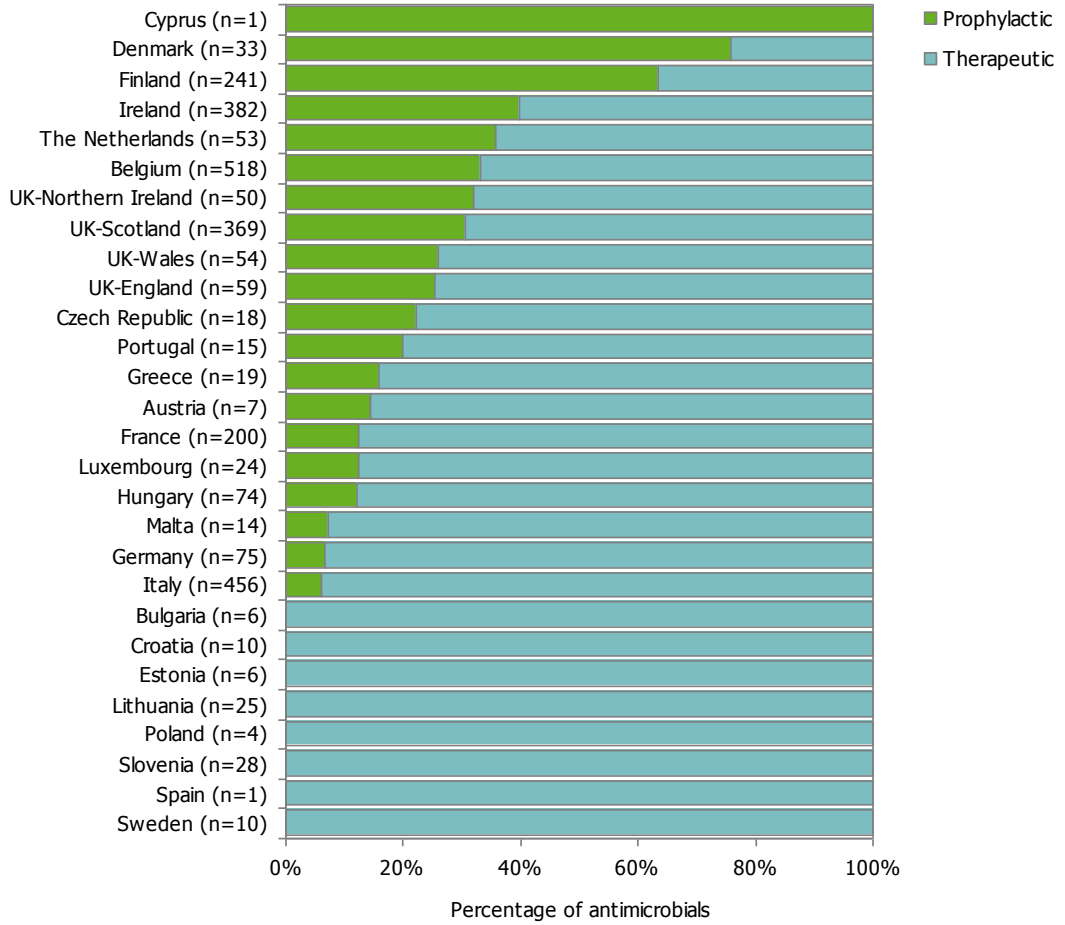
Figure 19. Distribution of type of antimicrobial prescribers to LTCF residents by country, HALT, 2010



Indications for antimicrobial prescribing

Antimicrobial agents were mainly prescribed for the treatment of an infection (72.3% n=2 752; 67 treatment types not recorded). The remaining antimicrobial agents were given as prophylaxis (27.7%). Prophylactic use was highest in Cyprus (only one antimicrobial prescribed), Denmark (75.8%) and Finland (63.5%). Only eight countries reported therapeutic use of antimicrobial agents (Figure 20).

Figure 20. Indication for antimicrobial use by country, HALT, 2010



The main indication for prophylactic prescriptions was the prevention of UTIs (79.9%). Uroprophylaxis accounted for 22.1% of all antimicrobial use and comprised more than 25% of antimicrobial use in following countries: UK-Scotland (27.9%), Belgium (28.4%), UK-Northern Ireland (32.0%), Ireland (35.9%), Finland (58.9%) and Denmark (75.8%) (Table 14).

The three most common indications for therapeutic prescription of antimicrobial agents were RTIs (35.9%), UTIs (35.7%) and 'skin or wound infections' (17.9%). These were most common in all countries except Bulgaria and the Czech Republic (gastrointestinal), Croatia (ear, nose, mouth), Luxembourg and Sweden ('other'; Table 14).

Table 14. Indications for antimicrobial prescribing by country (number and relative frequency) by country, HALT, 2010

Indication	All countries		Austria		Belgium		Bulgaria		Croatia		Cyprus		Czech Republic		Denmark		Estonia		Finland	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Prophylactic use	761	27.7	1	14.3	172	33.2	0	0.0	0	0.0	1	100.0	4	22.2	25	75.8	0	0.0	153	63.5
Urinary tract	608	79.9	0	0.0	147	85.5	0	0.0	0	0.0	0	0.0	2	50.0	25	100.0	0	0.0	142	92.8
Skin or wound	29	3.8	0	0.0	5	2.9	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	6	3.9
Respiratory tract	37	4.9	1	100.0	7	4.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Gastrointestinal	5	0.7	0	0.0	3	1.7	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Eye	1	0.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Ear, nose, mouth	11	1.4	0	0.0	2	1.2	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	3	2.0
Systemic infection	3	0.4	0	0.0	1	0.6	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Unexplained fever	2	0.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	25.0	0	0.0	0	0.0	0	0.0
Other	23	3.0	0	0.0	6	3.5	0	0.0	0	0.0	0	0.0	1	25.0	0	0.0	0	0.0	2	1.3
Unknown	42	5.5	0	0.0	1	0.6	0	0.0	0	0.0	1	100.0	0	0.0	0	0.0	0	0.0	0	0.0
Therapeutic use	1 991	72.3	6	85.7	346	66.8	6	100.0	10	100.0	0	0.0	14	77.8	8	24.2	6	100.0	88	36.5
Urinary tract	710	35.7	1	16.7	110	31.8	4	66.7	8	80.0	0	0.0	9	64.3	2	25.0	2	33.3	36	40.9
Skin or wound	356	17.9	1	16.7	52	15.0	1	16.7	1	10.0	0	0.0	0	0.0	2	25.0	1	16.7	15	17.0
Respiratory tract	715	35.9	3	50.0	157	45.4	0	0.0	0	0.0	0	0.0	1	7.1	2	25.0	2	33.3	23	26.1
Gastrointestinal	41	2.1	0	0.0	6	1.7	1	16.7	0	0.0	0	0.0	4	28.6	0	0.0	1	16.7	2	2.3
Eye	5	0.3	0	0.0	2	0.6	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Ear, nose, mouth	55	2.8	0	0.0	5	1.4	0	0.0	1	10.0	0	0.0	0	0.0	0	0.0	0	0.0	3	3.4
Systemic infection	18	0.9	1	16.7	2	0.6	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	1.1
Unexplained fever	20	1.0	0	0.0	1	0.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	4	4.5
Other	59	3.0	0	0.0	8	2.3	0	0.0	0	0.0	0	0.0	0	0.0	2	25.0	0	0.0	4	4.5
Unknown	12	0.6	0	0.0	3	0.9	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0

Table 14. Indications for antimicrobial prescribing by country (number and relative frequency) by country, HALT, 2010 (continued)

Indication	France		Germany		Greece		Hungary		Ireland		Italy		Lithuania		Luxembourg		Malta		The Netherlands	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Prophylactic use	25	12.5	5	6.7	3	15.8	9	12.2	152	39.8	27	5.9	0	0.0	3	12.5	1	7.1	19	35.8
Urinary tract	7	28.0	0	0.0	0	0.0	0	0.0	137	90.1	3	11.1	0	0.0	2	66.6	0	0.0	12	63.2
Skin or wound	6	24.0	0	0.0	0	0.0	0	0.0	4	2.6	2	7.4	0	0.0	0	0.0	0	0.0	2	10.5
Respiratory tract	5	20.0	1	20.0	0	0.0	0	0.0	8	5.3	5	18.5	0	0.0	0	0.0	0	0.0	3	15.8
Gastrointestinal	0	0.0	1	20.0	0	0.0	0	0.0	0	0.0	1	3.7	0	0.0	0	0.0	0	0.0	0	0.0
Eye	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	3.7	0	0.0	0	0.0	0	0.0	0	0.0
Ear, nose, mouth	2	8.0	0	0.0	0	0.0	0	0.0	1	0.7	3	11.1	0	0.0	0	0.0	0	0.0	0	0.0
Systemic infection	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	3.7	0	0.0	0	0.0	0	0.0	0	0.0
Unexplained fever	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	3.7	0	0.0	0	0.0	0	0.0	0	0.0
Other	2	8.0	2	40.0	0	0.0	0	0.0	1	0.7	4	14.8	0	0.0	1	33.3	0	0.0	2	10.5
Unknown	3	12.0	1	20.0	3	100.0	9	100.0	1	0.7	6	22.2	0	0.0	0	0.0	1	100.0	0	0.0
Therapeutic use	175	87.5	70	93.3	16	84.2	65	87.8	230	60.2	429	94.1	25	100.0	21	87.5	13	92.9	34	64.2
Urinary tract	76	43.4	31	44.3	7	43.8	17	26.2	76	33.0	117	27.3	2	8.0	10	47.6	1	7.7	15	44.1
Skin or wound	32	18.3	9	12.9	2	12.5	16	24.6	50	21.7	62	14.5	4	16.0	1	4.8	5	38.5	7	20.6
Respiratory tract	46	26.3	16	22.9	7	43.8	31	47.7	81	35.2	195	45.5	16	64.0	7	33.3	5	38.5	6	17.6
Gastrointestinal	4	2.3	7	10.0	0	0.0	0	0.0	8	3.5	5	1.2	2	8.0	0	0.0	0	0.0	0	0.0
Eye	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	7.7	0	0.0
Ear, nose, mouth	8	4.6	2	2.9	0	0.0	1	1.5	7	3.0	15	3.5	1	4.0	0	0.0	0	0.0	1	2.9
Systemic infection	2	1.1	0	0.0	0	0.0	0	0.0	2	0.9	7	1.6	0	0.0	0	0.0	0	0.0	1	2.9
Unexplained fever	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	15	3.5	0	0.0	0	0.0	0	0.0	0	0.0
Other	7	4.0	4	5.7	0	0.0	0	0.0	3	1.3	12	2.8	0	0.0	3	14.3	1	7.7	4	11.8
Unknown	0	0.0	1	1.4	0	0.0	0	0.0	3	1.3	1	0.2	0	0.0	0	0.0	0	0.0	0	0.0

Table 14. Indications for antimicrobial prescribing by country (number and relative frequency) by country, HALT, 2010 (continued)

Indication	Poland		Portugal		Slovenia		Spain		Sweden		UK - England		UK - Northern Ireland		UK - Scotland		UK - Wales	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Prophylactic use	0	0.0	3	20.0	0	0.0	0	0.0	0	0.0	15	25.4	16	32.0	113	30.6	14	25.9
Urinary tract	0	0.0	2	66.6	0	0.0	0	0.0	0	0.0	10	66.7	16	100.0	103	91.2	0	0.0
Skin or wound	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	13.3	0	0.0	2	1.8	0	0.0
Respiratory tract	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	13.3	0	0.0	5	4.4	0	0.0
Gastrointestinal	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Eye	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Ear, nose, mouth	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Systemic infection	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	6.7	0	0.0	0	0.0	0	0.0
Unexplained fever	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Other	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	1.8	0	0.0
Unknown	0	0.0	1	33.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.9	14	100.0
Therapeutic use	4	100.0	12	80.0	28	100.0	1	100.0	10	100.0	44	74.6	34	68.0	256	69.4	40	74.1
Urinary tract	1	25.0	8	66.7	8	28.6	0	0.0	3	30.0	14	31.8	12	35.3	125	48.8	15	37.5
Skin or wound	0	0.0	1	8.3	7	25.0	0	0.0	2	20.0	17	38.6	8	23.5	48	18.8	12	30.0
Respiratory tract	3	75.0	3	25.0	13	46.4	1	100.0	2	20.0	10	22.7	12	35.3	63	24.6	10	25.0
Gastrointestinal	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.4	0	0.0
Eye	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	0.8	0	0.0
Ear, nose, mouth	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	5.9	9	3.5	0	0.0
Systemic infection	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	0.8	0	0.0
Unexplained fever	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Other	0	0.0	0	0.0	0	0.0	0	0.0	3	30.0	3	6.8	0	0.0	5	2.0	0	0.0
Unknown	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.4	3	7.5

Prophylactic prescriptions of antimicrobial agents were less frequent in RHs (9.2%) compared to mixed LTCFs (26.4%) and NHs (29.1%). In all three LTCF types, UTIs were the main indication for this prophylactic use. Uroprophylaxis accounted for 23.9% of total antimicrobial use in NHs, 1.5% in RHs and 20.0% in mixed LTCFs.

Therapeutic prescriptions accounted for 90.8% of the overall antimicrobial use in RHs and for 70.9% and 73.7% in NHs and mixed LTCFs, respectively. The three most dominant indications in RHs and mixed LTCFs were RTIs (44.1% and 38.2%, respectively), UTIs (32.2% and 35.0%, respectively) and skin or wound infections (18.6% and 19.8%, respectively). In NHs, UTIs were the main indication for therapeutic prescriptions of antimicrobial agents (36.1%), followed by RTIs (34.7%) and skin or wound infections (17.4%).

Antimicrobial agents prescribed in the long-term care facilities

Antibacterials for systemic use (ATC J01) represented 96.2% of all prescribed antimicrobial agents.

Forty antimicrobial agents were 'Antiprotozoal' (ATC P01; 1.4%). All were metronidazole and were prescribed in ten countries: Belgium, Finland, France, Germany, Ireland, Italy, Lithuania, Luxembourg, Malta and UK-Scotland. Metronidazole was mainly used for the treatment of gastro-intestinal infections (n=20, of which three were prophylactic).

'Antimycotics for systemic use' (ATC J02) were the third most frequent group (1.2%), in particular fluconazole (n=24), itraconazole (n=8) and ketoconazole (n=1). These antimycotics were mainly used for the prevention (n=1) or treatment (n=16) of skin or wound infections (51.5%).

'Antidiarrheals, intestinal antiinflammatory/antiinfective agents' (ATC A07) were reported 13 times (0.5%): vancomycin (n=6), nystatin (n=4), miconazole (n=2) and rifaximin (n=1). These antidiarrheals were prescribed in Belgium (n=1), the Czech Republic (n=2), Germany (n=1), Hungary (n=2), Italy (n=3), the Netherlands (n=1) and UK-Scotland (n=3).

Eleven 'drugs for treatment of tuberculosis' (ATC J04A) were prescribed: rifampicin (n=9), rifamycin (n=1) and isoniazid (n=1). The reasons for prescribing these drugs were treatment of a skin or wound infection (n=4), a RTI (n=1, multidrug-resistant *Proteus mirabilis*) or an 'other infection': osteitis (n=2), surgical site infection (n=1), sepsis on a prosthesis and supraclavicular lymph node tuberculosis (one Italian resident treated with rifampicin and isoniazid).

Four 'antifungals for systemic use' (ATC D01B), all terbinafine, were used for the treatment of a skin or wound infection: two in Belgium, one in UK-England and one in UK-Scotland.

Miconazole ('stomatological preparations', ATC A01) was reported once in Belgium (gastro-intestinal infection) and once in France (ear/nose/mouth infection).

No name, and therefore no ATC code, was reported for three antimicrobial agents.

Antibacterials for systemic use (ATC J01)

During the PPS, 2 713 antibacterials for systemic use (ATC J01) were recorded. This group accounted for 96.0% (n=2 084) of all antimicrobial agents prescribed in NHs, for 96.3% (n=129) of antimicrobial agents in RHs (n=129) and 97.5% (n=500) of antimicrobial agents in mixed LTCFs.

Overall, the most frequently prescribed groups of antibacterials for systemic use were beta-lactams/penicillins (J01C; 28.7%), other antibacterials (J01X; 19.4%), quinolones (J01M; 15.5%), other beta-lactams (J01D; 14.1%), and sulfonamides and trimethoprim (J01E; 13.3%) (Figure 21 and Table 15).

In NHs, the three most frequently prescribed antibacterials for systemic use were beta-lactams/penicillins (J01C; 27.9%), other antibacterials (J01X; 22.7%) and quinolones (J01M; 15.7%). In RHs, these were beta-lactams/penicillins (J01C; 35.7%), other beta-lactams (J01D; 21.7%) and quinolones (ATC J01M; 17.1%). In mixed LTCFs, beta-lactams/penicillins (J01C; 30.4%) was the most frequently used group, followed by sulfonamides and trimethoprim (J01E; 18.2%), 'other beta-lactams' (J01D; 17.2%) and quinolones (J01M; 14.0%).

Figure 21. Distribution of prescribed antibacterials for systemic use (ATC J01), HALT, 2010

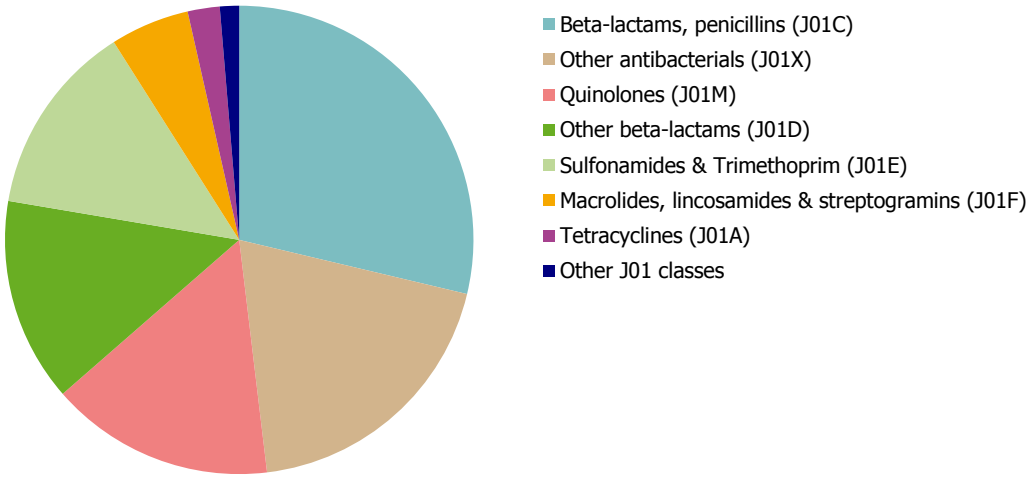
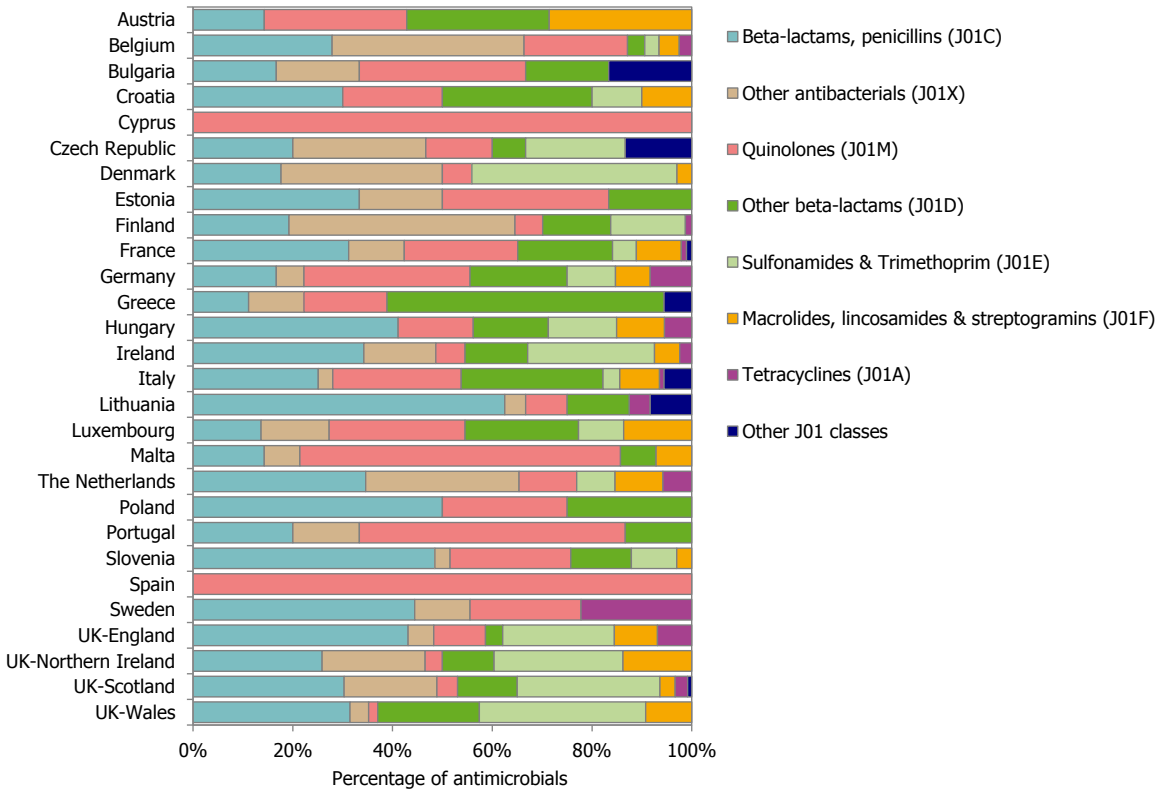


Table 15. Distribution of prescribed antibacterials for systemic use (ATC J01) by country, HALT, 2010

Country	Tetracyclines (J01A)		Amphenicols (J01B)		Beta-lactams, penicillins (J01C)		Other beta-lactams (J01D)		Sulfonamides & trimethoprim (J01E)		Macrolides, lincosamides & streptogramins (J01F)		Aminoglycosides (J01G)		Quinolones (J01M)		Combinations of antibacterials (J01R)		Other antibacterials (J01X)		Total J01 antimicrobial agents
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n
Austria	0	0.0	0	0.0	1	14.3	2	28.6	0	0.0	2	28.6	0	0.0	2	28.6	0	0.0	0	0.0	7
Belgium	13	2.5	0	0.0	145	27.9	18	3.5	15	2.9	21	4.0	0	0.0	108	20.8	0	0.0	200	38.5	520
Bulgaria	0	0.0	0	0.0	1	16.7	1	16.7	0	0.0	0	0.0	1	16.7	2	33.3	0	0.0	1	16.7	6
Croatia	0	0.0	0	0.0	3	30.0	3	30.0	1	10.0	1	10.0	0	0.0	2	20.0	0	0.0	0	0.0	10
Cyprus	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	100.0	0	0.0	0	0.0	1
Czech Republic	0	0.0	0	0.0	3	20.0	1	6.7	3	20.0	0	0.0	2	13.3	2	13.3	0	0.0	4	26.7	15
Denmark	0	0.0	0	0.0	6	17.6	0	0.0	14	41.2	1	2.9	0	0.0	2	5.9	0	0.0	11	32.4	34
Estonia	0	0.0	0	0.0	2	33.3	1	16.7	0	0.0	0	0.0	0	0.0	2	33.3	0	0.0	1	16.7	6
Finland	3	1.3	0	0.0	45	19.2	32	13.7	35	15.0	0	0.0	0	0.0	13	5.6	0	0.0	106	45.3	234
France	2	1.1	0	0.0	59	31.2	36	19.0	9	4.8	17	9.0	1	0.5	43	22.8	1	0.5	21	11.1	189
Germany	6	8.3	0	0.0	12	16.7	14	19.4	7	9.7	5	6.9	0	0.0	24	33.3	0	0.0	4	5.6	72
Greece	0	0.0	0	0.0	2	11.1	10	55.6	0	0.0	0	0.0	1	5.6	3	16.7	0	0.0	2	11.1	18
Hungary	4	5.5	0	0.0	30	41.1	11	15.1	10	13.7	7	9.6	0	0.0	11	15.1	0	0.0	0	0.0	73
Ireland	9	2.4	0	0.0	128	34.2	47	12.6	95	25.4	19	5.1	0	0.0	22	5.9	0	0.0	54	14.4	374
Italy	4	0.9	0	0.0	113	25.1	128	28.4	15	3.3	36	8.0	25	5.6	116	25.8	0	0.0	13	2.9	450
Lithuania	1	4.2	0	0.0	15	62.5	3	12.5	0	0.0	0	0.0	2	8.3	2	8.3	0	0.0	1	4.2	24
Luxembourg	0	0.0	0	0.0	3	13.6	5	22.7	2	9.1	3	13.6	0	0.0	6	27.3	0	0.0	3	13.6	22
Malta	0	0.0	0	0.0	2	14.3	1	7.1	0	0.0	1	7.1	0	0.0	9	64.3	0	0.0	1	7.1	14
The Netherlands	3	5.8	0	0.0	18	34.6	0	0.0	4	7.7	5	9.6	0	0.0	6	11.5	0	0.0	16	30.8	52
Poland	0	0.0	0	0.0	2	50.0	1	25.0	0	0.0	0	0.0	0	0.0	1	25.0	0	0.0	0	0.0	4
Portugal	0	0.0	0	0.0	3	20.0	2	13.3	0	0.0	0	0.0	0	0.0	8	53.3	0	0.0	2	13.3	15
Slovenia	0	0.0	0	0.0	16	48.5	4	12.1	3	9.1	1	3.0	0	0.0	8	24.2	0	0.0	1	3.0	33
Spain	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	100.0	0	0.0	0	0.0	1
Sweden	2	22.2	0	0.0	4	44.4	0	0.0	0	0.0	0	0.0	0	0.0	2	22.2	0	0.0	1	11.1	9
UK - England	4	6.9	0	0.0	25	43.1	2	3.4	13	22.4	5	8.6	0	0.0	6	10.3	0	0.0	3	5.2	58
UK – Northern Ireland	0	0.0	0	0.0	15	25.9	6	10.3	15	25.9	8	13.8	0	0.0	2	3.4	0	0.0	12	20.7	58
UK - Scotland	9	2.5	2	0.6	109	30.3	43	11.9	103	28.6	11	3.1	1	0.3	15	4.2	0	0.0	67	18.6	360
UK - Wales	0	0.0	0	0.0	17	31.5	11	20.4	18	33.3	5	9.3	0	0.0	1	1.9	0	0.0	2	3.7	54
TOTAL	**60**	**2.2**	**2**	**0.1**	**779**	**28.7**	**382**	**14.1**	**362**	**13.3**	**148**	**5.5**	**33**	**1.2**	**420**	**15.5**	**1**	**0.0**	**526**	**19.4**	**2 713**

Figure 22. Distribution of prescribed antibacterials for systemic use (ATC J01) by country, HALT, 2010

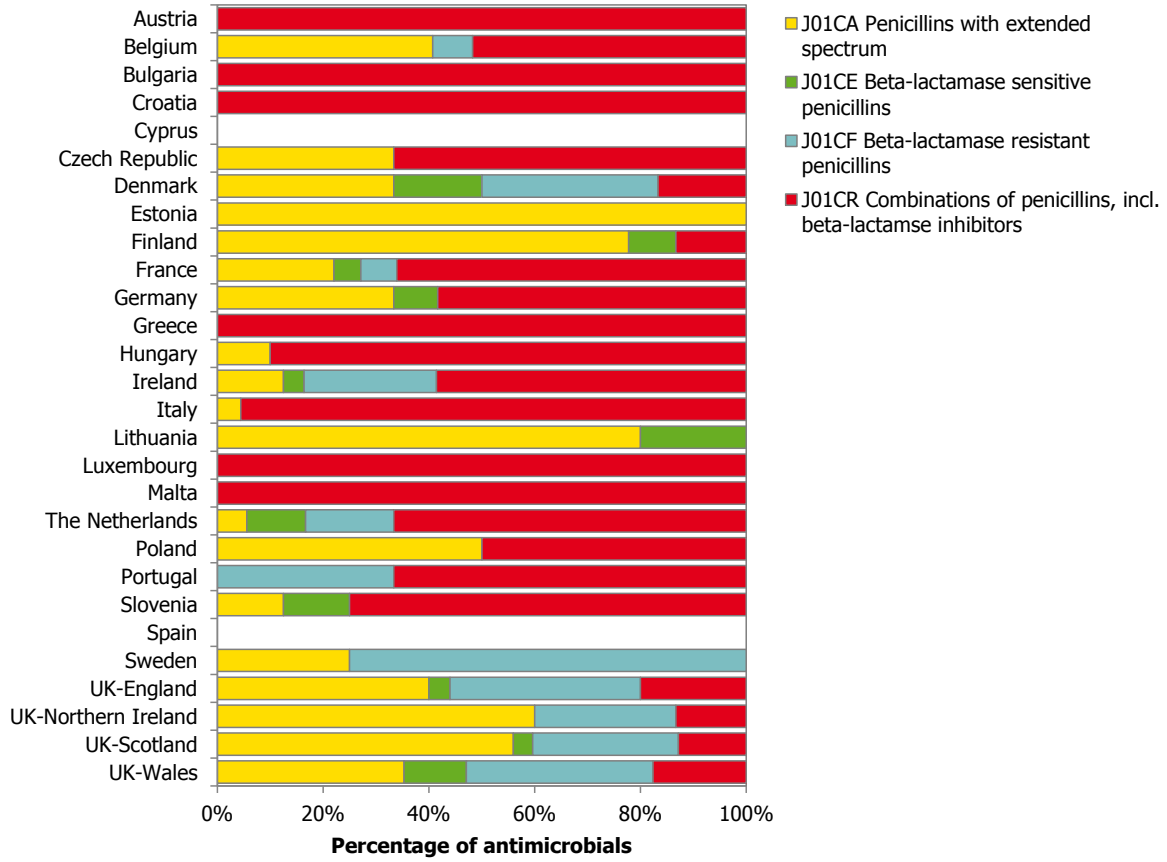


Beta-lactams/penicillins (ATC J01C) were the most frequently prescribed antibacterial agents in ten countries: France (31.2% of all antibacterial agents prescribed), Hungary (41.1%), Ireland (34.2%), Lithuania (62.5%), the Netherlands (34.6%), Poland (50.0%), Sweden (44.4%), Slovenia (48.5%), UK-England (43.1%) and UK-Scotland (30.3%). Other antibacterials (ATC J01X) were the most frequently prescribed antibacterial agents in three countries: Belgium (38.5%), the Czech Republic (26.7%) and Finland (45.3). Quinolones (ATC J01M) were the most frequently prescribed antibacterial agents in seven countries: Bulgaria (33.3%), Cyprus (100%, n=1), Germany (33.3%), Estonia (100%, n=1), Luxembourg (27.3%), Malta (64.3%) and Portugal (53.3%). Other beta-lactams (J01D) were the most frequently prescribed antimicrobial agents in Greece (55.6%) and Italy (28.4%). Sulfonamides & trimethoprim (ATC J01E) were the most frequently prescribed in Denmark (41.2%) and UK-Wales (33.3%) (Figure 22 and Table 15).

Beta-lactams, penicillins (ATC J01C)

Combinations of penicillins, including beta-lactamase inhibitors (J01CR; 51.7%) and penicillins with extended spectrum (J01CA; 31.2%) were the most frequently prescribed beta-lactams/penicillins (J01C). Beta-lactamase resistant penicillins (J01CF, 13.5%) and beta-lactamase sensitive penicillins (J01CE; 3.6%) were less frequently prescribed. Figure 23 shows the distribution of prescribed beta-lactams/penicillins (ATC J01C) by country.

Figure 23. Distribution of prescribed beta-lactams/penicillins (ATC J01C) by country, HALT, 2010



Overall, amoxicillin & enzyme inhibitor (J01CR02; 46.0%), amoxicillin (J01CA04; 26.2%), flucloxacillin (J01CF05; 12.7%), pivmecillinam (J01CA08; 4.0%) and piperacillin & enzyme inhibitor (J01CR05; 4.0%) were the most frequently prescribed beta-lactams/penicillins.

Beta-lactams/penicillins (J01C; n=741; 38 missing indications) were mainly prescribed therapeutically (90.3%), for the treatment of RTIs (51.3%), skin or wound infections (23.8%) and UTIs (16.9%). When beta-lactams/penicillins were prescribed prophylactically (9.7%), this was mainly for the prevention of UTIs (45.8%).

Other antibacterials (ATC J01X)

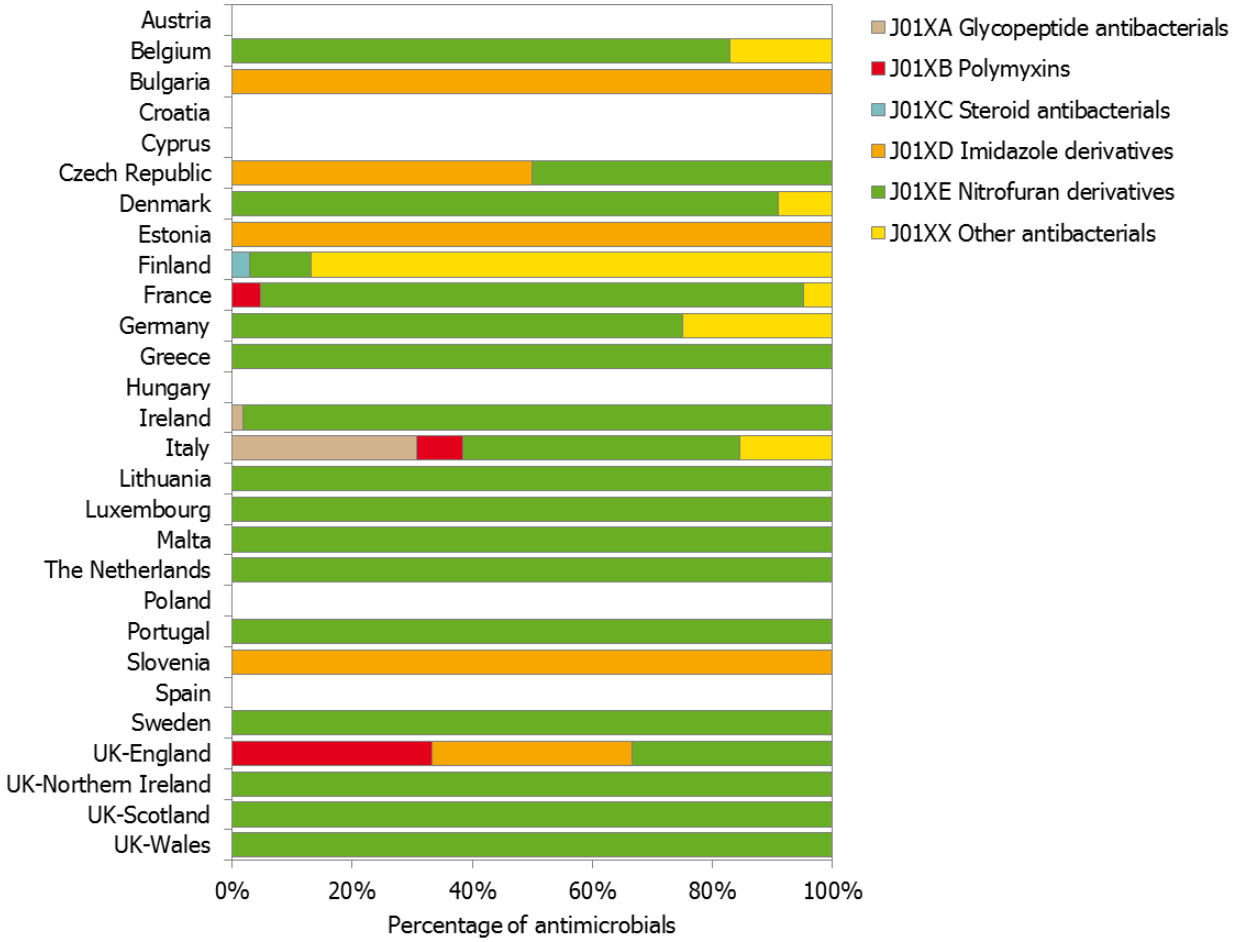
Within other antibacterials (ATC J01X), two sub-groups dominated: nitrofuran derivates (J01XE; 71.9%) and 'other antibacterials' (J01XX; 24.9%). Glycopeptide antibacterials (J01XA; 1.0%), polymyxins (J01XB; 0.6%), steroid antibacterials (J01XC; 0.6%) and imidazole derivatives (J01XD; 1.1%) were rarely prescribed. Figure 24 presents the distribution of prescribed 'other antibacterials' (J01X) by country.

The most frequently prescribed 'other antibacterials' were nitrofurantoin (J01XE01; 55.5%), methenamine (J01XX05; 17.7%), nifurtoinol (J01XE02; 16.4%) and fosfomycin (J01XX01; 7.0%).

Two thirds of 'other antibacterials' (ATC J01X) were used as prophylaxis (66.0%, of which 65.2% was uroprophylaxis). Treatment of UTIs accounted for 31.1% of all J01X prescriptions.

Nitrofurantoin (n=283) was mainly prescribed for UTIs (98.9%); 55.3% prophylactically and 44.6% therapeutically. Methenamine (n=93) was only used as uroprophylaxis. Nifurtoinol (n=84) and fosfomycin (n=37) were only used for UTIs, 72.6% and 73.0% as prophylaxis, respectively.

Figure 24. Distribution of prescribed other antibacterials (ATC J01X) by country, HALT, 2010



Quinolones (ATC J01M)

Almost all prescribed quinolones (ATC J01M) were fluoroquinolones (J01MA; n=416 of 420). Only four prescribed quinolones were 'other quinolones' (J01MB). These were pipemidic acid (J01MB04) prescribed in France and Italy.

The majority of the prescribed quinolones were ciprofloxacin (J01MA02, 46.4%). Twenty-three per cent of the prescribed fluoroquinolones were levofloxacin (J01MA12) and 13.6% were moxifloxacin (J01MA14). Norfloxacin (J01MA06), ofloxacin (J01MA01) and lomefloxacin (J01MA07) were 8.8%, 6.4% and 0.2% of all prescribed fluoroquinolones, respectively.

Quinolones were mainly prescribed for treatment of UTIs (45.6%), RTIs (27.4%), and skin or wound infections (11.5%), while prophylactic use was rare (7.7%, of which 58.0% prescribed for uroprophylaxis).

Other beta-lactams (ATC J01D)

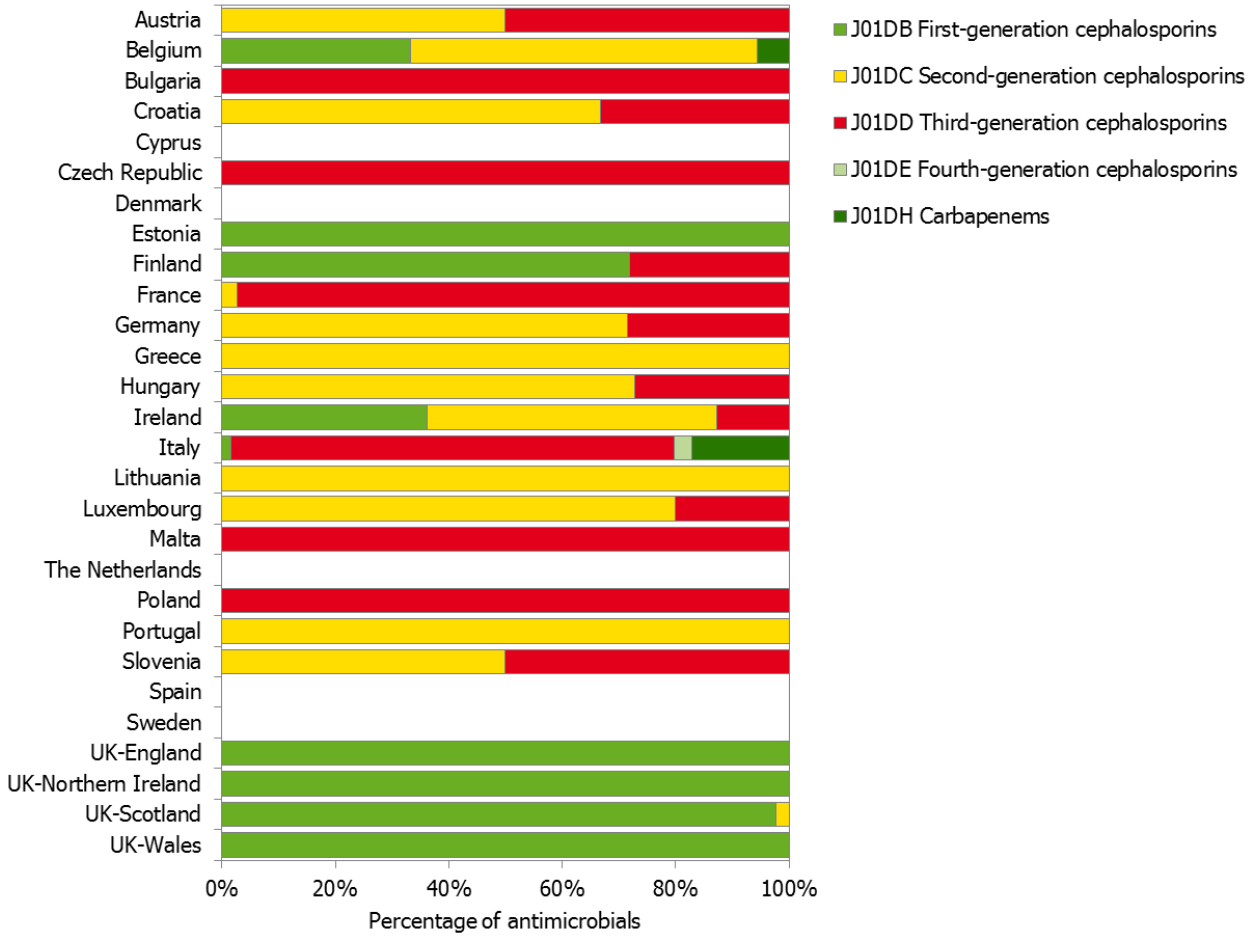
Within other beta-lactams (ATC J01D), third-generation cephalosporins (J01DD, 43.5%) were most commonly prescribed, followed by first-generation cephalosporins (J01DB, 26.4%) and second-generation cephalosporins (J01DC, 20.7%). Carbapenems (J01DH, 6.0%) and fourth-generation cephalosporins (J01DE, 1.0%) were less frequently prescribed (Figure 25).

The most frequently prescribed other beta-lactams (J01D) were: ceftriaxone (J01DD04, 29.8%), cefalexin (J01DB01, 22.8%) and cefuroxime (J01DC02, 14.9%). With the exception of one meropenem (J01DH02) prescription in Belgium, all carbapenems were prescribed in LTCFs in Italy and were meropenem (J01DH02, n=10) or imipenem & enzyme inhibitor (J01DH51, n=12).

Overall, other beta-lactams (ATC J01D) were mainly prescribed therapeutically (86.5%), of which 48.9% were for RTIs, 30.2% for UTIs and 12.7% for skin or wound infections. Prophylactic use of this group (13.5%) was predominantly for the prevention of UTIs (83.7%).

Carbapenems (J01DH) were prescribed for the therapeutic treatment of RTIs (n=7), UTIs (n=6), skin or wound infections (n=5), systemic infections (n=2), other infections (n=2) and unexplainable febrile episodes (n=1).

Figure 25. Distribution of prescribed other beta-lactams (ATC J01D) by country, HALT, 2010



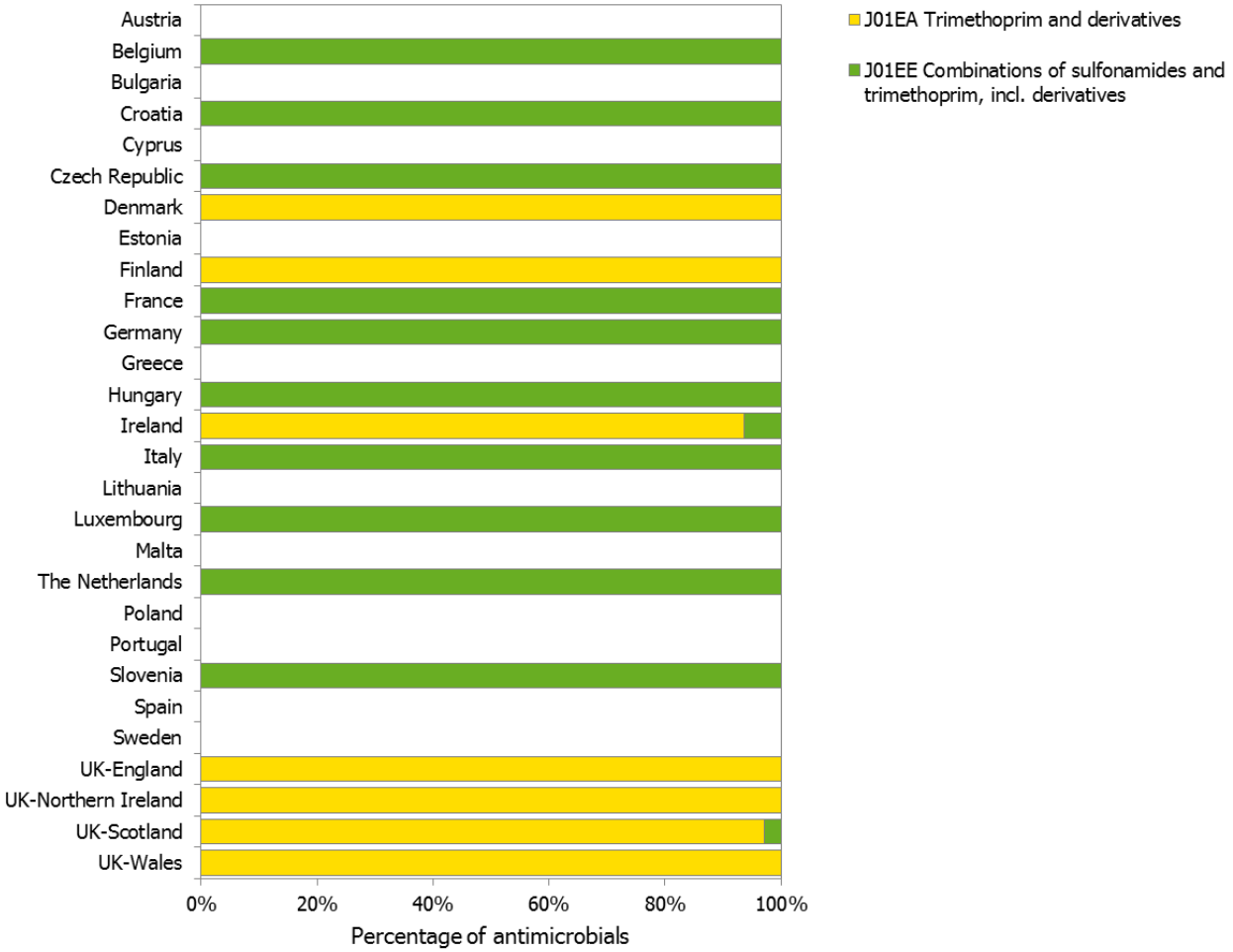
Sulfonamides & trimethoprim (ATC J01E)

Prescription of sulfonamides & trimethoprim (ATC J01E; n=362) varied greatly between countries. Eleven countries reported no use of this group.

Two subgroups were identified: trimethoprim & derivatives (J01EA, 78.5%) and combinations of sulfonamides and trimethoprim, including derivatives (J01EE, 21.6%). In ten countries, only combinations of sulfonamides and trimethoprim (J01EE) were prescribed, while five countries only reported prescriptions of trimethoprim & derivatives (J01EA; Figure 26).

Only two different sulfonamides & trimethoprims (J01E) were reported: trimethoprim (J01EA01), and 'sulfamethoxazole and trimethoprim' (J01EE01). Trimethoprim (J01EA01; n=266; 18 missing indications) was mainly prescribed as prophylaxis (66.2%); all were for uroprophylaxis). When prescribed therapeutically (33.8%), trimethoprim was almost all for UTIs (92.2%). 'Sulfamethoxazole and trimethoprim' (J01EE01; n=75; 3 missing indications) was prescribed therapeutically for UTIs (66.2%), skin or wound infections (15.4%) and RTIs (13.8%). Prophylactic use accounted for 13.3% prescriptions (n=10). In these cases, 'sulfamethoxazole and trimethoprim' (J01EE01) was prescribed for the prevention of UTIs (40%), of RTIs (40%) and of 'other infections' (20%).

Figure 26. Distribution of prescribed sulphonamides and trimethoprim (ATC J01E) by country, HALT, 2010



Isolated microorganisms and antimicrobial resistance

In 31.0% of antimicrobial prescriptions there was reporting of a sample being taken for microbiological culture (n=771 of 2 489). However microbiological results were only reported for 49.7% of these samples (n=383 of 771). Explanations for this low percentage included the unavailability of these results to the data collector, including unavailability of the results at the time of the PPS. Table 16 indicates the number of antimicrobial treatments with a culture sample taken and the number of culture samples for which results were reported by country.

Table 16. Number of antimicrobial prescriptions with a culture sample taken, number of culture sample for which results were reported and number of microorganisms reported by country, HALT, 2010

Country	Number of antimicrobial agents	Number of answers missing to the question on culture sample taken		Number culture sample taken		Culture sample taken but microorganisms reported		Culture sample taken and micro-organisms reported		Number of microorganisms
		n	%	n	%	n	%	n	%	n
Austria	7	0	0.0	5	71.4	1	14.3	1	14.3	1
Belgium	540	80	14.8	339	62.8	48	8.9	73	13.5	83
Bulgaria	6	1	16.7	2	33.3	0	0.0	3	50.0	2
Croatia	10	0	0.0	5	50.0	5	50.0	0	0.0	0
Cyprus	1	0	0.0	0	0.0	0	0.0	1	100.0	1
Czech Republic	18	0	0.0	7	38.9	0	0.0	11	61.1	11
Denmark	34	2	5.9	7	20.6	22	64.7	3	8.8	3
Estonia	6	0	0.0	6	100.0	0	0.0	0	0.0	0
Finland	241	79	32.8	108	44.8	22	9.1	32	13.3	33
France	204	8	3.9	124	60.8	14	6.9	58	28.4	60
Germany	79	7	8.9	52	65.8	6	7.6	14	17.7	17
Greece	19	0	0.0	12	63.2	0	0.0	7	36.8	8
Hungary	75	0	0.0	70	93.3	3	4.0	2	2.7	2
Ireland	391	39	10.0	222	56.8	81	20.7	49	12.5	51
Italy	464	17	3.7	342	73.7	13	2.8	92	19.8	109
Lithuania	25	0	0.0	25	100.0	0	0.0	0	0.0	0
Luxembourg	24	8	33.3	7	29.2	3	12.5	6	25.0	6
Malta	15	0	0.0	12	80.0	0	0.0	3	20.0	4
The Netherlands	53	10	18.9	30	56.6	9	17.0	4	7.5	3
Poland	4	0	0.0	4	100.0	0	0.0	0	0.0	0
Portugal	15	0	0.0	13	86.7	0	0.0	2	13.3	2
Slovenia	33	0	0.0	30	90.9	0	0.0	3	9.1	4
Spain	1	0	0.0	1	100.0	0	0.0	0	0.0	0
Sweden	10	1	10.0	5	50.0	1	10.0	3	30.0	6
UK - England	61	8	13.1	44	72.1	5	8.2	4	6.6	4
UK – N. Ireland	58	8	13.8	40	69.0	10	17.2	0	0.0	0
UK - Scotland	371	51	13.7	172	46.4	136	36.7	12	3.2	13
UK - Wales	54	11	20.4	34	63.0	9	16.7	0	0.0	0
Total	**2 819**	**330**	**11.7**	**1 718**	**60.9**	**388**	**13.8**	**383**	**13.6**	**423**

When a culture sample was taken, the antimicrobial was most frequently prescribed therapeutically (72.0%). Prophylactic prescription following a positive microbiological result appears to be contradictory. These accounted for 28.0%, of which 94.4% were uroprophylaxis. An explanation for this may include the reporting of microorganisms identified in previous cultures (not related to the reported prophylactic antimicrobial prescription), recorded in this PPS as an explanation of the current prescription, e.g. prophylaxes for recurrent urinary tract infections.

Culture samples (n=768) were primarily taken when antimicrobial agents were prescribed for an indication related to the urinary tract (72.3%), followed by skin or wounds (12.9%), respiratory tract (5.9%), gastrointestinal tract (3.0%) and other (2.9%) indications.

In total, 423 microorganisms were reported. The ten most frequently isolated bacteria were:

- *Escherichia coli* (n=162, 38.3%), of which 16 were resistant to third-generation cephalosporins;
- *Staphylococcus aureus* (n=57, 13.5%), of which 23 were meticillin-resistant (MRSA);
- *Proteus mirabilis* (n=42, 9.9%), of which eight were resistant to third-generation cephalosporins;
- *Pseudomonas aeruginosa* (n=24, 5.7%), of which one was resistant to carbapenems;
- *Klebsiella pneumoniae* (n=23, 5.4%), of which one was resistant to third-generation cephalosporins;
- *Clostridium difficile* (n=17, 4.0%);
- *Providencia* species (n=12, 2.8%);
- *Enterococcus faecalis* (n=7, 1.7%);
- *Enterococcus* not specified (n=6, 1.4%);
- *Morganella* species (n=6, 1.4%);
- *Acinetobacter baumannii* (n=5, 1.2%), of which two were resistant to third-generation cephalosporins.

One *Enterococcus* spp. resistant to glycopeptides was reported, whereas no *Enterobacter* spp. resistant to third-generation cephalosporins was reported.

In total, 52 antimicrobial-resistant microorganisms were isolated, i.e. 12.3% of all microorganisms reported. These resistant microorganisms were identified in twelve countries: Italy (n=21), France (n=7), Belgium (n=5), Germany (n=5), Ireland (n=3), UK-Scotland (n=3), Finland (n=2), UK-England (n=2), Bulgaria (n=1), Luxembourg (n=1), Portugal (n=1) and the Netherlands (n=1).

Discussion and conclusions

The number of LTCFs throughout Europe is increasing as a result of an aging population. More NHs and RHs are needed to take care of an increasing number of vulnerable older adults with increasingly complex conditions, including residents of palliative care and rehabilitation centres.

This PPS helps to improve our knowledge of the status of HAIs, antimicrobial use and AMR in LTCFs in a European context. This improved understanding is needed as the care load is increasing, with frequent patient transfer between acute and chronic care facilities, increasing use of invasive devices and immunosenescence as some of the factors that could increase the risk to LTCF residents.

In 2009, the HALT project was initiated to develop, implement and promote a sustainable methodology to study the prevalence of HAIs and antimicrobial use in European LTCFs, and related IPC structure and process indicators in the same group of LTCFs. After a successful pilot survey, a first EU-wide PPS was conducted.

In total, 722 LTCFs across 28 countries (UK administrations counted separately) were enrolled. The majority of the participating facilities were general NHs (75.1%), mixed LTCF (14.8%) and RHs (6.5%). To increase the homogeneity, and therefore also the comparability of the data, responses from these three types of LTCFs were pooled at country level for analyses (n=694, 96.1%; two Portuguese LTCFs excluded due to late data delivery).

Healthcare-associated infections

The crude prevalence of residents with at least one HAI on the day of the PPS was 2.4%. Respiratory tract infections were reported most frequently (33.6%), followed by UTIs; (22.3%) and skin infections (21.4%).

Data on HAIs were collected through a checklist of signs and symptoms per infection site. Modified McGeer criteria were applied during analysis to identify the infections [10]. Sufficient s/s were present to confirm the HAI in only 56.8% of the cases. The largest reduction in case numbers due to non-confirmation was for influenza-like illness (-90.7%), UTIs (-60.2%) and fungal skin infections (-53.0%). These could have been the result of underreporting of s/s by local staff members. The criterion 'diagnosed by the attending physician' had been added to the original McGeer criteria in order to reduce underestimation of the infection rate due to the lack of on-site diagnostic testing in European LTCFs. This criterion was not only sufficient to confirm an HAI, but had to be accompanied by other relevant s/s.

Several other surveys carried out in individual European countries also explored HAIs in LTCFs, but differences in applied methodologies make comparison difficult. One Italian PPS, conducted in 15 NHs and 34 RHs, reported a crude prevalence of residents with an HAI of 9.4 per 100 eligible residents, which is higher than the crude prevalence of 3.3% identified in this European PPS for Italy. The most common infections (according to the unmodified McGeer criteria) in the Italian survey were lower RTIs (26.8%), cellulitis (26.8%), conjunctivitis (15.8%) and UTIs (12.1%). These HAI types were also most frequently reported in the Italian LTCFs in this European PPS, but the percentages differed somewhat (cellulitis and conjunctivitis less and UTIs more common) [5].

Norway (not participating in this PPS) also performed a study, based on two PPSs in LTCFs (n=203 and n=323), finding an HAI prevalence of between 6.6% and 7.6%, but only four infection types were included. The most frequent infections in their sample were UTIs (49–53%), followed by skin (23–27%), lower RTIs (17–21%) and surgical site infections (5–7%) [6].

Finally, a Swedish three-month incidence survey conducted in 58 NHs identified UTIs (54.6%), skin/soft tissue infections (16.6%) and RTIs (14.8%) as the most frequently reported infections (according to a physician's opinion) [7].

Antimicrobial use

In our sample of selected NHs, RHs and mixed LTCFs, the crude prevalence of residents receiving at least one antimicrobial agent was 4.3%, and 4.4% in NHs alone. The majority of the prescribed antimicrobial agents were administered orally (89.3%) and mainly prescribed for the treatment of an infection (72.3%). However, a considerable proportion of antimicrobial agents were given as prophylaxis (27.7%).

Antibacterials for systemic use (ATC J01) represented 96.2% of all antimicrobial agents prescribed on the day of the PPS. Beta-lactams, penicillins (ATC J01; 28.7%), 'other antibacterials' (ATC J01X; 19.4%), quinolones (ATC J01M; 15.5%) and other beta-lactams (ATC J01D; 14.1%) were the most frequently prescribed antibacterials.

In 2009, the ESAC nursing home subproject carried out two PPSs in LTCFs that showed similar results. The first PPS (April 2009) conducted in 304 NHs across 19 European countries and including 31 691 eligible residents reported a prevalence of antimicrobial use of 5.9%. The oral administration route was chosen for 89.7% of all

prescribed antimicrobial agents. Prophylaxis accounted for 29% of the prescriptions. Antibacterials for systemic use (ATC J01) represented 95% of all prescriptions and beta-lactams/penicillins (J01C, 28.5%), other antibacterials (J01X, 26.8%) and quinolones (J01M, 14.5%) were the most commonly prescribed groups [8].

The second PPS (November 2009) was organised in 22 European countries and included 266 NHs and 28 569 eligible residents. The crude prevalence of residents who received at least one antimicrobial agent was 5.0%, and 90.3% of these antimicrobial agents were administered orally. Therapeutic and prophylactic prescriptions accounted for 72.7% and 27.3%, respectively. Again, beta-lactams/penicillins (J01C, 28.8%), other antibacterials (J01X, 26.9%) and quinolones (J01M, 16.0%) were the most commonly prescribed groups [9].

Isolated microorganisms

The results on isolated microorganisms and antimicrobial resistance should be interpreted with caution. Culture samples were not taken frequently in LTCFs, and this practice also differs between countries. Moreover, the accessibility of the microbiological results also depends on the country and its LTCFs. Overall, it was reported that a sample had been taken for microbiological culture for 31.0% of the antimicrobial treatments, and data on the detected microorganisms were only reported for 49.7% of these.

The most frequently reported microorganisms were *Escherichia coli* (38.3%), *Staphylococcus aureus* (13.5%), *Proteus mirabilis* (9.9%), *Pseudomonas aeruginosa* (5.7%) and *Klebsiella pneumoniae* (5.4%) of which one was resistant to third-generation cephalosporins. In total, 52 antimicrobial-resistant microorganisms were isolated, i.e. 12.3% of all microorganisms reported.

Structure and process indicators

Infection prevention and control remains a challenge within LTCFs. Antimicrobial resistance is increasingly being encountered in both acute and chronic care settings, but the infection control resources available to LTCFs are more limited in comparison with acute care hospitals.

During this PPS, the presence of an IPC practitioner, an IPC committee and/or IPC advice in the LTCFs was explored. The majority of the LTCFs could only count on IPC advice (30.0%). The combination of an IPC practitioner and IPC advice was present in 27.0% of the LTCFs, while 21.1% of the LTCFs had all three IPC structures (21.1%). However, 9.0% of the LTCFs had none of the explored IPC structures in place.

With regard to antimicrobial stewardship in LTCFs, there is still room for improvement. The most frequently reported antimicrobial stewardship elements were 'taking microbiological samples for the guidance of the antibiotic choice' (n=347), 'the availability of a therapeutic formulary comprising a list of antibiotics' (n=230) and 'the availability of a pharmacist providing advice on antibiotics which were not included in the formulary' (n=154). Less available elements included 'regular training on appropriate antibiotic prescribing' (n=70), 'permission of a designated person(s) for prescribing restricted antibiotics not included in the local formulary' (n=70) and 'an antibiotic committee' (n=54).

Future steps and recommendations

For the first time a Europe-wide PPS was organised to explore HAIs, antimicrobial use and AMR in LTCFs using a standardised methodology. This methodology proved to be feasible for use in chronic care facilities where workload is often high and the level of expertise in IPC and available resources for IPC are limited.

However, the results of this PPS are subject to some limitations of the PPS methodology itself. Firstly, because in most countries the PPS would be conducted by local data collectors with limited knowledge of HAI definitions, it was decided beforehand to collect sign/symptoms of an infection and apply definitions for HAI only during analysis. Exhaustive reporting of signs/symptoms was therefore a prerequisite, but we are unsure that they were always reported exhaustively. Addition of the criterion 'diagnosed by the attending physician' was insufficient to confirm an HAI using the modified McGeer criteria as other relevant signs/symptoms were necessary to confirm an HAI. Incomplete reporting of signs/symptoms could have led to the under-reporting of HAIs.

In addition, the group of LTCFs was very heterogeneous. In the absence of a good definition of LTCF groups, applicable for all types of LTCFs in all European countries, several steps were undertaken to minimise differences between the LTCFs. National representatives were asked to include only high-skilled LTCFs (analogous with the definition of high-skilled NHs used in the pilot survey) and to classify the participating LTCFs according to the type of LTCF, length of stay, and type of residents. To further increase homogeneity of data in this report, we decided to pool data from NHs, RHs and mixed LTCFs at country level for the analyses.

Despite all these efforts, the case-mix of the residents living in the selected LTCFs still differed tremendously. The differences were not only seen between countries, but also within countries.

Finally, the representativeness of the data can be questioned. The number of participating LTCFs varied greatly between countries, from two to 111 LTCFs. As the aim of the PPS was to describe HAI and antimicrobial use, only a minimal participation of two LTCFs was required. However, national representatives were encouraged to achieve a higher enrolment of their country's LTCFs. Representative data were not required and LTCFs were therefore often selected based on convenience (e.g. large LTCFs, LTCFs in close proximity, public centres). General NHs, RHs and mixed LTCFs were highly represented, but the participation rate in the other categories was too low to draw valid conclusions.

Based on the results of HALT and taking into account the above-mentioned limitations, the following recommendations can be made for future PPSs in LTCFs:

- continue the monitoring of HAI and antimicrobial use using a standardised methodology based on repeated PPSs in LTCFs across EU Member States
- improve data quality by increasing the level of controlled data entry in the software tool for repeated PPS in LTCFs, by developing standardised training material and by providing a train-the-trainers course
- propose and validate case definitions of HAI in LTCFs and develop a protocol for field validation of data collected during the repeated PPSs in LTCFs
- explore the different types of LTCFs in EU Member States and collect information on the number of LTCFs and LTCF beds by category
- encourage EU Member States to participate in the PPS and recommend that they draw a representative sample of each country's LTCFs.

References

1 European Centre for Disease Prevention and Control (ECDC). Healthcare-associated Infections Surveillance Network (HAI-net). Stockholm: ECDC; 2013. Available from: http://www.ecdc.europa.eu/en/activities/surveillance/HAI/Pages/default.aspx

2 European Surveillance of Antimicrobial Consumption (ESAC). European Surveillance of Antimicrobial Consumption Nursing Home Subproject (ESAC-NH). Antwerp: University of Antwerp; 2011. Available from: http://www.esac.ua.ac.be/main.aspx?c=*ESAC2&n=50204

3 World Health Organization (WHO) Collaborating Centre for Drug Statistics Methodology. The ATC/DDD system: International language for drug utilization research. Oslo: WHO Collaborating Centre for Drug Statistics Methodology Norwegian Institute of Public Health; 2012. Available from: http://www.whocc.no/atc_ddd_index/

4 McGeer A, Campbell B, Emori TG, Hierholtzer W, Jackson M, Nicolle L et al. Definitions of infection for surveillance in long-term care facilities. Am J Infect Control 1991;19:1–7.

5 Moro ML, Mongardi M, Marchi M, Taroni F. Prevalence of long-term care acquired infections in nursing and residential homes in the Emilia-Romagna Region. Infection 2007;35:250–5.

6 Eriksen HM, Iversen BG, Aavitsland P. (Prevalence of nosocomial infections and use of antibiotics in long-term care facilities in Norway, 2002 and 2003. J Hosp Infect 2004;57:316–20.

7 Pettersson E, Vernby A, Mölstad S, Lundborg CS. Infections and antibiotic prescribing in Swedish nursing homes: a cross-sectional study. Scand J Infect Dis 2008;40:393–8.

8 Jans B, Latour K, Broex E, Goossens H, and the ESAC management team. Report on point prevalence survey of antimicrobial prescription in European nursing homes, 2009. Brussels: WIV-ISP; 2010. Available from: http://www.nsih.be/nursing_homes/download_nl.asp

9 Broex E, Jans B, Latour K, Goossens H, and the ESAC management team. Report on point prevalence survey of antimicrobial prescription in European nursing homes, November 2009. Brussels: WIV-ISP; 2011. Available from: http://www.nsih.be/nursing_homes/download_nl.asp

10 European Centre for Disease Prevention and Control (ECDC). Point prevalence survey of healthcare-associated infections and antimicrobial use in European long-term care facilities (HALT), May – September 2010. Protocol. Stockholm: ECDC: 2010. Available upon request from: arhai@ecdc.europa.eu.