

AUSTRIA

Participating institutions:

Federal Ministry of Health and Women's Affairs www.bmgf.gv.at

Medical University Vienna, www.meduniwien.ac.at

Ordensklinikum Linz, Elisabethinen, www.ordensklinikum.at

Population and hospitals contributing data: coverage, representativeness and blood-culture rate, Austria, 2016–2020

Parameter	2016	2017	2018	2019	2020
Estimated national population coverage (%)	90	Unknown	Unknown	Unknown	Unknown
Geographical representativeness	High	Unknown	High	High	High
Hospital representativeness	Unknown	Unknown	High	High	High
Patient and isolate representativeness	Unknown	Unknown	High	High	High
Blood culture sets/1 000 patient-days	16.2	Unknown	24.2	Unknown	Unknown

Laboratories contributing data: use of clinical breakpoint guidelines and participation in EARS-Net EQA, Austria, 2016–2020

Parameter	2016	2017	2018	2019	2020
Percentage of laboratories using EUCAST or EUCAST-harmonised guidelines	100	100	100	100 ^a	100 ^a
Percentage of laboratories participating in EARS-Net EQA	100	100	97	95	NA

EQA: external quality assessment.

NA: not applicable.

^a Starting with 2019 data, EARS-Net was restricted to laboratories using EUCAST or EUCAST-harmonised methodology and breakpoints.

Annual number of reporting laboratories,^a number of reported isolates and percentage of isolates reported from patients in ICUs,^b Austria, 2016–2020

Bacterial species	2016			2017			2018			2019			2020		
	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)
<i>E. coli</i>	39	5 285	9	39	5 381	9	38	5 686	9	38	6 305	8	37	5 394	8
<i>K. pneumoniae</i>	38	1 247	14	39	1 152	14	38	1 228	14	38	1 333	14	36	1 133	17
<i>P. aeruginosa</i>	39	697	17	39	725	16	38	737	16	38	808	13	36	727	18
<i>Acinetobacter</i> spp.	24	81	17	25	75	11	28	95	12	23	82	13	22	69	12
<i>S. aureus</i>	39	3 057	14	39	3 162	14	38	3 310	13	38	3 419	12	36	2 934	14
<i>S. pneumoniae</i>	39	457	24	39	513	19	38	567	18	37	550	18	34	301	10
<i>E. faecalis</i>	38	677	17	38	769	19	38	837	17	37	792	16	35	840	21
<i>E. faecium</i>	38	535	28	38	573	31	35	524	28	34	537	33	32	509	30

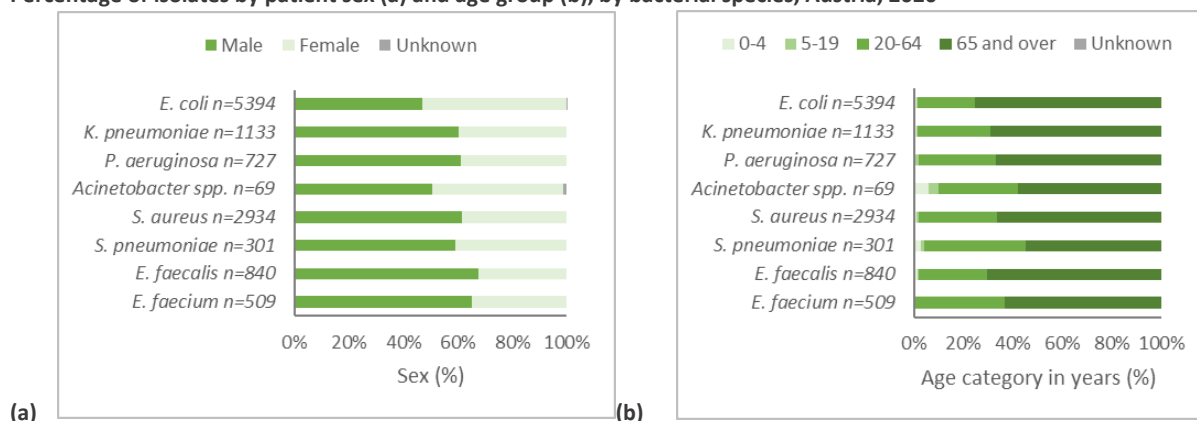
ICU: intensive care unit.

Lab: laboratories.

^a Number of laboratories reporting at least one isolate during the specific year. The total number of participating laboratories might be higher.

^b Isolates with missing information on hospital department are excluded, and results are presented only if data on hospital department are available for ≥70% of isolates.

Percentage of isolates by patient sex (a) and age group (b), by bacterial species, Austria, 2020



Total number of invasive isolates tested (n) and percentages of isolates with resistance phenotype (%), by bacterial species and antimicrobial group/agent, 2020 EU/EEA range, population-weighted mean and trend, Austria, 2016–2020

Bacterial species	Antimicrobial group/agent	2016		2017		2018		2019		2020		Trend 2016-2020 ^a
		n	%	n	%	n	%	n	%	n	%	
<i>E. coli</i>	Aminopenicillin (amoxicillin/ampicillin) resistance	5 094	50.5	5 188	49.5	5 456	50.7	6 042	46.3	4 798	46.0	↓
	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	5 267	10.0	5 129	9.6	5 672	10.2	6 106	9.3	5 376	9.5	-
	Carbapenem (imipenem/meropenem) resistance	5 134	0.0	5 227	0.0	5 564	0.1	5 935	0.0	5 141	0.1	-
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	5 278	19.8	5 367	20.5	5 679	21.9	6 111	18.2	5 373	17.3	↓
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	5 248	7.8	5 318	7.7	5 616	8.2	6 102	6.9	5 219	6.2	↓
	Combined resistance to third-generation cephalosporins, fluoroquinolones, and aminoglycosides ^b	5 235	3.5	5 071	3.3	5 598	3.6	6 072	2.7	5 192	2.8	↓
<i>K. pneumoniae</i>	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	1 245	9.6	1 072	8.6	1 221	8.4	1 326	10.3	1 124	7.8	-
	Carbapenem (imipenem/meropenem) resistance	1 198	0.7	1 109	1.0	1 184	1.0	1 296	1.2	1 055	0.9	-
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	1 246	9.8	1 147	14.2	1 221	13.2	1 327	15.7	1 129	12.0	↑
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	1 157	4.8	1 141	4.8	1 214	4.8	1 319	5.5	1 085	3.7	-
	Combined resistance to fluoroquinolones, third-generation cephalosporins and aminoglycosides ^b	1 156	3.5	1 062	3.0	1 203	3.1	1 312	3.0	1 076	2.8	-
<i>P. aeruginosa</i>	Piperacillin-tazobactam resistance	674	11.4	628	10.4	650	10.6	665	9.5	624	9.0	-
	Ceftazidime resistance	628	11.3	620	8.7	729	10.3	781	8.5	688	9.4	-
	Carbapenem (imipenem/meropenem) resistance	696	12.9	725	13.9	736	12.8	786	13.4	683	15.1	-
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	694	7.2	721	12.3	736	14.0	805	10.7	676	14.3	↑
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^c	692	6.1	717	5.0	729	6.3	784	3.8	426	2.6	↓
	Combined resistance to ≥3 antimicrobial groups (among piperacillin-tazobactam, ceftazidime, carbapenems, fluoroquinolones and aminoglycosides) ^c	697	6.5	724	6.1	736	6.7	787	5.5	709	4.9	-
<i>Acinetobacter</i> species	Carbapenem (imipenem/meropenem) resistance	81	12.3	75	6.7	91	4.4	81	7.4	69	7.2	-
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	81	16.0	74	9.5	91	7.7	82	9.8	69	10.1	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	81	16.0	75	9.3	92	8.7	82	7.3	66	7.6	-
	Combined resistance to carbapenems, fluoroquinolones and aminoglycosides ^b	81	8.6	74	6.8	88	4.5	81	6.2	66	6.1	-
<i>S. aureus</i>	MRSA ^d	3 053	7.2	3 158	6.0	3 307	6.4	3 323	5.2	2 843	4.4	↓
	Penicillin non-wild-type ^e	440	3.4	463	6.0	523	6.3	458	6.8	258	3.9	-
<i>S. pneumoniae</i>	Macrolide (azithromycin/clarithromycin/erythromycin) resistance	455	8.6	507	10.8	562	11.6	547	12.4	295	11.5	-
	Combined penicillin non-wild-type and resistance to macrolides ^e	438	1.4	457	3.3	519	3.3	455	3.5	252	2.4	-
<i>E. faecalis</i>	High-level gentamicin resistance	447	33.3	474	33.1	417	28.3	285	22.8	258	14.3	↓
<i>E. faecium</i>	Vancomycin resistance	533	4.3	570	3.2	524	2.1	537	3.2	507	3.6	-

^a ↑ and ↓ indicate statistically significantly increasing and decreasing trends, respectively; – indicates no statistically significant trend.

^b The aminoglycoside group includes only gentamicin and tobramycin from 2020 onwards.

^c The aminoglycoside group includes only tobramycin from 2020 onwards.

^d MRSA is based on AST results for oxacillin or cefoxitin, but AST results reported as cloxacillin, dicloxacillin, flucloxacillin or meticillin are accepted as a marker for oxacillin resistance if AST results for oxacillin are not reported. Data from molecular confirmation tests (detection of *mecA* gene by PCR or a positive PBP2A-agglutination test) are given priority over phenotypic AST results.

^e Penicillin results are based on penicillin or, if not available, oxacillin. For *S. pneumoniae*, the term penicillin non-wild-type is used in this report, referring to *S. pneumoniae* isolates reported by the local laboratories as susceptible increased exposure (I) or resistant (R) to penicillin, assuming MIC to benzylpenicillin above those of wild-type isolates (>0.06 mg/L). The qualitative susceptibility categories (S/I/R) as reported by the laboratory are used, since quantitative susceptibility information is missing for a large part of the data. Laboratories not using EUCAST clinical breakpoints in the period 2016–2018 might define the cut-off values for the susceptibility categories differently.

BELGIUM

Participating institutions:

Sciensano www.sciensano.be

Population and hospitals contributing data: coverage, representativeness and blood-culture rate, Belgium, 2016–2020

Parameter	2016	2017	2018	2019	2020
Estimated national population coverage (%)	29	30			
Laboratories collecting <i>S. pneumoniae</i>			86	87	91
Laboratories collecting others species			30	26	36
Geographical representativeness	High	High			
Laboratories collecting <i>S. pneumoniae</i>			High	High	High
Laboratories collecting others species			Medium	Medium	High
Hospital representativeness	High	High	High	High	High
Patient and isolate representativeness	High	High	High	High	High
Blood culture sets/1 000 patient-days	Unknown	Unknown	99.1 ^a	87.5 ^a	129.6 ^a

^a Not including *S. pneumoniae* network.

Laboratories contributing data: use of clinical breakpoint guidelines and participation in EARS-Net EQA, Belgium, 2016–2020

Parameter	2016	2017	2018	2019	2020
Percentage of laboratories using EUCAST or EUCAST-harmonised guidelines	65	68	91	100 ^a	100 ^a
Percentage of laboratories participating in EARS-Net EQA	100	90	82	91	NA

EQA: external quality assessment. NA: not applicable.

^a Starting with 2019 data, EARS-Net was restricted to laboratories using EUCAST or EUCAST-harmonised methodology and breakpoints.

Annual number of reporting laboratories,^a number of reported isolates and percentage of isolates reported from patients in ICUs,^b Belgium, 2016–2020

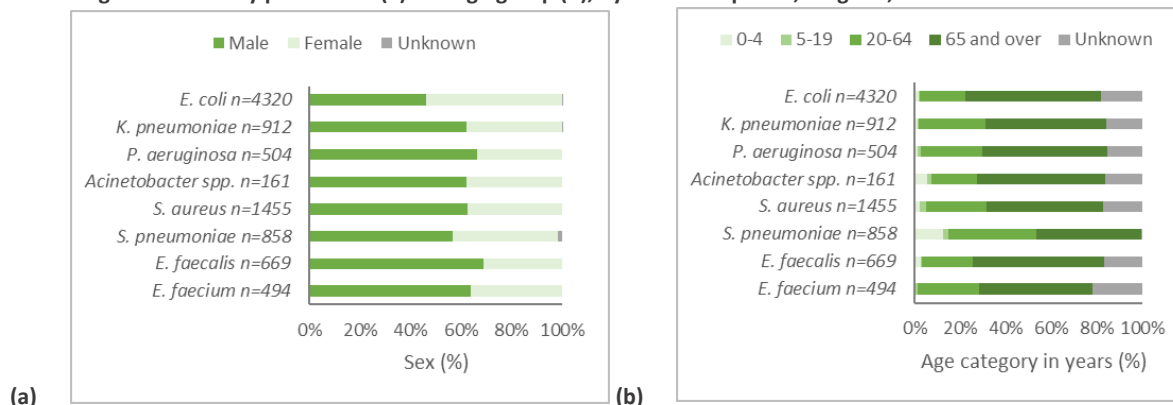
Bacterial species	2016			2017			2018			2019			2020		
	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)
<i>E. coli</i>	31	3 856	Unknown	32	4 676	Unknown	32	4 675	Unknown	27	3 940	Unknown	28	4 320	Unknown
<i>K. pneumoniae</i>	28	669	Unknown	31	803	Unknown	31	956	Unknown	26	759	Unknown	27	912	Unknown
<i>P. aeruginosa</i>	31	366	Unknown	31	474	Unknown	30	490	Unknown	27	441	Unknown	28	504	Unknown
<i>Acinetobacter</i> spp.	18	79	Unknown	21	131	Unknown	26	134	Unknown	23	94	Unknown	23	161	Unknown
<i>S. aureus</i>	31	1 368	Unknown	31	1 531	Unknown	31	1 750	Unknown	27	1 169	Unknown	28	1 455	Unknown
<i>S. pneumoniae</i>	97	1 327	Unknown	91	1 472	23	88	1 526	Unknown	89	1 548	Unknown	89	858	27
<i>E. faecalis</i>	30	465	Unknown	31	551	Unknown	31	615	Unknown	26	496	Unknown	29	669	Unknown
<i>E. faecium</i>	27	289	Unknown	30	418	Unknown	30	441	Unknown	25	343	Unknown	26	494	Unknown

ICU: intensive care unit. Lab: laboratories.

^a Number of laboratories reporting at least one isolate during the specific year. The total number of participating laboratories might be higher.

^b Isolates with missing information on hospital department are excluded, and results are presented only if data on hospital department are available for ≥70% of isolates.

Percentage of isolates by patient sex (a) and age group (b), by bacterial species, Belgium, 2020



Total number of invasive isolates tested (n) and percentages of isolates with resistance phenotype (%), by bacterial species and antimicrobial group/agent, 2020 EU/EEA range, population-weighted mean and trend, Belgium, 2016–2020

Bacterial species	Antimicrobial group/agent	2016		2017		2018		2019		2020		Trend 2016-2020 ^a
		n	%	n	%	n	%	n	%	n	%	
<i>E. coli</i>	Aminopenicillin (amoxicillin/ampicillin) resistance	3 736	58.0	4 669	57.5	4 445	55.8	3 601	56.5	4 009	56.5	-
	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	3 737	10.5	4 672	9.7	4 644	9.0	3 937	10.0	4 320	9.9	-
	Carbapenem (imipenem/meropenem) resistance	3 845	0.1	4 672	0.0	4 641	0.1	3 926	0.1	4 126	0.0	-
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	3 854	24.5	4 382	23.8	4 211	21.8	3 925	19.1	4 320	18.1	↓
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	3 499	8.4	3 769	8.1	3 822	7.4	3 922	6.9	4 312	7.5	↓
	Combined resistance to third-generation cephalosporins, fluoroquinolones, and aminoglycosides ^b	3 496	3.8	3 765	3.5	3 809	3.1	3 920	3.0	4 312	2.9	↓
<i>K. pneumoniae</i>	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	669	22.9	803	19.3	935	21.4	759	19.5	912	19.7	-
	Carbapenem (imipenem/meropenem) resistance	669	2.4	791	1.1	935	1.4	757	1.1	881	1.1	-
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	669	23.6	803	23.7	932	22.6	757	19.8	911	22.8	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	637	13.8	633	12.5	747	12.4	755	11.4	910	13.1	-
	Combined resistance to fluoroquinolones, third-generation cephalosporins and aminoglycosides ^b	637	9.3	633	8.5	742	9.8	755	8.7	909	10.3	-
<i>P. aeruginosa</i>	Piperacillin-tazobactam resistance	318	9.7	438	10.5	430	10.0	439	12.1	503	11.1	-
	Ceftazidime resistance	320	7.8	431	7.2	441	7.5	427	8.2	489	9.0	-
	Carbapenem (imipenem/meropenem) resistance	365	9.6	474	8.2	487	7.4	440	10.7	474	12.4	↑#
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	366	14.5	430	10.5	451	14.0	440	14.3	503	14.7	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^c	327	11.0	377	7.7	406	8.4	438	7.1	304	6.3	↓
	Combined resistance to ≥3 antimicrobial groups (among piperacillin-tazobactam, ceftazidime, carbapenems, fluoroquinolones and aminoglycosides) ^c	366	6.3	439	6.6	454	5.3	440	5.9	503	6.6	-
<i>Acinetobacter</i> species	Carbapenem (imipenem/meropenem) resistance	78	2.6	131	6.9	132	3.8	94	0.0	160	1.3	↓
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	78	7.7	130	10.8	134	12.7	93	8.6	141	15.6	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	66	1.5	99	13.1	122	7.4	85	3.5	148	2.7	-
	Combined resistance to carbapenems, fluoroquinolones and aminoglycosides ^b	64	0.0	98	7.1	120	3.3	84	0.0	127	0.8	-
<i>S. aureus</i>	MRSA ^d	1 364	12.2	1 511	8.5	1 735	9.1	1 168	6.7	1 455	6.9	↓
	Penicillin non-wild-type ^e	1 327	0.4	1 472	0.2	1 526	0.1	1 548	9.7	858	14.5	↑
<i>S. pneumoniae</i>	Macrolide (azithromycin/clarithromycin/erythromycin) resistance	1 327	15.7	1 472	15.1	1 526	15.2	1 548	15.7	858	19.1	-
	Combined penicillin non-wild-type and resistance to macrolides ^e	1 327	0.3	1 472	0.1	1 526	0.1	1 548	5.7	858	8.7	↑
<i>E. faecalis</i>	High-level gentamicin resistance	328	19.8	304	16.4	390	12.3	363	16.8	296	13.2	↓#
<i>E. faecium</i>	Vancomycin resistance	289	1.7	417	5.5	436	1.8	343	0.6	491	2.9	-

^a ↑ and ↓ indicate statistically significantly increasing and decreasing trends, respectively; # indicates a significant trend in the overall data, but not in data that only included laboratories reporting continuously for all five years; – indicates no statistically significant trend.

^b The aminoglycoside group includes only gentamicin and tobramycin from 2020 onwards.

^c The aminoglycoside group includes only tobramycin from 2020 onwards.

^d MRSA is based on AST results for oxacillin or ceftioxin, but AST results reported as cloxacillin, dicloxacillin, fluocloxacillin or meticillin are accepted as a marker for oxacillin resistance if AST results for oxacillin are not reported. Data from molecular confirmation tests (detection of *mecA* gene by PCR or a positive PBP2A-agglutination test) are given priority over phenotypic AST results.

^e Penicillin results are based on penicillin or, if not available, oxacillin. For *S. pneumoniae*, the term penicillin non-wild-type is used in this report, referring to *S. pneumoniae* isolates reported by the local laboratories as susceptible increased exposure (I) or resistant (R) to penicillin, assuming MIC to benzylpenicillin above those of wild-type isolates (>0.06 mg/L). The qualitative susceptibility categories (S/I/R) as reported by the laboratory are used, since quantitative susceptibility information is missing for a large part of the data. Laboratories not using EUCAST clinical breakpoints in the period 2016–2018 might define the cut-off values for the susceptibility categories differently.

BULGARIA

Participating institutions:

National Center of Infectious and Parasitic Diseases

Population and hospitals contributing data: coverage, representativeness and blood-culture rate, Bulgaria, 2016–2020

Parameter	2016	2017	2018	2019	2020
Estimated national population coverage (%)	30	30	46	45	45
Geographical representativeness	Medium	Medium	Medium	Medium	Medium
Hospital representativeness	Poor	Poor	Poor	Medium	Medium
Patient and isolate representativeness	High	High	Medium	Medium	Medium
Blood culture sets/1 000 patient-days	7.2	8.3	8.5	8.6	10.4

Laboratories contributing data: use of clinical breakpoint guidelines and participation in EARS-Net EQA, Bulgaria, 2016–2020

Parameter	2016	2017	2018	2019	2020
Percentage of laboratories using EUCAST or EUCAST-harmonised guidelines	100	95	100	100 ^a	100 ^a
Percentage of laboratories participating in EARS-Net EQA	91	95	100	100	NA

EQA: external quality assessment.

NA: not applicable.

^a Starting with 2019 data, EARS-Net was restricted to laboratories using EUCAST or EUCAST-harmonised methodology and breakpoints.

Annual number of reporting laboratories,^a number of reported isolates and percentage of isolates reported from patients in ICUs,^b Bulgaria, 2016–2020

Bacterial species	2016			2017			2018			2019			2020		
	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)
<i>E. coli</i>	20	241	15	20	247	20	22	292	22	23	352	23	23	261	19
<i>K. pneumoniae</i>	17	161	41	18	169	41	21	193	47	20	267	53	19	249	48
<i>P. aeruginosa</i>	12	56	41	16	71	28	18	90	36	16	107	40	17	70	51
<i>Acinetobacter</i> spp.	15	106	52	15	92	64	19	110	66	15	132	60	14	129	60
<i>S. aureus</i>	18	231	22	18	227	25	22	313	29	23	324	23	23	220	22
<i>S. pneumoniae</i>	13	33	18	12	29	38	14	42	17	14	46	35	9	28	21
<i>E. faecalis</i>	17	114	26	17	133	28	20	150	34	20	150	35	19	165	41
<i>E. faecium</i>	12	45	53	17	84	42	20	91	49	17	99	31	16	77	57

ICU: intensive care unit.

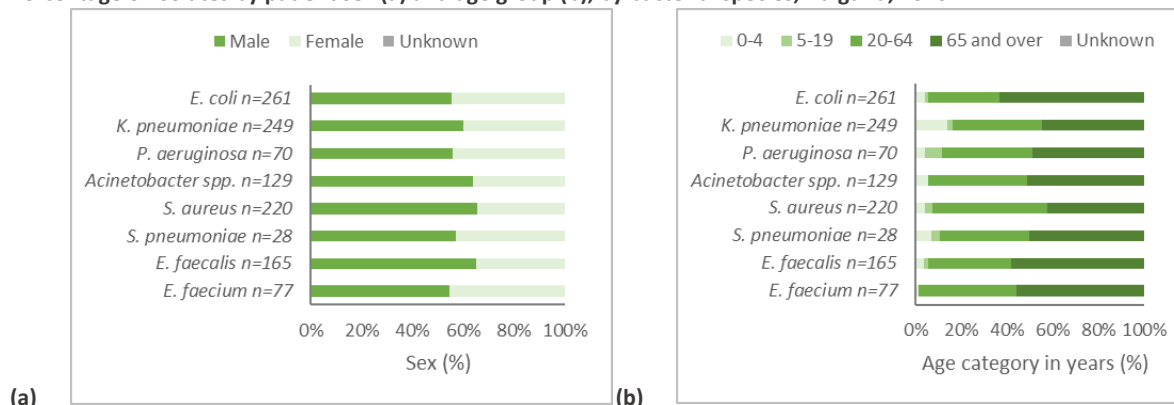
Lab: laboratories.

Note: a small number of isolates were tested ($n < 30$), and the percentage resistance should be interpreted with caution.

^a Number of laboratories reporting at least one isolate during the specific year. The total number of participating laboratories might be higher.

^b Isolates with missing information on hospital department are excluded, and results are presented only if data on hospital department are available for $\geq 70\%$ of isolates.

Percentage of isolates by patient sex (a) and age group (b), by bacterial species, Bulgaria, 2020



Total number of invasive isolates tested (n) and percentages of isolates with resistance phenotype (%), by bacterial species and antimicrobial group/agent, 2020 EU/EEA range, population-weighted mean and trend, Bulgaria, 2016–2020

Bacterial species	Antimicrobial group/agent	2016		2017		2018		2019		2020		Trend 2016-2020 ^a
		n	%	n	%	n	%	n	%	n	%	
<i>E. coli</i>	Aminopenicillin (amoxicillin/ampicillin) resistance	186	78.0	203	73.9	287	66.6	352	63.4	261	66.7	↓
	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	238	41.6	247	41.3	292	38.7	352	38.6	261	41.4	-
	Carbapenem (imipenem/meropenem) resistance	224	0.9	247	0.0	292	1.4	352	0.0	261	0.8	-
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	237	42.2	247	42.1	292	41.8	352	38.6	261	42.9	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	210	34.8	229	36.2	275	28.4	352	24.4	219	34.2	-
	Combined resistance to third-generation cephalosporins, fluoroquinolones, and aminoglycosides ^b	204	22.1	229	24.9	275	19.6	352	19.0	219	18.7	-
<i>K. pneumoniae</i>	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	160	72.5	169	76.3	193	77.7	267	75.7	249	79.1	-
	Carbapenem (imipenem/meropenem) resistance	159	4.4	169	12.4	193	21.2	267	27.0	249	28.1	↑
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	160	55.6	169	59.8	193	62.7	267	60.7	249	67.1	↑
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	135	64.4	168	63.1	191	59.2	267	57.3	230	67.0	-
<i>P. aeruginosa</i>	Combined resistance to fluoroquinolones, third-generation cephalosporins and aminoglycosides ^b	133	45.9	168	50.0	191	47.6	267	44.9	230	57.4	-
	Piperacillin-tazobactam resistance	55	40.0	69	33.3	89	32.6	107	31.8	70	64.3	↑
	Ceftazidime resistance	54	38.9	71	38.0	90	20.0	107	30.8	70	54.3	-
	Carbapenem (imipenem/meropenem) resistance	56	30.4	71	25.4	90	25.6	107	25.2	70	42.9	-
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	56	35.7	71	28.2	90	30.0	107	29.9	70	52.9	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^c	39	48.7	71	28.2	90	24.4	107	31.8	50	32.0	-
<i>Acinetobacter</i> species	Combined resistance to ≥3 antimicrobial groups (among piperacillin-tazobactam, ceftazidime, carbapenems, fluoroquinolones and aminoglycosides) ^c	56	35.7	71	26.8	90	25.6	107	30.8	70	47.1	-
	Carbapenem (imipenem/meropenem) resistance	103	74.8	92	80.4	110	74.5	132	72.0	129	82.9	-
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	106	67.9	92	95.7	110	78.2	132	74.2	129	82.9	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	79	81.0	92	89.1	110	73.6	132	78.0	129	76.0	-
<i>S. aureus</i>	Combined resistance to carbapenems, fluoroquinolones and aminoglycosides ^b	76	72.4	92	78.3	110	66.4	132	69.7	129	72.9	-
	MRSA ^d	231	14.3	227	13.7	313	17.6	324	14.8	220	11.8	-
<i>S. pneumoniae</i>	Penicillin non-wild-type ^e	33	27.3	29	27.6	42	9.5	46	8.7	28	7.1	↓
	Macrolide (azithromycin/clarithromycin/erythromycin) resistance	32	21.9	29	27.6	42	16.7	46	30.4	28	10.7	-
	Combined penicillin non-wild-type and resistance to macrolides ^e	32	9.4	29	17.2	42	2.4	46	8.7	28	3.6	-
<i>E. faecalis</i>	High-level gentamicin resistance	98	46.9	133	43.6	150	39.3	150	37.3	165	47.9	-
<i>E. faecium</i>	Vancomycin resistance	44	18.2	84	19.0	91	9.9	99	12.1	77	7.8	↓

Note: a small number of isolates were tested (n < 30), and the percentage resistance should be interpreted with caution.

^a ↑ and ↓ indicate statistically significantly increasing and decreasing trends, respectively; – indicates no statistically significant trend.

^b The aminoglycoside group includes only gentamicin and tobramycin from 2020 onwards.

^c The aminoglycoside group includes only tobramycin from 2020 onwards.

^d MRSA is based on AST results for oxacillin or ceftioxin, but AST results reported as cloxacillin, dicloxacillin, fluocloxacillin or meticillin are accepted as a marker for oxacillin resistance if AST results for oxacillin are not reported. Data from molecular confirmation tests (detection of *mecA* gene by PCR or a positive PBP2A-agglutination test) are given priority over phenotypic AST results.

^e Penicillin results are based on penicillin or, if not available, oxacillin. For *S. pneumoniae*, the term penicillin non-wild-type is used in this report, referring to *S. pneumoniae* isolates reported by the local laboratories as susceptible increased exposure (I) or resistant (R) to penicillin, assuming MIC to benzylpenicillin above those of wild-type isolates (>0.06 mg/L). The qualitative susceptibility categories (S/I/R) as reported by the laboratory are used, since quantitative susceptibility information is missing for a large part of the data. Laboratories not using EUCAST clinical breakpoints in the period 2016–2018 might define the cut-off values for the susceptibility categories differently.

CROATIA

Participating institutions:

Reference Center for Antimicrobial Resistance Surveillance

Ministry of Health Zagreb University Hospital for Infectious Diseases (Dr. Fran Mihaljević)

Population and hospitals contributing data: coverage, representativeness and blood-culture rate, Croatia, 2016–2020

Parameter	2016	2017	2018	2019	2020
Estimated national population coverage (%)	78	80	80	Unknown	80
Geographical representativeness	High	High	High	Unknown	High
Hospital representativeness	Unknown	Unknown	High	Unknown	High
Patient and isolate representativeness	Unknown	Unknown	High	Unknown	High
Blood culture sets/1 000 patient-days	Unknown	Unknown	Unknown	Unknown	109

Laboratories contributing data: use of clinical breakpoint guidelines and participation in EARS-Net EQA, Croatia, 2016–2020

Parameter	2016	2017	2018	2019	2020
Percentage of laboratories using EUCAST or EUCAST-harmonised guidelines	100	100	100	100 ^a	100 ^a
Percentage of laboratories participating in EARS-Net EQA	94	94	100	100	NA

EQA: external quality assessment.

NA: not applicable.

^a Starting with 2019 data, EARS-Net was restricted to laboratories using EUCAST or EUCAST-harmonised methodology and breakpoints.

Annual number of reporting laboratories,^a number of reported isolates and percentage of isolates reported from patients in ICUs,^b Croatia, 2016–2020

Bacterial species	2016			2017			2018			2019			2020		
	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)
<i>E. coli</i>	18	1 045	6	19	1 160	6	19	1 216	5	19	1 123	8	19	828	7
<i>K. pneumoniae</i>	17	323	19	19	313	18	19	332	14	17	328	14	16	270	20
<i>P. aeruginosa</i>	16	260	23	17	238	17	17	200	16	15	185	15	18	165	32
<i>Acinetobacter</i> spp.	14	182	41	17	208	42	14	155	26	16	143	31	14	225	73
<i>S. aureus</i>	18	458	12	18	520	16	18	458	11	15	360	11	19	424	16
<i>S. pneumoniae</i>	17	155	22	16	130	13	17	146	9	16	156	20	12	55	17
<i>E. faecalis</i>	15	179	12	17	171	11	16	145	12	14	127	16	16	162	23
<i>E. faecium</i>	15	104	17	12	89	12	11	71	13	11	74	19	16	88	28

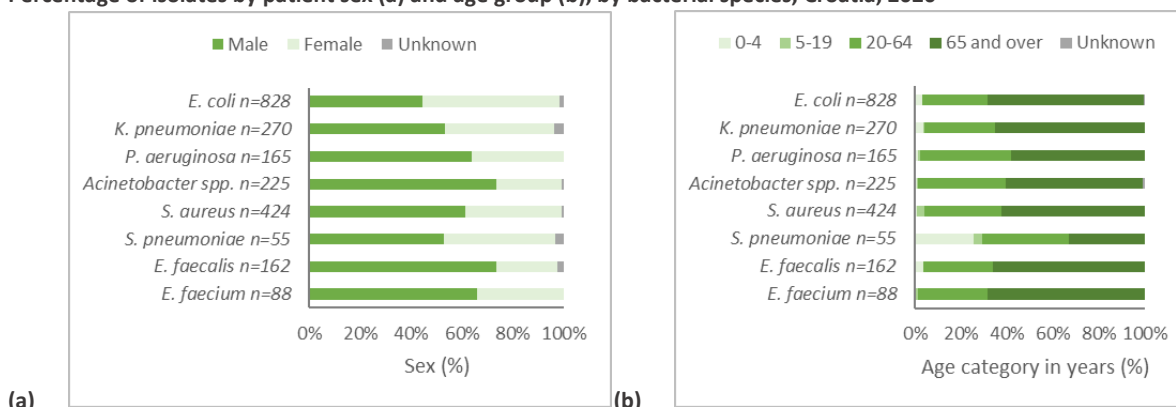
ICU: intensive care unit.

Lab: laboratories.

^a Number of laboratories reporting at least one isolate during the specific year. The total number of participating laboratories might be higher.

^b Isolates with missing information on hospital department are excluded, and results are presented only if data on hospital department are available for ≥70% of isolates.

Percentage of isolates by patient sex (a) and age group (b), by bacterial species, Croatia, 2020



Total number of invasive isolates tested (n) and percentages of isolates with resistance phenotype (%), by bacterial species and antimicrobial group/agent, 2020 EU/EEA range, population-weighted mean and trend, Croatia, 2016–2020

Bacterial species	Antimicrobial group/agent	2016		2017		2018		2019		2020		Trend 2016-2020 ^a
		n	%	n	%	n	%	n	%	n	%	
<i>E. coli</i>	Aminopenicillin (amoxicillin/ampicillin) resistance	1 043	57.3	1 135	58.8	1 214	57.7	1 108	57.1	827	57.7	-
	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	1 045	14.7	1 148	16.5	1 168	14.8	1 085	15.9	827	16.6	-
	Carbapenem (imipenem/meropenem) resistance	1 045	0.0	1 132	0.0	1 190	0.0	1 090	0.2	820	0.0	-
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	1 041	27.9	1 150	28.2	1 199	30.0	1 108	27.3	826	29.7	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	1 027	15.7	1 154	16.6	1 210	14.9	1 112	14.8	828	14.9	-
	Combined resistance to third-generation cephalosporins, fluoroquinolones, and aminoglycosides ^b	1 023	9.4	1 133	9.4	1 150	9.2	1 064	9.2	825	8.7	-
<i>K. pneumoniae</i>	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	321	48.6	309	41.7	318	44.3	317	53.0	270	52.2	↑
	Carbapenem (imipenem/meropenem) resistance	323	0.0	302	0.0	325	2.2	325	12.0	267	19.1	↑
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	318	43.4	309	40.8	327	48.6	318	57.9	268	54.1	↑
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	316	36.1	311	30.9	330	36.4	325	42.8	270	38.1	-
	Combined resistance to fluoroquinolones, third-generation cephalosporins and aminoglycosides ^b	309	27.5	305	23.0	312	28.2	312	38.1	268	35.8	↑
<i>P. aeruginosa</i>	Piperacillin-tazobactam resistance	252	18.7	234	16.2	196	11.2	182	14.3	164	10.4	↓#
	Ceftazidime resistance	240	20.8	231	19.5	195	17.9	173	20.2	164	18.9	-
	Carbapenem (imipenem/meropenem) resistance	260	42.3	238	30.7	199	27.6	183	26.2	165	30.3	↓
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	259	37.5	237	32.9	200	29.0	181	29.8	165	23.0	↓
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^c	260	33.5	237	26.6	199	21.6	183	20.2	ND	ND	NA
	Combined resistance to ≥3 antimicrobial groups (among piperacillin-tazobactam, ceftazidime, carbapenems, fluoroquinolones and aminoglycosides) ^c	260	31.9	238	21.4	200	19.0	184	17.4	164	11.6	↓
<i>Acinetobacter</i> species	Carbapenem (imipenem/meropenem) resistance	181	94.5	208	96.2	155	95.5	143	92.3	225	96.4	-
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	176	94.9	204	98.0	155	96.1	142	93.7	224	98.2	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	182	83.0	206	84.0	153	91.5	140	92.1	225	96.4	↑
<i>S. aureus</i>	Combined resistance to carbapenems, fluoroquinolones and aminoglycosides ^b	175	81.1	203	83.7	153	90.8	139	91.4	224	95.1	↑
	MRSA ^d	458	25.3	520	28.5	458	26.4	358	24.9	424	29.2	-
<i>S. pneumoniae</i>	Penicillin non-wild-type ^e	155	21.9	129	22.5	144	18.1	154	20.1	55	23.6	-
	Macrolide (azithromycin/clarithromycin/erythromycin) resistance	154	33.8	127	36.2	143	32.2	154	29.9	55	40.0	-
	Combined penicillin non-wild-type and resistance to macrolides ^e	154	14.9	126	15.9	141	11.3	152	13.8	55	16.4	-
<i>E. faecalis</i>	High-level gentamicin resistance	179	33.0	171	33.3	143	33.6	125	24.0	161	37.9	-
<i>E. faecium</i>	Vancomycin resistance	104	22.1	89	19.1	71	25.4	74	25.7	88	33.0	-

NA: not applicable as data were not reported for all years, a significant change in data source occurred during the period, or the number of isolates was < 20 in any year during the period.

ND: no data available.

^a ↑ and ↓ indicate statistically significantly increasing and decreasing trends, respectively; # indicates a significant trend in the overall data, but not in data that only included laboratories reporting continuously for all five years; – indicates no statistically significant trend.

^b The aminoglycoside group includes only gentamicin and tobramycin from 2020 onwards.

^c The aminoglycoside group includes only tobramycin from 2020 onwards.

^d MRSA is based on AST results for oxacillin or ceftazidime, but AST results reported as cloxacillin, dicloxacillin, flucloxacillin or meticillin are accepted as a marker for oxacillin resistance if AST results for oxacillin are not reported. Data from molecular confirmation tests (detection of *mecA* gene by PCR or a positive PBP2A-agglutination test) are given priority over phenotypic AST results.

^e Penicillin results are based on penicillin or, if not available, oxacillin. For *S. pneumoniae*, the term penicillin non-wild-type is used in this report, referring to *S. pneumoniae* isolates reported by the local laboratories as susceptible increased exposure (I) or resistant (R) to penicillin, assuming MIC to benzylpenicillin above those of wild-type isolates (>0.06 mg/L). The qualitative susceptibility categories (S/I/R) as reported by the laboratory are used, since quantitative susceptibility information is missing for a large part of the data. Laboratories not using EUCAST clinical breakpoints in the period 2016–2018 might define the cut-off values for the susceptibility categories differently.

CYPRUS

Participating institutions:

Microbiology Department, Nicosia General Hospital

Population and hospitals contributing data: coverage, representativeness and blood-culture rate, Cyprus, 2016–2020

Parameter	2016	2017	2018	2019	2020
Estimated national population coverage (%)	85	85	85	35	85
Geographical representativeness	High	High	High	High	High
Hospital representativeness	High	High	High	High	High
Patient and isolate representativeness	High	High	High	High	High
Blood culture sets/1 000 patient-days	46.2	44.9	51.1	56.9	60.9

Laboratories contributing data: use of clinical breakpoint guidelines and participation in EARS-Net EQA, Cyprus, 2016–2020

Parameter	2016	2017	2018	2019	2020
Percentage of laboratories using EUCAST or EUCAST-harmonised guidelines	0	20	20	100 ^a	100 ^a
Percentage of laboratories participating in EARS-Net EQA	80	100	100	100	NA

EQA: external quality assessment.

NA: not applicable.

^a Starting with 2019 data, EARS-Net was restricted to laboratories using EUCAST or EUCAST-harmonised methodology and breakpoints.

Annual number of reporting laboratories,^a number of reported isolates and percentage of isolates reported from patients in ICUs,^b Cyprus, 2016–2020

Bacterial species	2016			2017			2018			2019			2020		
	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)
<i>E. coli</i>	5	149	16	5	156	15	4	151	19	1	92	Unknown	4	228	9
<i>K. pneumoniae</i>	5	75	30	5	71	33	4	87	33	1	60	Unknown	4	172	29
<i>P. aeruginosa</i>	5	64	40	4	53	33	4	55	39	1	33	25	4	128	37
<i>Acinetobacter</i> spp.	5	29	69	5	50	46	3	57	53	1	32	69	4	116	60
<i>S. aureus</i>	5	141	21	5	129	26	4	117	17	1	63	23	4	212	11
<i>S. pneumoniae</i>	4	10	11	4	19	37	3	16	8	1	8	<10 isolates	3	10	0
<i>E. faecalis</i>	5	39	45	5	70	30	4	87	34	1	37	20	4	150	41
<i>E. faecium</i>	4	41	28	5	41	26	4	45	37	1	32	38	3	86	32

ICU: intensive care unit.

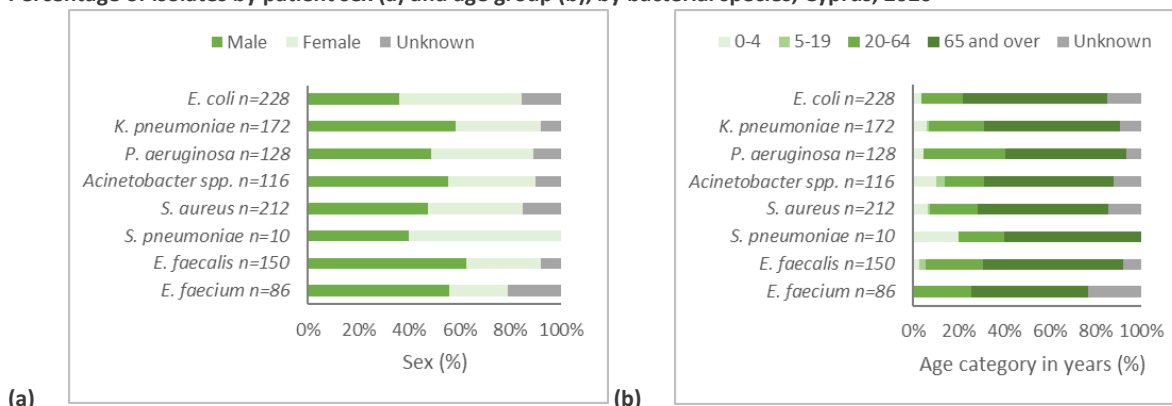
Lab: laboratories.

Note: a small number of isolates were tested (n < 30), and the percentage resistance should be interpreted with caution.

^a Number of laboratories reporting at least one isolate during the specific year. The total number of participating laboratories might be higher.

^b Isolates with missing information on hospital department are excluded, and results are presented only if data on hospital department are available for ≥70% of isolates.

Percentage of isolates by patient sex (a) and age group (b), by bacterial species, Cyprus, 2020



Total number of invasive isolates tested (n) and percentages of isolates with resistance phenotype (%), by bacterial species and antimicrobial group/agent, 2020 EU/EEA range, population-weighted mean and trend, Cyprus, 2016–2020

Bacterial species	Antimicrobial group/agent	2016		2017		2018		2019		2020		Trend 2016-2020 ^a
		n	%	n	%	n	%	n	%	n	%	
<i>E. coli</i>	Aminopenicillin (amoxicillin/ampicillin) resistance	149	69.1	156	65.4	151	64.9	92	71.7	228	67.5	-
	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	149	30.2	156	30.8	151	37.1	92	20.7	228	29.8	-
	Carbapenem (imipenem/meropenem) resistance	149	0.0	156	1.3	150	2.0	92	0.0	228	0.0	-
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	149	47.0	156	42.9	151	42.4	92	43.5	228	48.2	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	149	16.1	156	21.8	151	19.9	92	10.9	228	21.9	-
	Combined resistance to third-generation cephalosporins, fluoroquinolones, and aminoglycosides ^b	149	11.4	156	15.4	151	14.6	92	6.5	228	13.6	-
<i>K. pneumoniae</i>	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	75	30.7	71	46.5	87	48.3	60	48.3	172	54.7	↑#
	Carbapenem (imipenem/meropenem) resistance	75	10.7	71	15.5	87	21.8	60	13.3	172	19.8	-
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	75	32.0	71	35.2	87	49.4	60	31.7	172	50.0	↑#
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	75	22.7	71	26.8	87	36.8	58	24.1	170	22.9	-
	Combined resistance to fluoroquinolones, third-generation cephalosporins and aminoglycosides ^b	75	18.7	71	25.4	87	32.2	58	20.7	170	18.2	-
<i>P. aeruginosa</i>	Piperacillin-tazobactam resistance	64	10.9	53	15.1	55	21.8	33	21.2	109	25.7	↑#
	Ceftazidime resistance	64	10.9	53	13.2	55	16.4	33	18.2	122	18.0	-
	Carbapenem (imipenem/meropenem) resistance	64	18.8	53	17.0	55	12.7	33	21.2	126	20.6	-
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	64	20.3	53	5.7	55	25.5	33	12.1	83	31.3	↑#
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^c	64	4.7	53	1.9	55	7.3	33	3.0	98	6.1	-
	Combined resistance to ≥3 antimicrobial groups (among piperacillin-tazobactam, ceftazidime, carbapenems, fluoroquinolones and aminoglycosides) ^c	64	4.7	53	9.4	55	16.4	33	12.1	122	14.8	-
<i>Acinetobacter</i> species	Carbapenem (imipenem/meropenem) resistance	28	71.4	50	76.0	57	84.2	32	87.5	116	81.0	-
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	28	71.4	50	76.0	55	89.1	32	90.6	113	85.0	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	28	57.1	50	76.0	57	75.4	32	84.4	116	77.6	-
	Combined resistance to carbapenems, fluoroquinolones and aminoglycosides ^b	28	57.1	50	76.0	55	78.2	32	81.3	113	77.9	-
<i>S. aureus</i>	MRSA ^d	139	38.8	125	31.2	117	40.2	58	36.2	212	49.1	↑
<i>S. pneumoniae</i>	Penicillin non-wild-type ^e	10	40.0	11	45.5	16	6.3	2	<10 isolates	10	40.0	NA
	Macrolide (azithromycin/clarithromycin/erythromycin) resistance	10	60.0	19	26.3	14	7.1	8	<10 isolates	10	40.0	NA
	Combined penicillin non-wild-type and resistance to macrolides ^e	10	40.0	11	45.5	14	7.1	2	<10 isolates	10	20.0	NA
<i>E. faecalis</i>	High-level gentamicin resistance	39	20.5	70	8.6	87	12.6	37	0.0	146	4.1	↓#
<i>E. faecium</i>	Vancomycin resistance	41	46.3	41	43.9	44	59.1	32	50.0	86	44.2	-

NA: not applicable as data were not reported for all years, a significant change in data source occurred during the period, or the number of isolates was < 20 in any year during the period.

< 10 isolates: no percentage is displayed if < 10 isolates were available for analysis.

Note: a small number of isolates were tested (n < 30), and the percentage resistance should be interpreted with caution

^a ↑ and ↓ indicate statistically significantly increasing and decreasing trends, respectively; # indicates a significant trend in the overall data, but not in data that only included laboratories reporting continuously for all five years; – indicates no statistically significant trend.

^b The aminoglycoside group includes only gentamicin and tobramycin from 2020 onwards.

^c The aminoglycoside group includes only tobramycin from 2020 onwards.

^d MRSA is based on AST results for oxacillin or ceftoxitin, but AST results reported as cloxacillin, dicloxacillin, flucloxacillin or meticillin are accepted as a marker for oxacillin resistance if AST results for oxacillin are not reported. Data from molecular confirmation tests (detection of *mecA* gene by PCR or a positive PBP2A-agglutination test) are given priority over phenotypic AST results.

^e Penicillin results are based on penicillin or, if not available, oxacillin. For *S. pneumoniae*, the term penicillin non-wild-type is used in this report, referring to *S. pneumoniae* isolates reported by the local laboratories as susceptible increased exposure (I) or resistant (R) to penicillin, assuming MIC to benzylpenicillin above those of wild-type isolates (>0.06 mg/L). The qualitative susceptibility categories (S/I/R) as reported by the laboratory are used, since quantitative susceptibility information is missing for a large part of the data. Laboratories not using EUCAST clinical breakpoints in the period 2016–2018 might define the cut-off values for the susceptibility categories differently.

CZECHIA

Participating institutions:

National Institute of Public Health www.szu.cz

National Reference Laboratory for Antibiotics

Population and hospitals contributing data: coverage, representativeness and blood-culture rate, Czechia, 2016–2020

Parameter	2016	2017	2018	2019	2020
Estimated national population coverage (%)	85	85	81	81	80
Geographical representativeness	High	High	High	High	High
Hospital representativeness	High	High	High	High	High
Patient and isolate representativeness	High	High	High	High	High
Blood culture sets/1 000 patient-days	18	18	17	16.8	19.7

Laboratories contributing data: use of clinical breakpoint guidelines and participation in EARS-Net EQA, Czechia, 2016–2020

Parameter	2016	2017	2018	2019	2020
Percentage of laboratories using EUCAST or EUCAST-harmonised guidelines	98	100	100	100 ^a	100 ^a
Percentage of laboratories participating in EARS-Net EQA	96	100	98	100	NA

EQA: external quality assessment.

NA: not applicable.

^a Starting with 2019 data, EARS-Net was restricted to laboratories using EUCAST or EUCAST-harmonised methodology and breakpoints.

Annual number of reporting laboratories,^a number of reported isolates and percentage of isolates reported from patients in ICUs,^b Czechia, 2016–2020

Bacterial species	2016			2017			2018			2019			2020		
	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)
<i>E. coli</i>	44	3 075	18	43	3 201	18	48	3 650	19	47	3 565	16	48	3 005	14
<i>K. pneumoniae</i>	45	1 385	32	46	1 330	29	48	1 485	31	48	1 563	27	48	1 476	30
<i>P. aeruginosa</i>	43	465	38	44	411	37	47	539	36	47	595	32	48	559	37
<i>Acinetobacter</i> spp.	15	57	26	17	55	31	21	91	32	20	95	48	20	82	44
<i>S. aureus</i>	45	1 887	25	47	1 944	24	48	2 244	24	49	2 108	23	48	2 090	24
<i>S. pneumoniae</i>	42	267	35	46	366	26	47	378	26	49	387	27	43	204	32
<i>E. faecalis</i>	42	515	35	41	529	33	44	594	35	43	528	30	44	584	35
<i>E. faecium</i>	38	259	39	39	264	38	41	358	37	39	350	38	44	413	36

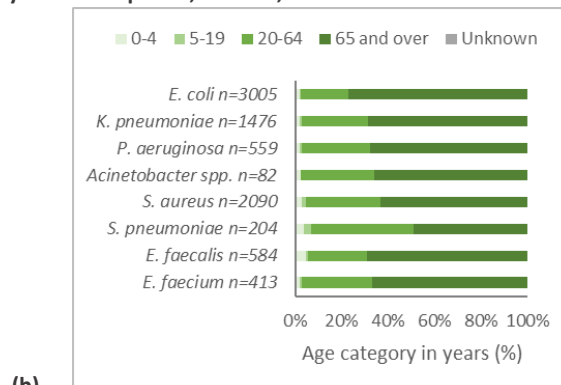
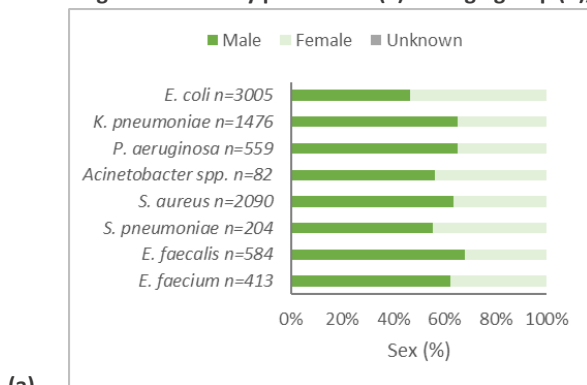
ICU: intensive care unit.

Lab: laboratories.

^a Number of laboratories reporting at least one isolate during the specific year. The total number of participating laboratories might be higher.

^b Isolates with missing information on hospital department are excluded, and results are presented only if data on hospital department are available for ≥70% of isolates.

Percentage of isolates by patient sex (a) and age group (b), by bacterial species, Czechia, 2020



Total number of invasive isolates tested (n) and percentages of isolates with resistance phenotype (%), by bacterial species and antimicrobial group/agent, 2020 EU/EEA range, population-weighted mean and trend, Czechia, 2016–2020

Bacterial species	Antimicrobial group/agent	2016		2017		2018		2019		2020		Trend 2016-2020 ^a
		n	%	n	%	n	%	n	%	n	%	
<i>E. coli</i>	Aminopenicillin (amoxicillin/ampicillin) resistance	3 055	55.1	3 198	53.0	3 640	54.2	3 556	54.6	2 997	52.7	-
	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	3 061	15.1	3 199	14.2	3 641	15.2	3 557	15.9	2 997	13.3	-
	Carbapenem (imipenem/meropenem) resistance	1 483	0.0	1 431	0.0	1 752	0.1	1 689	0.0	1 500	0.1	-
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	3 061	27.6	3 199	24.5	3 638	24.3	3 554	23.0	2 997	20.2	↓
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	3 061	12.2	3 199	10.7	3 643	9.5	3 559	11.4	2 999	10.2	-
	Combined resistance to third-generation cephalosporins, fluoroquinolones, and aminoglycosides ^b	3 061	7.9	3 199	6.3	3 638	6.3	3 554	6.6	2 995	5.4	↓
<i>K. pneumoniae</i>	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	1 384	51.8	1 329	53.2	1 482	50.1	1 563	50.7	1 474	45.9	↓
	Carbapenem (imipenem/meropenem) resistance	1 096	0.0	1 051	0.4	1 194	0.3	1 314	0.6	1 232	0.5	↑
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	1 384	50.5	1 329	49.2	1 482	47.2	1 562	48.7	1 474	44.2	↓
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	1 385	47.1	1 330	49.6	1 483	48.6	1 563	47.7	1 474	42.5	↓
	Combined resistance to fluoroquinolones, third-generation cephalosporins and aminoglycosides ^b	1 384	40.8	1 329	41.8	1 482	38.7	1 562	39.3	1 473	34.6	↓
<i>P. aeruginosa</i>	Piperacillin-tazobactam resistance	446	23.3	405	20.7	531	22.6	584	23.6	550	20.4	-
	Ceftazidime resistance	464	19.2	411	13.4	539	20.4	594	22.7	559	19.0	-
	Carbapenem (imipenem/meropenem) resistance	464	8.8	411	14.8	539	18.0	595	14.5	559	15.7	↑
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	464	34.7	411	30.2	539	33.4	594	33.7	559	28.4	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^c	464	18.8	411	14.4	539	19.3	594	21.7	559	13.2	-
	Combined resistance to ≥3 antimicrobial groups (among piperacillin-tazobactam, ceftazidime, carbapenems, fluoroquinolones and aminoglycosides) ^c	464	18.5	411	16.5	539	21.3	594	18.7	559	15.7	-
<i>Acinetobacter</i> species	Carbapenem (imipenem/meropenem) resistance	57	1.8	55	12.7	91	19.8	95	30.5	82	32.9	↑
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	57	17.5	55	20.0	91	24.2	95	32.6	82	35.4	↑
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	57	8.8	55	12.7	91	22.0	95	33.7	82	34.1	↑
	Combined resistance to carbapenems, fluoroquinolones and aminoglycosides ^b	57	0.0	55	5.5	91	18.7	95	29.5	82	30.5	↑
<i>S. aureus</i>	MRSA ^d	1 887	14.0	1 944	13.2	2 243	13.7	2 108	12.6	2 089	9.3	↓
	Penicillin non-wild-type ^e	266	4.5	366	4.9	378	5.0	387	4.9	204	4.4	-
<i>S. pneumoniae</i>	Macrolide (azithromycin/clarithromycin/erythromycin) resistance	263	7.2	366	9.0	378	10.1	387	10.3	204	6.9	-
	Combined penicillin non-wild-type and resistance to macrolides ^e	263	1.1	366	3.0	378	2.6	387	2.3	204	2.0	-
<i>E. faecalis</i>	High-level gentamicin resistance	515	37.1	526	34.0	594	33.7	527	31.5	583	30.2	↓
<i>E. faecium</i>	Vancomycin resistance	258	7.8	264	13.3	358	20.7	349	19.8	410	16.6	↑

^a ↑ and ↓ indicate statistically significantly increasing and decreasing trends, respectively; – indicates no statistically significant trend.

^b The aminoglycoside group includes only gentamicin and tobramycin from 2020 onwards.

^c The aminoglycoside group includes only tobramycin from 2020 onwards.

^d MRSA is based on AST results for oxacillin or cefoxitin, but AST results reported as cloxacillin, dicloxacillin, flucloxacillin or meticillin are accepted as a marker for oxacillin resistance if AST results for oxacillin are not reported. Data from molecular confirmation tests (detection of *mecA* gene by PCR or a positive PBP2A-agglutination test) are given priority over phenotypic AST results.

^e Penicillin results are based on penicillin or, if not available, oxacillin. For *S. pneumoniae*, the term penicillin non-wild-type is used in this report, referring to *S. pneumoniae* isolates reported by the local laboratories as susceptible increased exposure (I) or resistant (R) to penicillin, assuming MIC to benzylpenicillin above those of wild-type isolates (>0.06 mg/L). The qualitative susceptibility categories (S/I/R) as reported by the laboratory are used, since quantitative susceptibility information is missing for a large part of the data. Laboratories not using EUCAST clinical breakpoints in the period 2016–2018 might define the cut-off values for the susceptibility categories differently.

DENMARK

Participating institutions:

Statens Serum Institut

Danish Study Group for Antimicrobial Resistance Surveillance (DANRES), www.danmap.org

Population and hospitals contributing data: coverage, representativeness and blood-culture rate, Denmark, 2016–2020

Parameter	2016	2017	2018	2019	2020
Estimated national population coverage (%)	100	100	100	100	100
Geographical representativeness	High	High	High	High	High
Hospital representativeness	High	High	High	High	High
Patient and isolate representativeness	High	High	High	High	High
Blood culture sets/1 000 patient-days	121.9	138.5	142.9	160.9	202.4

Laboratories contributing data: use of clinical breakpoint guidelines and participation in EARS-Net EQA, Denmark, 2016–2020

Parameter	2016	2017	2018	2019	2020
Percentage of laboratories using EUCAST or EUCAST-harmonised guidelines	100	100	100	100 ^a	100 ^a
Percentage of laboratories participating in EARS-Net EQA	92	91	82	100	NA

EQA: external quality assessment.

NA: not applicable.

^a Starting with 2019 data, EARS-Net was restricted to laboratories using EUCAST or EUCAST-harmonised methodology and breakpoints.

Annual number of reporting laboratories,^a number of reported isolates and percentage of isolates reported from patients in ICUs,^b Denmark, 2016–2020

Bacterial species	2016			2017			2018			2019			2020		
	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)
<i>E. coli</i>	11	4 847	2	10	5 123	2	10	5 398	8	10	5 613	2	10	5 878	3
<i>K. pneumoniae</i>	11	1 156	4	10	1 186	3	10	1 280	7	10	1 361	3	10	1 415	5
<i>P. aeruginosa</i>	11	460	6	10	484	6	10	489	9	10	493	5	10	505	4
<i>Acinetobacter</i> spp.	11	72	8	9	68	5	8	55	8	9	72	6	9	66	6
<i>S. aureus</i>	10	1 963	Unknown	10	1 996	Unknown	10	2 181	Unknown	10	2 172	Unknown	10	2 390	5
<i>S. pneumoniae</i>	10	707	Unknown	10	727	Unknown	10	760	Unknown	10	601	2	10	351	Unknown
<i>E. faecalis</i>	11	600	9	10	674	6	10	606	8	10	632	5	10	651	7
<i>E. faecium</i>	11	685	31	10	786	30	10	782	28	10	737	23	10	795	20

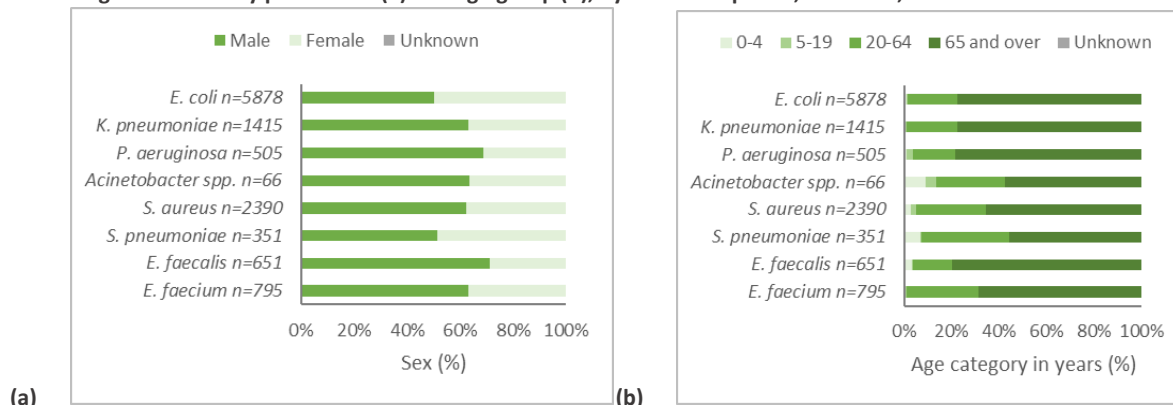
ICU: intensive care unit.

Lab: laboratories.

^a Number of laboratories reporting at least one isolate during the specific year. The total number of participating laboratories might be higher.

^b Isolates with missing information on hospital department are excluded, and results are presented only if data on hospital department are available for ≥70% of isolates.

Percentage of isolates by patient sex (a) and age group (b), by bacterial species, Denmark, 2020



Total number of invasive isolates tested (n) and percentages of isolates with resistance phenotype (%), by bacterial species and antimicrobial group/agent, 2020 EU/EEA range, population-weighted mean and trend, Denmark, 2016–2020

Bacterial species	Antimicrobial group/agent	2016		2017		2018		2019		2020		Trend 2016-2020 ^a
		n	%	n	%	n	%	n	%	n	%	
<i>E. coli</i>	Aminopenicillin (amoxicillin/ampicillin) resistance	4 698	45.0	4 885	45.6	5 383	46.0	5 593	46.3	5 864	44.1	-
	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	4 659	6.6	4 883	6.9	4 833	7.7	5 091	7.5	5 286	6.7	-
	Carbapenem (imipenem/meropenem) resistance	4 671	0.0	5 117	0.0	4 640	0.0	5 577	0.1	5 840	0.2	↑
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	4 827	11.0	5 123	12.8	5 386	13.3	5 605	11.5	5 870	11.2	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	4 846	6.1	5 122	6.0	5 393	5.7	5 599	5.5	5 870	5.5	-
	Combined resistance to third-generation cephalosporins, fluoroquinolones, and aminoglycosides ^b	4 640	1.8	4 883	1.8	4 829	2.0	5 084	1.9	5 277	1.6	-
<i>K. pneumoniae</i>	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	1 118	7.5	1 125	7.3	1 159	6.5	1 248	6.7	1 264	6.0	-
	Carbapenem (imipenem/meropenem) resistance	1 119	0.3	1 185	0.3	1 109	0.5	1 356	0.3	1 413	0.8	-
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	1 152	5.3	1 183	9.1	1 279	8.5	1 361	9.6	1 414	7.6	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	1 154	3.2	1 186	3.2	1 278	3.3	1 358	3.5	1 412	3.3	-
	Combined resistance to fluoroquinolones, third-generation cephalosporins and aminoglycosides ^b	1 112	1.4	1 122	2.4	1 159	1.9	1 245	2.3	1 261	1.7	-
<i>P. aeruginosa</i>	Piperacillin-tazobactam resistance	460	3.5	484	2.9	489	2.9	493	4.1	505	4.4	-
	Ceftazidime resistance	447	4.5	461	3.5	458	3.3	471	4.0	471	3.2	-
	Carbapenem (imipenem/meropenem) resistance	458	2.4	484	2.5	422	5.2	491	3.3	503	4.4	-
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	460	3.7	484	5.0	489	4.3	493	5.5	505	3.2	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^c	460	1.7	484	1.0	489	0.6	490	2.7	61	0.0	-
	Combined resistance to ≥3 antimicrobial groups (among piperacillin-tazobactam, ceftazidime, carbapenems, fluoroquinolones and aminoglycosides) ^c	460	1.3	484	0.4	489	1.2	493	1.6	505	1.2	-
<i>Acinetobacter</i> species	Carbapenem (imipenem/meropenem) resistance	69	0.0	66	0.0	47	6.4	72	0.0	64	4.7	-
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	72	2.8	68	1.5	55	9.1	72	6.9	65	13.8	↑
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	70	0.0	68	0.0	53	7.5	72	2.8	65	4.6	-
	Combined resistance to carbapenems, fluoroquinolones and aminoglycosides ^b	67	0.0	66	0.0	46	4.3	72	0.0	63	4.8	-
<i>S. aureus</i>	MRSA ^d	1963	2.0	1 996	2.5	2181	1.7	2 172	2.2	2 390	1.7	-
	Penicillin non-wild-type ^e	707	6.1	727	3.9	760	5.5	601	5.0	351	6.8	-
<i>S. pneumoniae</i>	Macrolide (azithromycin/clarithromycin/erythromycin) resistance	707	4.8	727	3.6	760	2.5	601	3.5	351	3.7	-
	Combined penicillin non-wild-type and resistance to macrolides ^e	707	2.3	727	1.8	760	1.3	601	1.3	351	2.3	-
<i>E. faecalis</i>	High-level gentamicin resistance	56	19.6	56	7.1	171	12.3	47	8.5	187	11.8	-
<i>E. faecium</i>	Vancomycin resistance	679	7.5	785	7.0	779	12.5	734	9.8	793	9.6	↑

^a ↑ and ↓ indicate statistically significantly increasing and decreasing trends, respectively; – indicates no statistically significant trend.

^b The aminoglycoside group includes only gentamicin and tobramycin from 2020 onwards.

^c The aminoglycoside group includes only tobramycin from 2020 onwards.

^d MRSA is based on AST results for oxacillin or cefoxitin, but AST results reported as cloxacillin, dicloxacillin, flucloxacillin or meticillin are accepted as a marker for oxacillin resistance if AST results for oxacillin are not reported. Data from molecular confirmation tests (detection of *mecA* gene by PCR or a positive PBP2a-agglutination test) are given priority over phenotypic AST results.

^e Penicillin results are based on penicillin or, if not available, oxacillin. For *S. pneumoniae*, the term penicillin non-wild-type is used in this report, referring to *S. pneumoniae* isolates reported by the local laboratories as susceptible increased exposure (I) or resistant (R) to penicillin, assuming MIC to benzylpenicillin above those of wild-type isolates (>0.06 mg/L). The qualitative susceptibility categories (S/I/R) as reported by the laboratory are used, since quantitative susceptibility information is missing for a large part of the data. Laboratories not using EUCAST clinical breakpoints in the period 2016–2018 might define the cut-off values for the susceptibility categories differently.

ESTONIA

Participating institutions:
 Estonian Health Board
 East-Tallinn Central Hospital
 Tartu University Hospital

Population and hospitals contributing data: coverage, representativeness and blood-culture rate, Estonia, 2016–2020

Parameter	2016	2017	2018	2019	2020
Estimated national population coverage (%)	100	100	100	100	100
Geographical representativeness	High	High	High	High	High
Hospital representativeness	High	High	High	High	High
Patient and isolate representativeness	High	High	High	High	High
Blood culture sets/1 000 patient-days	26.6	34.1	31.9	33.4	35.8

Laboratories contributing data: use of clinical breakpoint guidelines and participation in EARS-Net EQA, Estonia, 2016–2020

Parameter	2016	2017	2018	2019	2020
Percentage of laboratories using EUCAST or EUCAST-harmonised guidelines	100	100	100	100 ^a	100 ^a
Percentage of laboratories participating in EARS-Net EQA	100	100	100	100	NA

EQA: external quality assessment.

NA: not applicable.

^a Starting with 2019 data, EARS-Net was restricted to laboratories using EUCAST or EUCAST-harmonised methodology and breakpoints.

Annual number of reporting laboratories,^a number of reported isolates and percentage of isolates reported from patients in ICUs,^b Estonia, 2016–2020

Bacterial species	2016			2017			2018			2019			2020		
	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)
<i>E. coli</i>	11	702	10	10	788	9	10	850	7	9	910	8	9	979	7
<i>K. pneumoniae</i>	10	183	20	10	161	20	9	206	17	9	179	18	9	199	13
<i>P. aeruginosa</i>	8	56	33	9	57	39	7	48	19	8	70	13	9	79	20
<i>Acinetobacter</i> spp.	3	8	<10 isolates	9	16	19	7	14	21	5	16	19	4	12	0
<i>S. aureus</i>	11	314	12	10	290	8	9	360	8	9	366	11	9	367	11
<i>S. pneumoniae</i>	11	112	16	11	141	10	9	142	10	9	161	8	9	80	8
<i>E. faecalis</i>	9	56	25	10	71	23	8	88	20	9	93	18	9	108	19
<i>E. faecium</i>	8	64	38	10	52	37	7	64	36	7	74	43	8	61	16

ICU: intensive care unit.

Lab: laboratories.

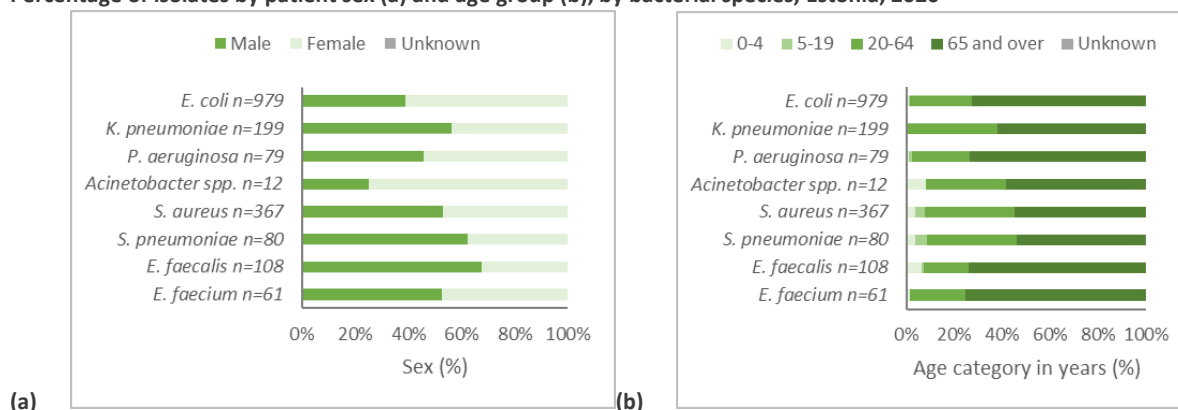
< 10 isolates: no percentage is displayed if < 10 isolates were available for analysis.

Note: a small number of isolates were tested (n < 30), and the percentage resistance should be interpreted with caution.

^a Number of laboratories reporting at least one isolate during the specific year. The total number of participating laboratories might be higher.

^b Isolates with missing information on hospital department are excluded, and results are presented only if data on hospital department are available for ≥70% of isolates.

Percentage of isolates by patient sex (a) and age group (b), by bacterial species, Estonia, 2020



Total number of invasive isolates tested (n) and percentages of isolates with resistance phenotype (%), by bacterial species and antimicrobial group/agent, 2020 EU/EEA range, population-weighted mean and trend, Estonia, 2016–2020

Bacterial species	Antimicrobial group/agent	2016		2017		2018		2019		2020		Trend 2016-2020 ^a
		n	%	n	%	n	%	n	%	n	%	
<i>E. coli</i>	Aminopenicillin (amoxicillin/ampicillin) resistance	471	46.7	439	47.8	457	43.5	499	42.1	422	45.7	-
	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	701	9.0	788	8.8	850	9.8	910	11.5	979	8.3	-
	Carbapenem (imipenem/meropenem) resistance	602	0.0	687	0.0	758	0.0	800	0.0	861	0.0	-
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	699	13.9	781	17.4	829	17.6	897	17.1	959	14.1	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	702	7.4	786	5.7	849	6.2	907	5.3	968	5.5	-
	Combined resistance to third-generation cephalosporins, fluoroquinolones, and aminoglycosides ^b	698	4.0	780	3.7	828	3.0	894	2.1	948	1.6	↓
<i>K. pneumoniae</i>	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	183	32.8	161	21.1	206	13.6	179	10.6	199	11.6	↓
	Carbapenem (imipenem/meropenem) resistance	168	0.0	143	0.0	179	0.6	152	0.0	173	0.0	-
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	183	29.5	161	24.8	205	21.0	179	16.2	197	17.3	↓
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	183	21.3	161	12.4	205	10.2	179	6.1	197	8.1	↓
	Combined resistance to fluoroquinolones, third-generation cephalosporins and aminoglycosides ^b	183	16.9	161	11.8	204	8.8	179	5.6	196	7.1	↓
<i>P. aeruginosa</i>	Piperacillin-tazobactam resistance	53	17.0	55	14.5	48	8.3	70	7.1	77	9.1	-
	Ceftazidime resistance	17	17.6	47	8.5	47	4.3	66	4.5	77	6.5	NA
	Carbapenem (imipenem/meropenem) resistance	54	20.4	55	9.1	48	16.7	69	5.8	79	12.7	-
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	56	3.6	56	12.5	45	13.3	68	5.9	76	10.5	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^c	54	7.4	56	5.4	48	4.2	67	3.0	1	<10 isolates	NA
	Combined resistance to ≥3 antimicrobial groups (among piperacillin-tazobactam, ceftazidime, carbapenems, fluoroquinolones and aminoglycosides) ^c	56	3.6	57	8.8	48	6.3	70	2.9	79	5.1	-
<i>Acinetobacter</i> species	Carbapenem (imipenem/meropenem) resistance	8	<10 isolates	15	33.3	14	28.6	16	50.0	11	18.2	NA
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	5	<10 isolates	11	36.4	11	45.5	10	80.0	7	<10 isolates	NA
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	5	<10 isolates	9	<10 isolates	11	45.5	8	<10 isolates	5	<10 isolates	NA
	Combined resistance to carbapenems, fluoroquinolones and aminoglycosides ^b	5	<10 isolates	9	<10 isolates	11	36.4	8	<10 isolates	5	<10 isolates	NA
<i>S. aureus</i>	MRSA ^d	314	3.5	290	2.1	359	3.3	366	3.0	367	3.0	-
	Penicillin non-wild-type ^e	112	3.6	141	2.1	142	2.8	161	4.3	79	5.1	-
<i>S. pneumoniae</i>	Macrolide (azithromycin/clarithromycin/erythromycin) resistance	100	7.0	127	3.9	136	7.4	158	7.0	76	9.2	-
	Combined penicillin non-wild-type and resistance to macrolides ^e	100	1.0	127	1.6	136	2.2	158	2.5	75	2.7	-
<i>E. faecalis</i>	High-level gentamicin resistance	56	32.1	71	19.7	87	25.3	93	12.9	107	15.0	↓
<i>E. faecium</i>	Vancomycin resistance	64	0.0	52	5.8	64	6.3	74	4.1	61	3.3	-

NA: not applicable as data were not reported for all years, a significant change in data source occurred during the period, or the number of isolates was < 20 in any year during the period.

< 10 isolates: no percentage is displayed if < 10 isolates were available for analysis.

Note: a small number of isolates were tested (n < 30), and the percentage resistance should be interpreted with caution.

^a ↑ and ↓ indicate statistically significantly increasing and decreasing trends, respectively; – indicates no statistically significant trend.

^b The aminoglycoside group includes only gentamicin and tobramycin from 2020 onwards.

^c The aminoglycoside group includes only tobramycin from 2020 onwards.

^d MRSA is based on AST results for oxacillin or ceftoxitin, but AST results reported as cloxacillin, dicloxacillin, fluoxacillin or meticillin are accepted as a marker for oxacillin resistance if AST results for oxacillin are not reported. Data from molecular confirmation tests (detection of *mecA* gene by PCR or a positive PBP2A-agglutination test) are given priority over phenotypic AST results.

^e Penicillin results are based on penicillin or, if not available, oxacillin. For *S. pneumoniae*, the term penicillin non-wild-type is used in this report, referring to *S. pneumoniae* isolates reported by the local laboratories as susceptible increased exposure (I) or resistant (R) to penicillin, assuming MIC to benzylpenicillin above those of wild-type isolates (>0.06 mg/L). The qualitative susceptibility categories (S/I/R) as reported by the laboratory are used, since quantitative susceptibility information is missing for a large part of the data. Laboratories not using EUCAST clinical breakpoints in the period 2016–2018 might define the cut-off values for the susceptibility categories differently.

FINLAND

Participating institutions:

Finnish Institute for Health and Welfare www.thl.fi, Department of Health Security

Finnish Study Group for Antimicrobial Resistance (FiRe), www.finres.fi

Finnish Hospital Infection Program (SIRO), thl.fi/en/web/infectious-diseases/surveillance/healthcare-associated-infections

Population and hospitals contributing data: coverage, representativeness and blood-culture rate, Finland, 2016–2020

Parameter	2016	2017	2018	2019	2020
Estimated national population coverage (%)	98	100	100	96	96
Geographical representativeness	High	High	High	High	High
Hospital representativeness	Unknown	High	High	High	High
Patient and isolate representativeness	Unknown	High	High	High	High
Blood culture sets/1 000 patient-days	Unknown	154.9	150.1	160.4	175.1

Laboratories contributing data: use of clinical breakpoint guidelines and participation in EARS-Net EQA, Finland, 2016–2020

Parameter	2016	2017	2018	2019	2020
Percentage of laboratories using EUCAST or EUCAST-harmonised guidelines	100	100	100	100 ^a	100 ^a
Percentage of laboratories participating in EARS-Net EQA	100	94	94	89	NA

EQA: external quality assessment.

NA: not applicable.

^a Starting with 2019 data, EARS-Net was restricted to laboratories using EUCAST or EUCAST-harmonised methodology and breakpoints.

Annual number of reporting laboratories,^a number of reported isolates and percentage of isolates reported from patients in ICUs,^b Finland, 2016–2020

Bacterial species	2016			2017			2018			2019			2020		
	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)
<i>E. coli</i>	20	4 833	Unknown	20	5 315	Unknown	19	5 057	Unknown	19	5 418	Unknown	18	5 375	Unknown
<i>K. pneumoniae</i>	20	770	Unknown	20	758	Unknown	19	810	Unknown	18	869	Unknown	17	901	Unknown
<i>P. aeruginosa</i>	20	352	Unknown	20	378	Unknown	19	391	Unknown	19	470	Unknown	17	433	Unknown
<i>Acinetobacter</i> spp.	12	28	Unknown	11	37	Unknown	14	28	Unknown	16	43	Unknown	12	37	Unknown
<i>S. aureus</i>	18	1 890	Unknown	20	2 439	Unknown	18	2 105	Unknown	19	2 473	Unknown	18	2 188	Unknown
<i>S. pneumoniae</i>	20	810	Unknown	20	835	Unknown	19	662	Unknown	18	678	Unknown	18	293	Unknown
<i>E. faecalis</i>	20	499	Unknown	20	549	Unknown	19	528	Unknown	19	592	Unknown	18	566	Unknown
<i>E. faecium</i>	20	295	Unknown	20	301	Unknown	19	290	Unknown	19	291	Unknown	18	259	Unknown

ICU: intensive care unit.

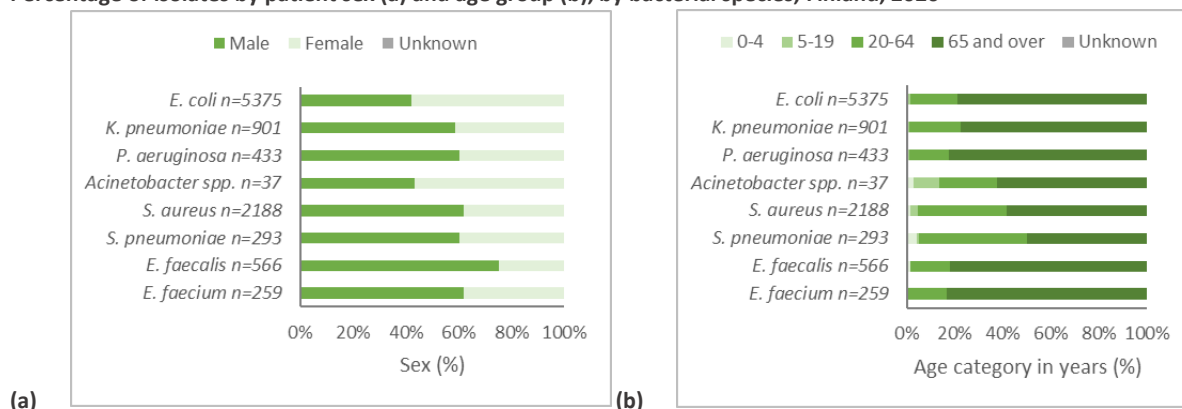
Lab: laboratories.

Note: a small number of isolates were tested (n < 30), and the percentage resistance should be interpreted with caution.

^a Number of laboratories reporting at least one isolate during the specific year. The total number of participating laboratories might be higher.

^b Isolates with missing information on hospital department are excluded, and results are presented only if data on hospital department are available for ≥70% of isolates.

Percentage of isolates by patient sex (a) and age group (b), by bacterial species, Finland, 2020



Total number of invasive isolates tested (n) and percentages of isolates with resistance phenotype (%), by bacterial species and antimicrobial group/agent, 2020 EU/EEA range, population-weighted mean and trend, Finland, 2016–2020

Bacterial species	Antimicrobial group/agent	2016		2017		2018		2019		2020		Trend 2016-2020 ^a
		n	%	n	%	n	%	n	%	n	%	
<i>E. coli</i>	Aminopenicillin (amoxicillin/ampicillin) resistance	2 690	35.8	2 874	35.2	3 129	35.3	3 000	35.5	2 928	34.1	-
	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	4 742	6.9	5 223	6.9	5 020	7.6	5 413	7.8	5 367	7.2	-
	Carbapenem (imipenem/meropenem) resistance	4 832	0.0	5 315	0.0	5 057	0.0	5 331	0.0	5 375	0.0	-
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	4 808	11.5	5 305	12.0	5 043	11.4	5 410	11.4	5 354	10.5	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	4 519	4.9	4 982	5.0	4 815	4.3	5 159	4.8	5 373	5.7	-
	Combined resistance to third-generation cephalosporins, fluoroquinolones, and aminoglycosides ^b	4 492	2.4	4 971	2.4	4 798	2.0	5 151	2.3	5 346	1.9	-
<i>K. pneumoniae</i>	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	760	4.1	744	4.6	805	4.5	868	6.3	901	7.2	↑
	Carbapenem (imipenem/meropenem) resistance	770	0.3	758	0.3	810	0.6	850	0.4	901	0.1	-
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	769	2.7	756	7.9	808	6.3	865	7.3	893	7.4	↑
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	727	2.3	721	2.9	774	2.6	831	4.2	901	5.8	↑
	Combined resistance to fluoroquinolones, third-generation cephalosporins and aminoglycosides ^b	726	1.2	716	2.4	771	1.6	827	3.1	893	3.5	↑
<i>P. aeruginosa</i>	Piperacillin-tazobactam resistance	351	9.4	377	6.4	391	6.6	457	6.6	433	5.5	-
	Ceftazidime resistance	352	5.4	378	6.1	390	4.4	463	4.5	433	5.3	-
	Carbapenem (imipenem/meropenem) resistance	352	6.0	377	6.1	391	4.9	462	6.3	433	3.7	-
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	292	7.9	356	11.2	376	12.8	468	8.5	431	10.2	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^c	352	2.3	378	1.9	391	1.0	458	0.7	433	1.4	-
	Combined resistance to ≥3 antimicrobial groups (among piperacillin-tazobactam, ceftazidime, carbapenems, fluoroquinolones and aminoglycosides) ^c	352	3.4	378	3.4	391	1.8	462	2.4	433	3.5	-
<i>Acinetobacter</i> species	Carbapenem (imipenem/meropenem) resistance	28	0.0	37	2.7	28	0.0	43	0.0	37	5.4	-
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	28	0.0	37	2.7	28	0.0	43	0.0	36	8.3	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	28	3.6	36	0.0	27	7.4	42	0.0	37	2.7	-
	Combined resistance to carbapenems, fluoroquinolones and aminoglycosides ^b	28	0.0	36	0.0	27	0.0	42	0.0	36	2.8	-
<i>S. aureus</i>	MRSA ^d	1 890	2.2	2 439	2.0	2 105	2.0	2 473	2.1	2 188	2.5	-
	Penicillin non-wild-type ^e	706	10.3	698	10.5	600	11.5	594	12.0	252	11.5	-
<i>S. pneumoniae</i>	Macrolide (azithromycin/clarithromycin/erythromycin) resistance	791	11.4	808	15.0	653	12.1	655	10.5	288	11.8	-
	Combined penicillin non-wild-type and resistance to macrolides ^e	687	6.1	671	6.7	591	5.8	571	6.3	247	7.3	-
<i>E. faecalis</i>	High-level gentamicin resistance	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
<i>E. faecium</i>	Vancomycin resistance	294	0.0	301	0.7	289	1.7	291	0.0	259	0.4	-

NA: not applicable as data were not reported for all years, a significant change in data source occurred during the period, or the number of isolates was < 20 in any year during the period.

ND: no data available.

Note: a small number of isolates were tested (n < 30), and the percentage resistance should be interpreted with caution.

^a ↑ and ↓ indicate statistically significantly increasing and decreasing trends, respectively; – indicates no statistically significant trend.

^b The aminoglycoside group includes only gentamicin and tobramycin from 2020 onwards.

^c The aminoglycoside group includes only tobramycin from 2020 onwards.

^d MRSA is based on AST results for oxacillin or ceftoxitin, but AST results reported as cloxacillin, dicloxacillin, flucloxacillin or meticillin are accepted as a marker for oxacillin resistance if AST results for oxacillin are not reported. Data from molecular confirmation tests (detection of *mecA* gene by PCR or a positive PBP2A-agglutination test) are given priority over phenotypic AST results.

^e Penicillin results are based on penicillin or, if not available, oxacillin. For *S. pneumoniae*, the term penicillin non-wild-type is used in this report, referring to *S. pneumoniae* isolates reported by the local laboratories as susceptible increased exposure (I) or resistant (R) to penicillin, assuming MIC to benzylpenicillin above those of wild-type isolates (>0.06 mg/L). The qualitative susceptibility categories (S/I/R) as reported by the laboratory are used, since quantitative susceptibility information is missing for a large part of the data. Laboratories not using EUCAST clinical breakpoints in the period 2016–2018 might define the cut-off values for the susceptibility categories differently.

FRANCE

Participating institutions:

Santé Publique France, www.santepubliquefrance.fr

Since 2020: Surveillance and Prevention of Antimicrobial RESistance in hospital settings (SPARES)

<https://www.preventioninfection.fr/>

National Reference Centre for Pneumococci, www.cnr-pneumo.com

Up to 2019: French National Observatory for the Epidemiology of Bacterial Resistance to Antimicrobials (ONERBA) through three participating networks: Azay-Résistance, Île-de-France, Réussir networks, www.onerba.org

Population and hospitals contributing data: coverage, representativeness and blood-culture rate, France, 2016–2020

Parameter	2016	2017	2018	2019	2020
Estimated national population coverage (%) ^a					
Laboratories collecting <i>S. pneumoniae</i> (CNRP)	51	58 ^b	61	56	38
Laboratories collecting others species (SPARES network since 2020 ^c)	20	22	21	20	48
Geographical representativeness	High	High	High	High	High
Hospital representativeness	High	High	High	High	High
Patient and isolate representativeness	High	High	High	High	High
Blood culture sets/1 000 patient-days ^d	77.1	88.1	105.2	112.2	54.5

^a Calculation based on proportion of hospital days in participating hospitals out of total hospital days in the country.

^b Restricted to first half of the year.

^c ONERBA laboratories up to 2019.

^d Calculated excluding laboratories collecting *S. pneumoniae*.

Laboratories contributing data: use of clinical breakpoint guidelines and participation in EARS-Net EQA, France, 2016–2020

Parameter	2016	2017	2018	2019	2020
Percentage of laboratories using EUCAST or EUCAST-harmonised guidelines	100	100	100	100 ^a	100 ^a
Percentage of laboratories participating in EARS-Net EQA	86	87	71	86	NA

EQA: external quality assessment.

NA: not applicable.

^a Starting with 2019 data, EARS-Net was restricted to laboratories using EUCAST or EUCAST-harmonised methodology and breakpoints.

Annual number of reporting laboratories,^a number of reported isolates and percentage of isolates reported from patients in ICUs,^b France, 2016–2020

Bacterial species	2016			2017			2018			2019			2020		
	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)
<i>E. coli</i>	49	11 337	9	54	13 392	8	49	12 645	8	46	13 536	8	779	18 939	8
<i>K. pneumoniae</i>	49	2 608	17	54	2 904	16	49	3 043	17	46	3 170	15	558	5 078	16
<i>P. aeruginosa</i>	49	1 988	24	36	1 721	22	34	1 902	25	45	2 200	21	490	3 656	26
<i>Acinetobacter</i> spp.	48	454	19	52	475	17	47	498	11	45	515	17	241	710	10
<i>S. aureus</i>	50	5 699	15	54	6 668	16	49	7 097	15	46	6 723	14	672	10 967	12
<i>S. pneumoniae</i>	175	1 046	Unknown	169	614	Unknown	143	1 045	Unknown	193	1 264	Unknown	127	668	Unknown
<i>E. faecalis</i>	49	2 022	20	53	2 259	20	48	2 300	20	46	2 526	19	508	4 456	21
<i>E. faecium</i>	48	819	29	53	1 000	27	49	1 001	27	46	1 080	24	295	1 428	28

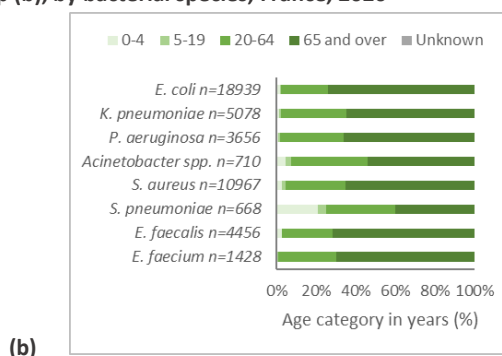
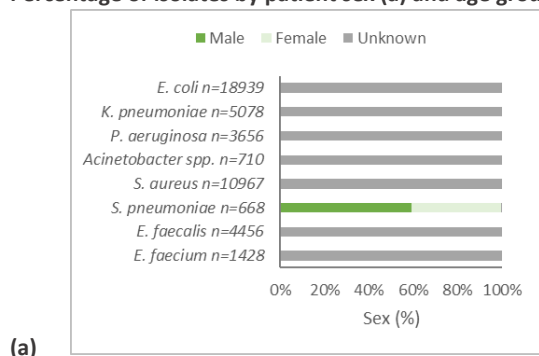
ICU: intensive care unit.

Lab: laboratories.

^a Number of laboratories reporting at least one isolate during the specific year. The total number of participating laboratories might be higher.

^b Isolates with missing information on hospital department are excluded, and results are presented only if data on hospital department are available for ≥70% of isolates.

Percentage of isolates by patient sex (a) and age group (b), by bacterial species, France, 2020



Total number of invasive isolates tested (n) and percentages of isolates with resistance phenotype (%), by bacterial species and antimicrobial group/agent, 2020 EU/EEA range, population-weighted mean and trend, France, 2016–2020

Bacterial species	Antimicrobial group/agent	2016		2017		2018		2019		2020		Trend 2016-2020
		n	%	n	%	n	%	n	%	n	%	
<i>E. coli</i>	Aminopenicillin (amoxicillin/ampicillin) resistance	11 248	57.2	13 293	55.6	12 553	55.6	13 415	54.5	17 674	53.9	NA
	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	11 313	11.2	13 352	10.2	12 614	9.6	13 019	8.8	18 857	9.5	NA
	Carbapenem (imipenem/meropenem) resistance	10 929	0.0	12 843	0.0	12 399	0.0	12 636	0.0	17 838	0.0	NA
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	11 251	16.7	13 328	15.0	12 443	16.3	13 431	16.0	18 569	15.9	NA
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^a	11 135	7.9	13 103	7.0	12 283	7.4	13 133	7.0	17 786	6.7	NA
	Combined resistance to third-generation cephalosporins, fluoroquinolones, and aminoglycosides ^a	11 082	3.8	13 038	3.0	12 107	3.5	12 639	3.0	17 433	2.9	NA
<i>K. pneumoniae</i>	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	2 597	28.9	2 892	28.8	3 033	30.8	3 075	30.2	5 045	27.8	NA
	Carbapenem (imipenem/meropenem) resistance	2 528	0.4	2 807	0.7	2 998	0.5	3 003	1.0	4 796	0.5	NA
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	2 589	27.7	2 886	26.8	2 997	30.4	3 143	30.9	5 001	28.1	NA
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^a	2 569	26.2	2 857	23.8	2 990	24.8	3 103	23.4	4 767	18.8	NA
<i>P. aeruginosa</i>	Combined resistance to fluoroquinolones, third-generation cephalosporins and aminoglycosides ^a	2 556	21.3	2 844	19.4	2 948	21.5	3 004	19.8	4 692	16.4	NA
	Piperacillin-tazobactam resistance	1 949	16.0	1 684	16.7	1 850	17.4	1 879	16.7	3 417	17.1	NA
	Ceftazidime resistance	1 956	11.3	1 568	12.2	1 892	13.0	1 999	11.5	3 574	12.8	NA
	Carbapenem (imipenem/meropenem) resistance	1 968	15.6	1 710	13.9	1 896	16.0	2 076	12.7	3 583	12.6	NA
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	1 971	13.6	1 709	15.1	1 893	15.1	2 074	13.7	3 585	14.8	NA
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	1 976	10.7	1 713	10.9	1 898	9.3	2 086	7.8	3 059	5.6	NA
<i>Acinetobacter species</i>	Combined resistance to ≥3 antimicrobial groups (among piperacillin-tazobactam, ceftazidime, carbapenems, fluoroquinolones and aminoglycosides) ^b	1 972	10.3	1 709	10.1	1 894	10.5	2 073	8.0	3 594	8.4	NA
	Carbapenem (imipenem/meropenem) resistance	450	7.1	469	6.2	490	6.5	487	9.0	692	3.3	NA
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	452	15.0	473	12.3	491	12.0	481	13.3	653	9.0	NA
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^a	449	12.2	474	9.1	482	8.9	473	14.6	661	8.3	NA
<i>S. aureus</i>	Combined resistance to carbapenems, fluoroquinolones and aminoglycosides ^a	447	6.7	468	5.3	470	5.5	458	8.5	628	1.9	NA
	MRSA ^c	5 578	13.8	6 472	12.9	6 903	12.1	6 467	11.6	10 763	12.1	NA
<i>S. pneumoniae</i>	Penicillin non-wild-type ^d	1 046	25.3	614	25.9	1 045	29.1	1 264	25.3	668	32.3	NA
	Macrolide (azithromycin/clarithromycin/erythromycin) resistance	1 046	22.9	614	23.1	1 045	23.9	1 264	19.4	668	21.6	NA
	Combined penicillin non-wild-type and resistance to macrolides ^d	1 046	18.0	614	17.6	1 045	20.4	1 264	16.1	668	18.4	NA
<i>E. faecalis</i>	High-level gentamicin resistance	1 057	15.0	795	12.7	1 568	9.8	1 346	12.0	ND	ND	NA
<i>E. faecium</i>	Vancomycin resistance	808	0.6	986	0.8	987	0.6	1 062	0.7	1 385	0.6	NA

NA: not applicable as data were not reported for all years, a significant change in data source occurred during the period, or the number of isolates was < 20 in any year during the period.

ND: no data available.

^a The aminoglycoside group includes only gentamicin and tobramycin from 2020 onwards.

^b The aminoglycoside group includes only tobramycin from 2020 onwards.

^c MRSA is based on AST results for oxacillin or ceftazidime, but AST results reported as cloxacillin, dicloxacillin, fluocloxacillin or meticillin are accepted as a marker for oxacillin resistance if AST results for oxacillin are not reported. Data from molecular confirmation tests (detection of *mecA* gene by PCR or a positive PBP2A-agglutination test) are given priority over phenotypic AST results.

^d Penicillin results are based on penicillin or, if not available, oxacillin. For *S. pneumoniae*, the term penicillin non-wild-type is used in this report, referring to *S. pneumoniae* isolates reported by the local laboratories as susceptible increased exposure (I) or resistant (R) to penicillin, assuming MIC to benzylpenicillin above those of wild-type isolates (>0.06 mg/L). The qualitative susceptibility categories (S/I/R) as reported by the laboratory are used, since quantitative susceptibility information is missing for a large part of the data. Laboratories not using EUCAST clinical breakpoints in the period 2016–2018 might define the cut-off values for the susceptibility categories differently.

GERMANY

Participating institutions:

Robert Koch Institute www.rki.de

Population and hospitals contributing data: coverage, representativeness and blood-culture rate, Germany, 2016–2020

Parameter	2016	2017	2018	2019	2020
Estimated national population coverage (%)	26	30	27	27	Unknown
Geographical representativeness	High	High	High	High	Unknown
Hospital representativeness	Medium	Medium	Medium	Medium	Unknown
Patient and isolate representativeness	High	High	High	High	Unknown
Blood culture sets/1 000 patient-days	26.2	27.2	30.8	37.9	Unknown

Laboratories contributing data: use of clinical breakpoint guidelines and participation in EARS-Net EQA, Germany, 2016–2020

Parameter	2016	2017	2018	2019	2020
Percentage of laboratories using EUCAST or EUCAST-harmonised guidelines	83	81	86	100 ^a	100 ^a
Percentage of laboratories participating in EARS-Net EQA	93	91	91	95	NA

EQA: external quality assessment.

NA: not applicable.

^a Starting with 2019 data, EARS-Net was restricted to laboratories using EUCAST or EUCAST-harmonised methodology and breakpoints.

Annual number of reporting laboratories,^a number of reported isolates and percentage of isolates reported from patients in ICUs,^b Germany, 2016–2020

Bacterial species	2016			2017			2018			2019			2020		
	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)
<i>E. coli</i>	41	17 199	14	56	22 945	14	48	21 994	15	47	23 415	15	50	27 521	15
<i>K. pneumoniae</i>	40	3 070	23	55	3 857	21	48	3 974	22	47	4 721	24	50	5 763	24
<i>P. aeruginosa</i>	39	1 423	27	55	1 896	26	47	1 792	26	46	2 108	27	50	2 579	25
<i>Acinetobacter</i> spp.	38	463	19	50	543	17	45	529	15	46	467	15	48	579	21
<i>S. aureus</i>	41	9 870	20	56	13 141	21	48	11 924	21	47	11 958	23	50	13 931	23
<i>S. pneumoniae</i>	40	1 403	23	54	2 049	22	48	1 916	24	46	2 035	24	50	1 314	27
<i>E. faecalis</i>	41	2 959	24	56	4 002	24	48	3 638	23	47	3 770	25	50	4 438	24
<i>E. faecium</i>	41	2 049	40	56	2 648	40	47	2 464	43	47	2 801	48	50	3 782	47

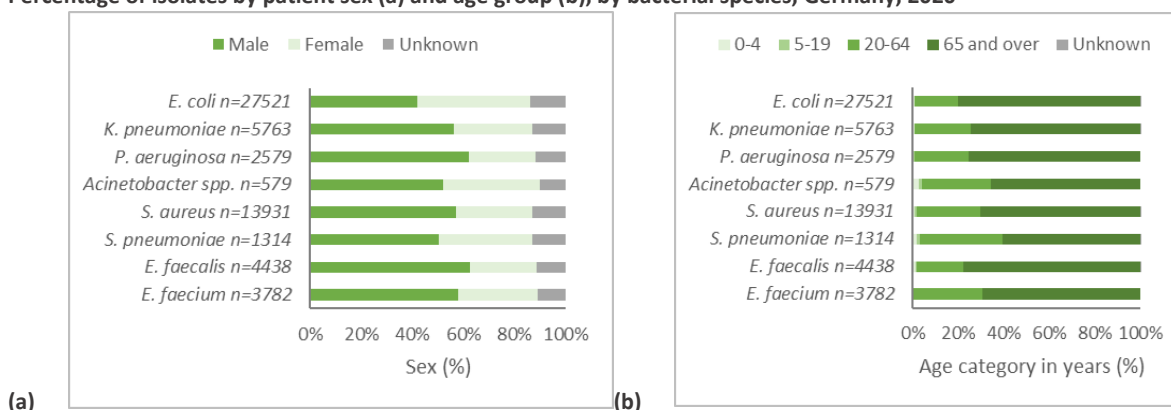
ICU: intensive care unit.

Lab: laboratories.

^a Number of laboratories reporting at least one isolate during the specific year. The total number of participating laboratories might be higher.

^b Isolates with missing information on hospital department are excluded, and results are presented only if data on hospital department are available for ≥70% of isolates.

Percentage of isolates by patient sex (a) and age group (b), by bacterial species, Germany, 2020



Total number of invasive isolates tested (n) and percentages of isolates with resistance phenotype (%), by bacterial species and antimicrobial group/agent, 2020 EU/EEA range, population-weighted mean and trend, Germany, 2016–2020

Bacterial species	Antimicrobial group/agent	2016		2017		2018		2019		2020		Trend 2016-2020 ^a
		n	%	n	%	n	%	n	%	n	%	
<i>E. coli</i>	Aminopenicillin (amoxicillin/ampicillin) resistance	15 957	49.0	21 646	48.9	20 841	49.2	23 324	48.7	27 284	47.5	↓
	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	17 190	11.1	22 929	12.3	21 989	12.2	23 413	11.5	27 520	10.3	↓
	Carbapenem (imipenem/meropenem) resistance	17 196	0.0	22 940	0.0	21 957	0.0	23 391	0.0	27 517	0.0	-
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	17 196	19.4	22 940	20.7	21 958	19.8	23 374	17.5	27 505	16.5	↓
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	17 023	7.0	22 478	7.0	21 634	6.9	22 990	8.3	26 358	7.5	↑
	Combined resistance to third-generation cephalosporins, fluoroquinolones, and aminoglycosides ^b	17 013	3.4	22 464	3.7	21 630	3.4	22 971	3.1	26 344	2.7	↓
<i>K. pneumoniae</i>	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	3 068	13.6	3 854	14.6	3 973	12.9	4 719	12.2	5 762	11.0	↓
	Carbapenem (imipenem/meropenem) resistance	3 068	0.5	3 857	0.5	3 968	0.4	4 718	0.9	5 762	0.5	-
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	3 068	12.6	3 857	15.3	3 970	13.4	4 715	13.1	5 761	11.6	↓
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	3 042	7.7	3 776	8.2	3 918	6.2	4 654	7.3	5 545	5.6	↓
	Combined resistance to fluoroquinolones, third-generation cephalosporins and aminoglycosides ^b	3 038	5.3	3 774	6.3	3 918	4.7	4 649	4.8	5 544	3.7	↓
<i>P. aeruginosa</i>	Piperacillin-tazobactam resistance	1 410	15.0	1 856	12.6	1 765	12.4	2 077	11.7	2 558	11.7	↓
	Ceftazidime resistance	1 421	10.1	1 883	9.8	1 784	9.1	2 104	10.0	2 576	10.0	-
	Carbapenem (imipenem/meropenem) resistance	1 422	14.5	1 892	12.6	1 790	12.1	2 108	12.9	2 579	13.8	-
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance ^c	1 423	12.4	1 895	13.9	1 789	12.4	2 108	13.4	2 579	10.6	↓
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^d	1 421	6.8	1 869	4.8	1 788	3.5	2 107	4.1	2 348	2.0	↓
	Combined resistance to ≥3 antimicrobial groups (among piperacillin-tazobactam, ceftazidime, carbapenems, fluoroquinolones and aminoglycosides) ^d	1 423	7.3	1 894	6.6	1 790	5.8	2 108	6.3	2 579	6.6	-
<i>Acinetobacter</i> species	Carbapenem (imipenem/meropenem) resistance	452	4.9	540	4.1	527	4.4	462	2.2	578	3.5	-
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	460	5.7	536	6.5	520	6.7	443	5.0	568	5.1	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	436	3.0	498	3.4	498	3.4	430	4.2	527	4.9	-
	Combined resistance to carbapenems, fluoroquinolones and aminoglycosides ^b	435	2.3	495	1.2	498	2.2	425	1.4	527	2.5	-
<i>S. aureus</i>	MRSA ^e	9 866	10.2	13 128	9.1	11 918	7.7	11 950	6.7	13 927	5.5	↓
	Penicillin non-wild-type ^f	1 359	4.6	1 989	4.5	1 867	5.2	1 962	5.7	1 275	6.1	↑#
<i>S. pneumoniae</i>	Macrolide (azithromycin/clarithromycin/erythromycin) resistance	1 386	8.0	2 029	6.9	1 883	7.1	1 970	7.7	1 281	7.2	-
	Combined penicillin non-wild-type and resistance to macrolides ^f	1 342	2.2	1 969	2.2	1 839	2.5	1 903	3.0	1 242	2.2	-
<i>E. faecalis</i>	High-level gentamicin resistance	2 341	25.2	2 930	25.3	2 273	22.9	1 561	18.0	2 288	16.3	↓
<i>E. faecium</i>	Vancomycin resistance	2 043	11.9	2 642	16.5	2 458	23.7	2 797	26.3	3 770	22.3	↑

^a ↑ and ↓ indicate statistically significantly increasing and decreasing trends, respectively; # indicates a significant trend in the overall data, but not in data that only included laboratories reporting continuously for all five years; – indicates no statistically significant trend.

^b The aminoglycoside group includes only gentamicin and tobramycin from 2020 onwards.

^c For 2020 only ciprofloxacin data was reported.

^d The aminoglycoside group includes only tobramycin from 2020 onwards.

^e MRSA is based on AST results for oxacillin or cefoxitin, but AST results reported as cloxacillin, dicloxacillin, fluocloxacillin or meticillin are accepted as a marker for oxacillin resistance if AST results for oxacillin are not reported. Data from molecular confirmation tests (detection of *mecA* gene by PCR or a positive PBP2A-agglutination test) are given priority over phenotypic AST results.

^f Penicillin results are based on penicillin or, if not available, oxacillin. For *S. pneumoniae*, the term penicillin non-wild-type is used in this report, referring to *S. pneumoniae* isolates reported by the local laboratories as susceptible increased exposure (I) or resistant (R) to penicillin, assuming MIC to benzylpenicillin above those of wild-type isolates (>0.06 mg/L). The qualitative susceptibility categories (S/I/R) as reported by the laboratory are used, since quantitative susceptibility information is missing for a large part of the data. Laboratories not using EUCAST clinical breakpoints in the period 2016–2018 might define the cut-off values for the susceptibility categories differently.

GREECE

Participating institutions:

National Public Health Organization, Central Public Health Laboratory

University of West Attica, Department of Public Health Policy, School of Public Health

Population and hospitals contributing data: coverage, representativeness and blood-culture rate, Greece, 2016–2020

Parameter	2016	2017	2018	2019	2020
Estimated national population coverage (%)	55	Unknown	68	Unknown	60
Geographical representativeness	Unknown	Unknown	High	Unknown	High
Hospital representativeness	Unknown	Unknown	High	Unknown	High
Patient and isolate representativeness	Unknown	Unknown	Medium	Unknown	Medium
Blood culture sets/1 000 patient-days	Unknown	Unknown	Unknown	Unknown	Unknown

Laboratories contributing data: use of clinical breakpoint guidelines and participation in EARS-Net EQA, Greece, 2016–2020

Parameter	2016	2017	2018	2019	2020
Percentage of laboratories using EUCAST or EUCAST-harmonised guidelines	12	13	21	100 ^a	100 ^a
Percentage of laboratories participating in EARS-Net EQA	96	89	96	95	NA

EQA: external quality assessment.

NA: not applicable.

^a Starting with 2019 data, EARS-Net was restricted to laboratories using EUCAST or EUCAST-harmonised methodology and breakpoints.

Annual number of reporting laboratories,^a number of reported isolates and percentage of isolates reported from patients in ICUs,^b Greece, 2016–2020

Bacterial species	2016			2017			2018			2019			2020		
	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)
<i>E. coli</i>	31	1 306	4	32	1 472	5	37	1 642	5	6	204	6	13	567	6
<i>K. pneumoniae</i>	30	1 183	41	33	1 363	38	36	1 500	37	6	312	37	12	728	38
<i>P. aeruginosa</i>	31	705	42	31	821	37	37	859	37	6	141	45	12	390	35
<i>Acinetobacter</i> spp.	29	903	57	32	1 096	50	34	1 015	48	5	196	45	12	742	47
<i>S. aureus</i>	31	682	10	33	833	11	36	889	7	5	171	8	13	449	14
<i>S. pneumoniae</i>	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
<i>E. faecalis</i>	28	576	35	33	638	25	36	682	28	6	141	26	11	376	28
<i>E. faecium</i>	28	358	31	31	412	26	35	529	25	5	117	32	12	460	39

ICU: intensive care unit.

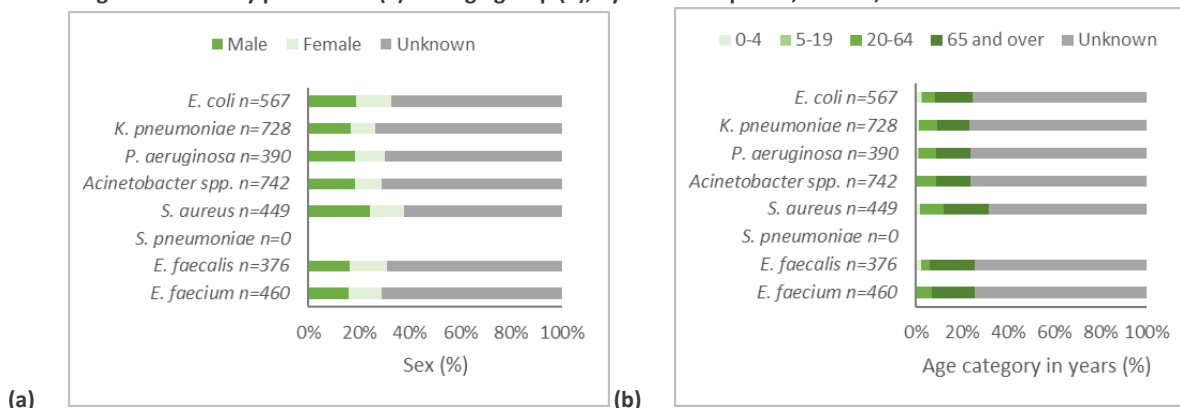
Lab: laboratories.

ND: no data available.

^a Number of laboratories reporting at least one isolate during the specific year. The total number of participating laboratories might be higher.

^b Isolates with missing information on hospital department are excluded, and results are presented only if data on hospital department are available for ≥70% of isolates.

Percentage of isolates by patient sex (a) and age group (b), by bacterial species, Greece, 2020



Total number of invasive isolates tested (n) and percentages of isolates with resistance phenotype (%), by bacterial species and antimicrobial group/agent, 2020 EU/EEA range, population-weighted mean and trend, Greece, 2016–2020

Bacterial species	Antimicrobial group/agent	2016		2017		2018		2019		2020		Trend 2016-2020
		n	%	n	%	n	%	n	%	n	%	
<i>E. coli</i>	Aminopenicillin (amoxicillin/ampicillin) resistance	1 170	56.9	1 306	57.5	1 444	57.5	154	57.1	452	55.5	NA
	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	1 304	17.6	1 470	18.3	1 640	19.3	190	18.9	567	21.9	NA
	Carbapenem (imipenem/meropenem) resistance	1 303	0.9	1 467	1.6	1 640	1.0	203	1.0	566	0.5	NA
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	1 304	32.1	1 464	32.9	1 631	30.8	203	29.6	565	32.7	NA
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^a	1 301	16.8	1 467	17.0	1 633	15.5	201	12.9	562	18.7	NA
	Combined resistance to third-generation cephalosporins, fluoroquinolones, and aminoglycosides ^a	1 300	10.4	1 463	9.8	1 628	9.8	186	8.6	561	10.5	NA
<i>K. pneumoniae</i>	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	1 181	72.5	1 362	69.2	1 500	70.7	310	66.5	726	74.5	NA
	Carbapenem (imipenem/meropenem) resistance	1 180	66.9	1 363	64.7	1 498	63.9	312	58.3	726	66.3	NA
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	1 180	68.6	1 346	66.9	1 488	68.1	311	66.9	726	74.4	NA
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^a	1 171	52.9	1 348	53.2	1 487	54.4	310	55.2	718	61.0	NA
	Combined resistance to fluoroquinolones, third-generation cephalosporins and aminoglycosides ^a	1 171	48.4	1 345	47.9	1 487	50.4	307	53.1	714	58.3	NA
<i>P. aeruginosa</i>	Piperacillin-tazobactam resistance	644	23.3	771	23.7	815	21.5	109	34.9	270	35.6	NA
	Ceftazidime resistance	696	33.6	814	24.9	853	22.3	136	39.7	344	30.2	NA
	Carbapenem (imipenem/meropenem) resistance	699	42.1	821	39.3	856	37.5	141	48.9	378	35.7	NA
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	702	34.6	816	35.3	856	33.1	141	46.8	333	42.9	NA
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	701	28.0	815	30.2	856	26.5	141	42.6	301	28.6	NA
	Combined resistance to ≥3 antimicrobial groups (among piperacillin-tazobactam, ceftazidime, carbapenems, fluoroquinolones and aminoglycosides) ^b	701	31.5	816	32.0	855	28.7	141	44.7	360	30.6	NA
<i>Acinetobacter</i> species	Carbapenem (imipenem/meropenem) resistance	861	95.4	1 095	94.8	1 013	92.4	196	92.3	740	94.6	NA
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	862	94.9	1 060	96.0	998	93.5	189	95.8	729	95.7	NA
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^a	878	85.0	1 064	85.6	1 003	81.6	194	88.7	727	90.4	NA
<i>S. aureus</i>	Combined resistance to carbapenems, fluoroquinolones and aminoglycosides ^a	838	84.0	1 059	84.3	995	81.3	187	91.4	715	90.8	NA
	MRSA ^c	639	38.8	822	38.4	888	36.4	170	37.6	448	40.2	NA
<i>S. pneumoniae</i>	Penicillin non-wild-type ^d	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
	Macrolide (azithromycin/clarithromycin/erythromycin) resistance	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
	Combined penicillin non-wild-type and resistance to macrolides ^d	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
<i>E. faecalis</i>	High-level gentamicin resistance	540	15.9	621	12.2	668	12.0	128	7.8	298	9.7	NA
<i>E. faecium</i>	Vancomycin resistance	358	27.9	412	30.8	527	28.1	117	47.0	445	41.8	NA

NA: not applicable as data were not reported for all years, a significant change in data source occurred during the period, or the number of isolates was < 20 in any year during the period. For Greece, the change comprises the decrease in the number of laboratories reporting data starting with 2019 data, as EARS-Net was restricted to laboratories using EUCAST or EUCAST-harmonized methodology and breakpoints.

ND: no data available.

^a The aminoglycoside group includes only gentamicin and tobramycin from 2020 onwards.

^b The aminoglycoside group includes only tobramycin from 2020 onwards.

^c MRSA is based on AST results for oxacillin or ceftazidime, but AST results reported as cloxacillin, dicloxacillin, flucloxacillin or meticillin are accepted as a marker for oxacillin resistance if AST results for oxacillin are not reported. Data from molecular confirmation tests (detection of *mecA* gene by PCR or a positive PBP2A-agglutination test) are given priority over phenotypic AST results.

^d Penicillin results are based on penicillin or, if not available, oxacillin. For *S. pneumoniae*, the term penicillin non-wild-type is used in this report, referring to *S. pneumoniae* isolates reported by the local laboratories as susceptible increased exposure (I) or resistant (R) to penicillin, assuming MIC to benzylpenicillin above those of wild-type isolates (>0.06 mg/L). The qualitative susceptibility categories (S/I/R) as reported by the laboratory are used, since quantitative susceptibility information is missing for a large part of the data. Laboratories not using EUCAST clinical breakpoints in the period 2016–2018 might define the cut-off values for the susceptibility categories differently.

HUNGARY

Participating institutions:

National Public Health Center www.oek.hu

Population and hospitals contributing data: coverage, representativeness and blood-culture rate, Hungary, 2016–2020

Parameter	2016	2017	2018	2019	2020
Estimated national population coverage (%)	90	Unknown	90	90	90
Geographical representativeness	High	Unknown	High	High	High
Hospital representativeness	Unknown	Unknown	High	High	High
Patient and isolate representativeness	Unknown	Unknown	High	High	High
Blood culture sets/1 000 patient-days	9.8	11.5	12.2	12.3	17.2

Laboratories contributing data: use of clinical breakpoint guidelines and participation in EARS-Net EQA, Hungary, 2016–2020

Parameter	2016	2017	2018	2019	2020
Percentage of laboratories using EUCAST or EUCAST-harmonised guidelines	100	100	100	100 ^a	100 ^a
Percentage of laboratories participating in EARS-Net EQA	100	97	93	97	NA

EQA: external quality assessment.

NA: not applicable.

^a Starting with 2019 data, EARS-Net was restricted to laboratories using EUCAST or EUCAST-harmonised methodology and breakpoints.

Annual number of reporting laboratories,^a number of reported isolates and percentage of isolates reported from patients in ICUs,^b Hungary, 2016–2020

Bacterial species	2016			2017			2018			2019			2020		
	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)
<i>E. coli</i>	29	1 995	14	31	2 061	13	29	2 373	11	30	2 413	12	29	1 963	15
<i>K. pneumoniae</i>	29	723	29	29	693	28	28	850	24	29	912	26	26	730	32
<i>P. aeruginosa</i>	29	740	45	30	735	49	29	807	40	30	884	42	26	779	44
<i>Acinetobacter</i> spp.	26	401	57	31	358	51	26	358	54	27	420	56	24	534	Unknown
<i>S. aureus</i>	28	1 668	20	28	1 566	19	27	1 721	17	28	1 884	16	28	1 513	23
<i>S. pneumoniae</i>	27	174	24	27	204	16	25	207	20	27	222	19	21	124	25
<i>E. faecalis</i>	28	786	38	30	769	38	29	750	36	30	816	37	28	962	49
<i>E. faecium</i>	25	272	46	27	315	46	29	303	42	27	304	42	27	471	Unknown

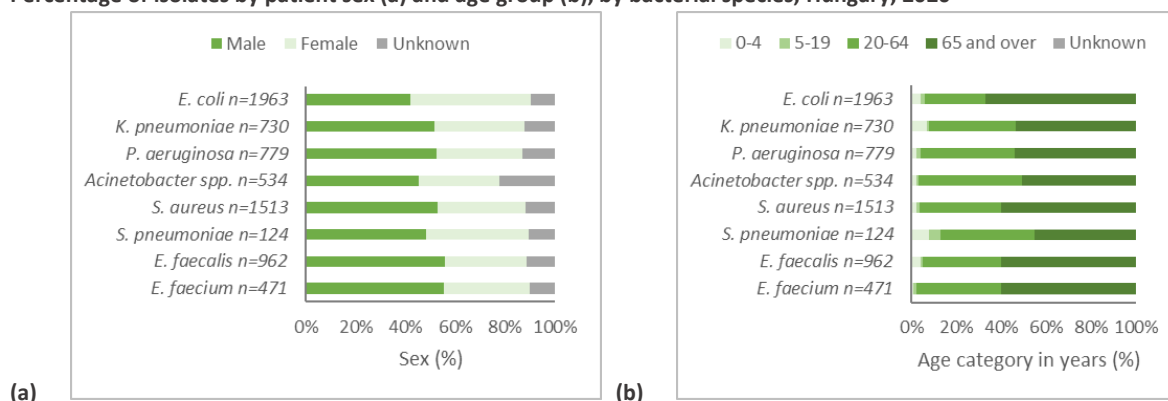
ICU: intensive care unit.

Lab: laboratories.

^a Number of laboratories reporting at least one isolate during the specific year. The total number of participating laboratories might be higher.

^b Isolates with missing information on hospital department are excluded, and results are presented only if data on hospital department are available for ≥70% of isolates.

Percentage of isolates by patient sex (a) and age group (b), by bacterial species, Hungary, 2020



Total number of invasive isolates tested (n) and percentages of isolates with resistance phenotype (%), by bacterial species and antimicrobial group/agent, 2020 EU/EEA range, population-weighted mean and trend, Hungary, 2016–2020

Bacterial species	Antimicrobial group/agent	2016		2017		2018		2019		2020		Trend 2016-2020 ^a
		n	%	n	%	n	%	n	%	n	%	
<i>E. coli</i>	Aminopenicillin (amoxicillin/ampicillin) resistance	1 969	57.4	2 021	60.3	2 312	62.7	2 363	59.3	1 804	58.6	-
	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	1 993	16.7	2 058	20.1	2 370	22.6	2 413	20.6	1 962	20.1	↑
	Carbapenem (imipenem/meropenem) resistance	1 905	0.0	1 987	0.1	2 279	0.0	2 326	0.0	1 917	0.0	-
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	1 986	26.8	2 051	30.6	2 364	33.2	2 398	30.3	1 958	30.3	↑
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	1 992	13.3	2 060	15.1	2 264	17.4	2 411	15.7	1 954	16.7	↑
	Combined resistance to third-generation cephalosporins, fluoroquinolones, and aminoglycosides ^b	1 981	6.4	2 047	8.2	2 254	11.4	2 397	10.4	1 950	8.8	↑
<i>K. pneumoniae</i>	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	722	37.5	693	41.1	848	40.2	911	36.7	728	40.4	-
	Carbapenem (imipenem/meropenem) resistance	703	0.4	681	0.1	827	0.2	890	0.9	721	0.7	-
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	713	35.2	685	41.5	842	38.0	909	36.7	728	40.8	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	720	34.7	693	37.8	845	32.7	912	30.8	727	34.9	-
	Combined resistance to fluoroquinolones, third-generation cephalosporins and aminoglycosides ^b	711	30.1	685	33.1	837	28.9	908	26.4	723	31.8	-
<i>P. aeruginosa</i>	Piperacillin-tazobactam resistance	720	23.6	721	24.3	791	24.3	860	19.7	774	20.3	↓
	Ceftazidime resistance	735	20.7	729	23.9	804	22.5	882	18.4	772	20.6	-
	Carbapenem (imipenem/meropenem) resistance	739	33.2	733	36.6	807	37.3	883	33.2	779	33.8	-
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	736	24.3	732	23.4	805	26.0	879	20.3	777	22.0	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^c	740	17.6	734	14.6	784	17.9	883	16.9	761	11.4	↓
	Combined resistance to ≥3 antimicrobial groups (among piperacillin-tazobactam, ceftazidime, carbapenems, fluoroquinolones and aminoglycosides) ^c	740	19.1	735	18.1	807	20.2	883	17.3	778	15.2	↓#
<i>Acinetobacter</i> species	Carbapenem (imipenem/meropenem) resistance	401	57.1	358	52.0	357	55.2	418	51.0	534	73.0	↑
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	397	68.0	352	67.0	356	66.0	412	63.3	530	77.0	↑
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	401	59.1	358	56.1	343	48.7	419	50.6	532	72.4	↑
	Combined resistance to carbapenems, fluoroquinolones and aminoglycosides ^b	397	51.4	352	48.6	341	41.3	410	45.6	529	69.4	↑
<i>S. aureus</i>	MRSA ^d	1 668	25.2	1 566	23.6	1 721	23.1	1 884	19.4	1 513	21.0	↓
	Penicillin non-wild-type ^e	174	15.5	204	6.9	207	10.1	222	6.3	124	8.9	↓
<i>S. pneumoniae</i>	Macrolide (azithromycin/clarithromycin/erythromycin) resistance	166	13.3	187	11.8	190	14.7	215	12.1	115	17.4	-
	Combined penicillin non-wild-type and resistance to macrolides ^e	166	7.8	187	6.4	190	7.9	215	5.1	115	8.7	-
<i>E. faecalis</i>	High-level gentamicin resistance	786	42.2	769	41.5	750	38.0	816	33.7	962	42.6	-
<i>E. faecium</i>	Vancomycin resistance	272	22.4	315	28.3	301	39.5	304	35.9	471	34.8	↑

^a ↑ and ↓ indicate statistically significantly increasing and decreasing trends, respectively; # indicates a significant trend in the overall data, but not in data that only included laboratories reporting continuously for all five years; – indicates no statistically significant trend.

^b The aminoglycoside group includes only gentamicin and tobramycin from 2020 onwards.

^c The aminoglycoside group includes only tobramycin from 2020 onwards.

^d MRSA is based on AST results for oxacillin or cefoxitin, but AST results reported as cloxacillin, dicloxacillin, flucloxacillin or meticillin are accepted as a marker for oxacillin resistance if AST results for oxacillin are not reported. Data from molecular confirmation tests (detection of *mecA* gene by PCR or a positive PBP2A-agglutination test) are given priority over phenotypic AST results.

^e Penicillin results are based on penicillin or, if not available, oxacillin. For *S. pneumoniae*, the term penicillin non-wild-type is used in this report, referring to *S. pneumoniae* isolates reported by the local laboratories as susceptible increased exposure (I) or resistant (R) to penicillin, assuming MIC to benzylpenicillin above those of wild-type isolates (>0.06 mg/L). The qualitative susceptibility categories (S/I/R) as reported by the laboratory are used, since quantitative susceptibility information is missing for a large part of the data. Laboratories not using EUCAST clinical breakpoints in the period 2016–2018 might define the cut-off values for the susceptibility categories differently.

ICELAND

Participating institutions:

National University Hospital of Iceland

Centre for Health Security and Infectious Disease Control

Population and hospitals contributing data: coverage, representativeness and blood-culture rate, Iceland, 2016–2020

Parameter	2016	2017	2018	2019	2020
Estimated national population coverage (%)	100	Unknown	100	100	100
Geographical representativeness	High	Unknown	High	High	High
Hospital representativeness	Unknown	Unknown	High	High	High
Patient and isolate representativeness	Unknown	Unknown	High	High	High
Blood culture sets/1 000 patient-days	Unknown	Unknown	50.6	61.6	61.3

Laboratories contributing data: use of clinical breakpoint guidelines and participation in EARS-Net EQA, Iceland, 2016–2020

Parameter	2016	2017	2018	2019	2020
Percentage of laboratories using EUCAST or EUCAST-harmonised guidelines	50	50	100	100 ^a	100 ^a
Percentage of laboratories participating in EARS-Net EQA	100	100	50	100	NA

EQA: external quality assessment.

NA: not applicable.

^a Starting with 2019 data, EARS-Net was restricted to laboratories using EUCAST or EUCAST-harmonised methodology and breakpoints.

Annual number of reporting laboratories,^a number of reported isolates and percentage of isolates reported from patients in ICUs,^b Iceland, 2016–2020

Bacterial species	2016			2017			2018			2019			2020		
	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)
<i>E. coli</i>	2	192	1	2	213	1	2	198	2	2	257	2	2	245	2
<i>K. pneumoniae</i>	2	25	4	2	17	0	2	16	7	2	23	0	2	32	3
<i>P. aeruginosa</i>	2	17	13	1	17	24	2	12	0	2	22	14	2	25	19
<i>Acinetobacter</i> spp.	1	3	<10 isolates	1	6	<10 isolates	1	2	<10 isolates	1	3	<10 isolates	1	3	<10 isolates
<i>S. aureus</i>	2	76	4	2	69	10	2	82	9	2	121	4	2	116	6
<i>S. pneumoniae</i>	2	19	5	2	27	4	2	31	3	2	44	0	2	20	0
<i>E. faecalis</i>	2	24	10	2	33	9	2	30	7	2	35	9	2	30	7
<i>E. faecium</i>	1	16	13	1	17	12	2	16	21	2	13	31	2	19	24

ICU: intensive care unit.

Lab: laboratories.

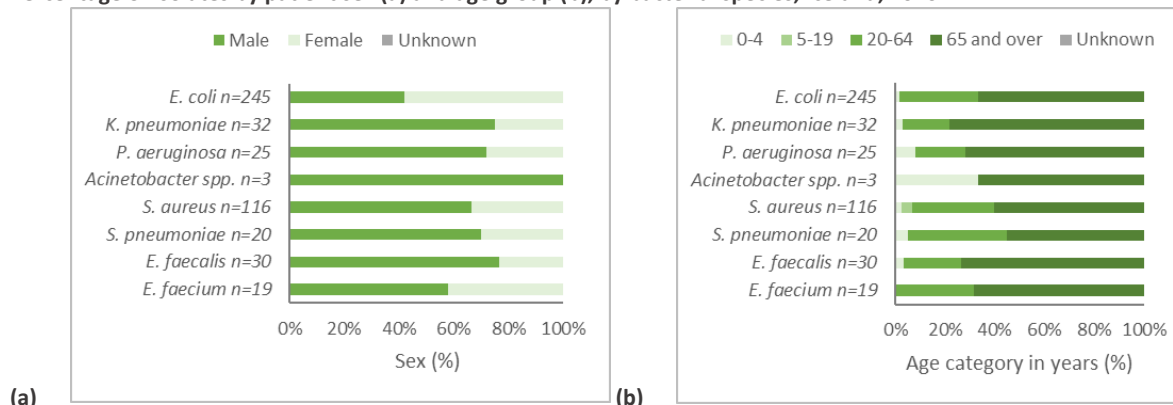
< 10 isolates: no percentage is displayed if < 10 isolates were available for analysis.

Note: a small number of isolates were tested (n < 30), and the percentage resistance should be interpreted with caution.

^a Number of laboratories reporting at least one isolate during the specific year. The total number of participating laboratories might be higher.

^b Isolates with missing information on hospital department are excluded, and results are presented only if data on hospital department are available for ≥70% of isolates.

Percentage of isolates by patient sex (a) and age group (b), by bacterial species, Iceland, 2020



Total number of invasive isolates tested (n) and percentages of isolates with resistance phenotype (%), by bacterial species and antimicrobial group/agent, 2020 EU/EEA range, population-weighted mean and trend, Iceland, 2016–2020

Bacterial species	Antimicrobial group/agent	2016		2017		2018		2019		2020		Trend 2016-2020 ^a
		n	%	n	%	n	%	n	%	n	%	
<i>E. coli</i>	Aminopenicillin (amoxicillin/ampicillin) resistance	192	43.8	213	41.3	198	49.0	257	52.5	245	55.1	↑
	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	192	4.2	213	6.1	198	8.1	257	7.0	245	11.0	↑
	Carbapenem (imipenem/meropenem) resistance	6	<10 isolates	8	<10 isolates	13	0.0	2	<10 isolates	245	0.0	NA
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	178	9.6	199	11.6	192	17.2	252	13.1	245	11.8	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	192	3.6	213	5.6	197	6.1	256	4.7	245	7.8	-
	Combined resistance to third-generation cephalosporins, fluoroquinolones, and aminoglycosides ^b	178	1.1	199	1.5	191	2.1	251	0.4	245	3.3	-
<i>K. pneumoniae</i>	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	25	0.0	17	5.9	16	0.0	23	4.3	32	0.0	NA
	Carbapenem (imipenem/meropenem) resistance	1	<10 isolates	ND	ND	1	<10 isolates	ND	ND	32	0.0	NA
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	21	0.0	16	6.3	16	0.0	23	4.3	32	0.0	NA
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	25	0.0	17	11.8	16	0.0	23	8.7	32	0.0	NA
	Combined resistance to fluoroquinolones, third-generation cephalosporins and aminoglycosides ^b	21	0.0	16	0.0	16	0.0	23	0.0	32	0.0	NA
<i>P. aeruginosa</i>	Piperacillin-tazobactam resistance	ND	ND	ND	ND	ND	ND	2	<10 isolates	ND	ND	NA
	Ceftazidime resistance	17	0.0	17	0.0	12	0.0	22	13.6	25	8.0	NA
	Carbapenem (imipenem/meropenem) resistance	17	5.9	17	0.0	12	0.0	22	0.0	25	12.0	NA
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	17	17.6	17	11.8	12	8.3	22	4.5	25	4.0	NA
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^c	17	0.0	17	0.0	12	0.0	22	4.5	25	0.0	NA
	Combined resistance to ≥3 antimicrobial groups (among piperacillin-tazobactam, ceftazidime, carbapenems, fluoroquinolones and aminoglycosides) ^c	17	0.0	17	0.0	12	0.0	22	4.5	25	0.0	NA
<i>Acinetobacter</i> species	Carbapenem (imipenem/meropenem) resistance	3	<10 isolates	6	<10 isolates	2	<10 isolates	3	<10 isolates	3	<10 isolates	NA
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	3	<10 isolates	6	<10 isolates	2	<10 isolates	3	<10 isolates	3	<10 isolates	NA
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	3	<10 isolates	6	<10 isolates	2	<10 isolates	3	<10 isolates	3	<10 isolates	NA
	Combined resistance to carbapenems, fluoroquinolones and aminoglycosides ^b	3	<10 isolates	6	<10 isolates	2	<10 isolates	3	<10 isolates	3	<10 isolates	NA
<i>S. aureus</i>	MRSA ^d	76	1.3	69	1.4	82	0.0	121	6.6	116	5.2	↑
	Penicillin non-wild-type ^e	19	10.5	27	18.5	31	9.7	44	15.9	20	30.0	NA
<i>S. pneumoniae</i>	Macrolide (azithromycin/clarithromycin/erythromycin) resistance	19	0.0	27	18.5	31	12.9	44	15.9	20	30.0	NA
	Combined penicillin non-wild-type and resistance to macrolides ^e	19	0.0	27	14.8	31	9.7	44	11.4	20	30.0	NA
<i>E. faecalis</i>	High-level gentamicin resistance	24	16.7	33	18.2	30	16.7	35	11.4	30	6.7	-
<i>E. faecium</i>	Vancomycin resistance	16	0.0	17	0.0	16	0.0	13	0.0	19	0.0	NA

NA: not applicable as data were not reported for all years, a significant change in data source occurred during the period, or the number of isolates was < 20 in any year during the period.

ND: no data available.

< 10 isolates: no percentage is displayed if < 10 isolates were available for analysis.

Note: a small number of isolates were tested (n < 30), and the percentage resistance should be interpreted with caution.

^a ↑ and ↓ indicate statistically significantly increasing and decreasing trends, respectively; – indicates no statistically significant trend.

^b The aminoglycoside group includes only gentamicin and tobramycin from 2020 onwards.

^c The aminoglycoside group includes only tobramycin from 2020 onwards.

^d MRSA is based on AST results for oxacillin or ceftoxitin, but AST results reported as cloxacillin, dicloxacillin, fluocloxacillin or meticillin are accepted as a marker for oxacillin resistance if AST results for oxacillin are not reported. Data from molecular confirmation tests (detection of *mecA* gene by PCR or a positive PBP2A-agglutination test) are given priority over phenotypic AST results.

^e Penicillin results are based on penicillin or, if not available, oxacillin. For *S. pneumoniae*, the term penicillin non-wild-type is used in this report, referring to *S. pneumoniae* isolates reported by the local laboratories as susceptible increased exposure (I) or resistant (R) to penicillin, assuming MIC to benzylpenicillin above those of wild-type isolates (>0.06 mg/L). The qualitative susceptibility categories (S/I/R) as reported by the laboratory are used, since quantitative susceptibility information is missing for a large part of the data. Laboratories not using EUCAST clinical breakpoints in the period 2016–2018 might define the cut-off values for the susceptibility categories differently.

IRELAND

Participating institutions:

Health Protection Surveillance Centre www.hpsc.ie

Population and hospitals contributing data: coverage, representativeness and blood-culture rate, Ireland, 2016–2020

Parameter	2016	2017	2018	2019	2020
Estimated national population coverage (%)	99	100	100	96	76
Geographical representativeness	High	High	High	High	High
Hospital representativeness	High	High	High	High	High
Patient and isolate representativeness	High	High	High	High	High
Blood culture sets/1 000 patient-days	57.5	58	57.3	58.9	Unknown

Laboratories contributing data: use of clinical breakpoint guidelines and participation in EARS-Net EQA, Ireland, 2016–2020

Parameter	2016	2017	2018	2019	2020
Percentage of laboratories using EUCAST or EUCAST-harmonised guidelines	91	94	97	100 ^a	100 ^a
Percentage of laboratories participating in EARS-Net EQA	90	85	87	84	NA

EQA: external quality assessment.

NA: not applicable.

^a Starting with 2019 data, EARS-Net was restricted to laboratories using EUCAST or EUCAST-harmonised methodology and breakpoints.

Annual number of reporting laboratories,^a number of reported isolates and percentage of isolates reported from patients in ICUs,^b Ireland, 2016–2020

Bacterial species	2016			2017			2018			2019			2020		
	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)
<i>E. coli</i>	39	2 991	Unknown	39	3 125	Unknown	38	3 239	Unknown	34	3 233	Unknown	26	2 135	Unknown
<i>K. pneumoniae</i>	32	453	Unknown	35	479	Unknown	34	483	Unknown	30	527	Unknown	25	380	Unknown
<i>P. aeruginosa</i>	30	243	Unknown	33	288	Unknown	29	273	Unknown	27	276	Unknown	20	196	Unknown
<i>Acinetobacter</i> spp.	25	68	Unknown	23	66	Unknown	17	62	Unknown	21	66	Unknown	14	50	Unknown
<i>S. aureus</i>	37	1 143	Unknown	37	1 144	Unknown	37	1 188	Unknown	32	1 146	Unknown	25	777	Unknown
<i>S. pneumoniae</i>	31	363	Unknown	31	412	Unknown	32	455	Unknown	27	348	Unknown	21	136	Unknown
<i>E. faecalis</i>	34	290	Unknown	33	340	Unknown	36	332	Unknown	30	301	Unknown	24	247	Unknown
<i>E. faecium</i>	31	423	Unknown	33	442	Unknown	30	419	Unknown	27	443	Unknown	21	352	Unknown

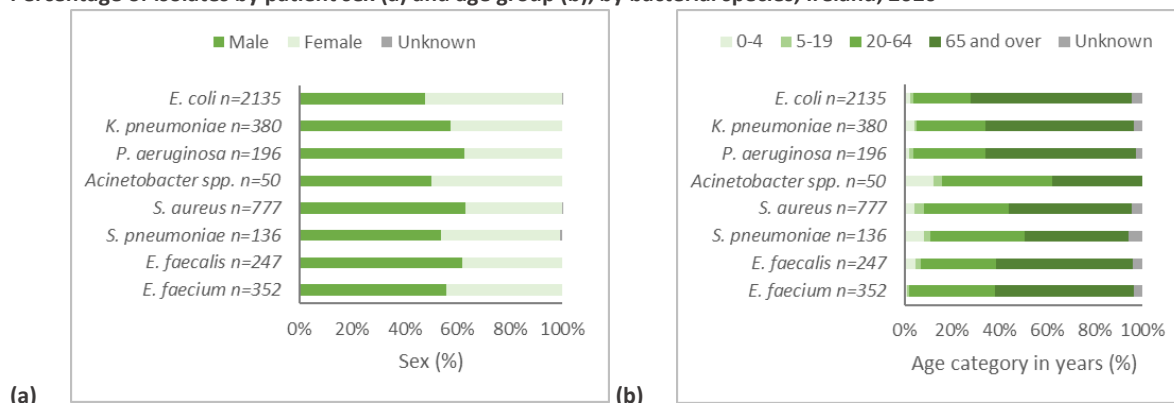
ICU: intensive care unit.

Lab: laboratories.

^a Number of laboratories reporting at least one isolate during the specific year. The total number of participating laboratories might be higher.

^b Isolates with missing information on hospital department are excluded, and results are presented only if data on hospital department are available for ≥70% of isolates.

Percentage of isolates by patient sex (a) and age group (b), by bacterial species, Ireland, 2020



Total number of invasive isolates tested (n) and percentages of isolates with resistance phenotype (%), by bacterial species and antimicrobial group/agent, 2020 EU/EEA range, population-weighted mean and trend, Ireland, 2016–2020

Bacterial species	Antimicrobial group/agent	2016		2017		2018		2019		2020		Trend 2016-2020 ^a
		n	%	n	%	n	%	n	%	n	%	
<i>E. coli</i>	Aminopenicillin (amoxicillin/ampicillin) resistance	2 990	68.1	2 991	69.8	3 237	67.6	3 201	67.5	2 126	64.8	↓
	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	2 985	11.4	3 121	12.0	3 237	12.9	3 231	12.1	2 134	11.3	-
	Carbapenem (imipenem/meropenem) resistance	2 989	0.0	3 116	0.0	3 237	0.0	3 229	0.0	2 106	0.1	-
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	2 990	22.9	3 119	23.6	3 238	23.9	3 223	20.4	2 133	18.9	↓
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	2 991	11.2	3 123	11.9	3 238	11.7	3 232	11.8	2 134	10.1	-
	Combined resistance to third-generation cephalosporins, fluoroquinolones, and aminoglycosides ^b	2 984	5.3	3 116	5.7	3 235	6.1	3 222	5.6	2 131	4.6	-
<i>K. pneumoniae</i>	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	452	13.5	478	14.6	483	14.5	527	17.6	380	18.4	↑
	Carbapenem (imipenem/meropenem) resistance	453	0.7	478	0.2	482	0.6	527	0.9	370	0.3	-
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	453	11.3	478	14.9	483	18.0	526	17.3	379	16.4	↑
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	453	11.5	479	11.9	483	13.0	526	11.0	379	10.8	-
	Combined resistance to fluoroquinolones, third-generation cephalosporins and aminoglycosides ^b	452	5.8	477	5.9	483	8.1	525	5.3	378	6.6	-
<i>P. aeruginosa</i>	Piperacillin-tazobactam resistance	242	12.4	286	14.0	270	8.1	276	10.9	174	14.4	-
	Ceftazidime resistance	243	10.7	272	9.6	261	8.4	272	9.2	172	12.8	-
	Carbapenem (imipenem/meropenem) resistance	243	6.2	288	9.0	273	6.6	275	6.5	193	7.8	-
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	243	11.9	287	13.9	272	8.8	276	9.4	194	12.9	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^c	243	10.3	288	8.7	273	5.5	276	6.5	113	1.8	↓
	Combined resistance to ≥3 antimicrobial groups (among piperacillin-tazobactam, ceftazidime, carbapenems, fluoroquinolones and aminoglycosides) ^c	243	8.6	288	7.6	273	3.3	276	5.1	192	5.7	-
<i>Acinetobacter</i> species	Carbapenem (imipenem/meropenem) resistance	65	0.0	63	6.3	60	1.7	63	1.6	48	0.0	-
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	68	1.5	66	7.6	61	0.0	64	7.8	37	5.4	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	63	1.6	62	3.2	56	3.6	57	1.8	44	0.0	-
	Combined resistance to carbapenems, fluoroquinolones and aminoglycosides ^b	61	0.0	59	1.7	55	0.0	53	0.0	31	0.0	-
<i>S. aureus</i>	MRSA ^d	1 143	14.3	1 140	16.3	1 188	12.4	1 146	12.6	777	12.1	↓
	Penicillin non-wild-type ^e	363	16.5	412	15.8	455	20.7	348	14.4	136	17.6	-
<i>S. pneumoniae</i>	Macrolide (azithromycin/clarithromycin/erythromycin) resistance	354	13.3	396	12.9	419	13.6	340	12.6	130	13.8	-
	Combined penicillin non-wild-type and resistance to macrolides ^e	354	9.6	396	9.3	419	10.0	340	8.2	130	11.5	-
<i>E. faecalis</i>	High-level gentamicin resistance	265	29.4	302	30.8	292	23.6	243	23.0	134	17.2	↓
<i>E. faecium</i>	Vancomycin resistance	422	44.1	442	38.2	418	40.2	443	38.4	351	35.9	↓

^a ↑ and ↓ indicate statistically significantly increasing and decreasing trends, respectively; – indicates no statistically significant trend.

^b The aminoglycoside group includes only gentamicin and tobramycin from 2020 onwards.

^c The aminoglycoside group includes only tobramycin from 2020 onwards.

^d MRSA is based on AST results for oxacillin or cefoxitin, but AST results reported as cloxacillin, dicloxacillin, flucloxacillin or meticillin are accepted as a marker for oxacillin resistance if AST results for oxacillin are not reported. Data from molecular confirmation tests (detection of *mecA* gene by PCR or a positive PBP2A-agglutination test) are given priority over phenotypic AST results.

^e Penicillin results are based on penicillin or, if not available, oxacillin. For *S. pneumoniae*, the term penicillin non-wild-type is used in this report, referring to *S. pneumoniae* isolates reported by the local laboratories as susceptible increased exposure (I) or resistant (R) to penicillin, assuming MIC to benzylpenicillin above those of wild-type isolates (>0.06 mg/L). The qualitative susceptibility categories (S/I/R) as reported by the laboratory are used, since quantitative susceptibility information is missing for a large part of the data. Laboratories not using EUCAST clinical breakpoints in the period 2016–2018 might define the cut-off values for the susceptibility categories differently.

ITALY

Participating institutions:

National Institute of Health www.iss.it

Population and hospitals contributing data: coverage, representativeness and blood-culture rate, Italy, 2016–2020

Parameter	2016	2017	2018	2019	2020
Estimated national population coverage (%)	17	21	36	41	47
Geographical representativeness	Unknown	Medium	High	High	High
Hospital representativeness	Unknown	Unknown	High	High	High
Patient and isolate representativeness	Unknown	Unknown	High	High	High
Blood culture sets/1 000 patient-days	Unknown	Unknown	55.4	Unknown	57

Laboratories contributing data: use of clinical breakpoint guidelines and participation in EARS-Net EQA, Italy, 2016–2020

Parameter	2016	2017	2018	2019	2020
Percentage of laboratories using EUCAST or EUCAST-harmonised guidelines	100	100	100	100 ^a	100 ^a
Percentage of laboratories participating in EARS-Net EQA	92	97	95	95	NA

EQA: external quality assessment.

NA: not applicable.

^a Starting with 2019 data, EARS-Net was restricted to laboratories using EUCAST or EUCAST-harmonised methodology and breakpoints.

Annual number of reporting laboratories,^a number of reported isolates and percentage of isolates reported from patients in ICUs,^b Italy, 2016–2020

Bacterial species	2016			2017			2018			2019			2020		
	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)
<i>E. coli</i>	46	6 110	8	54	7 478	7	97	16 539	7	128	18 866	6	151	19 086	6
<i>K. pneumoniae</i>	47	2 314	28	55	2 720	27	98	5 913	23	123	7 782	22	147	8 597	24
<i>P. aeruginosa</i>	43	1 207	25	54	1 455	25	95	3 050	23	124	3 895	23	145	4 678	27
<i>Acinetobacter</i> spp.	41	708	46	48	878	42	92	1 392	42	100	1 651	38	123	2 577	48
<i>S. aureus</i>	46	3 309	15	55	4 213	16	97	8 581	12	125	9 943	11	149	11 164	14
<i>S. pneumoniae</i>	43	515	11	52	673	9	80	1 160	9	100	1 351	10	109	685	10
<i>E. faecalis</i>	47	1 617	24	55	2 004	26	94	4 153	19	122	4 705	18	149	6 354	28
<i>E. faecium</i>	47	958	23	54	1 085	22	92	2 304	19	118	2 878	19	138	4 243	26

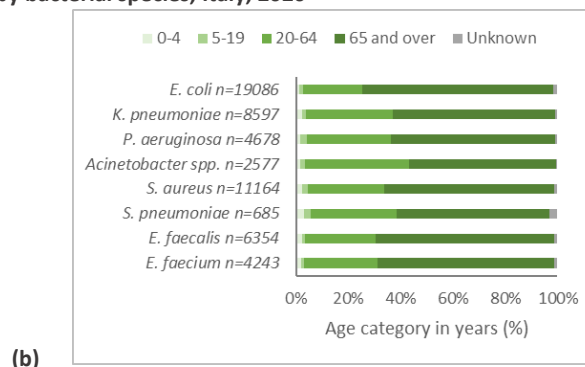
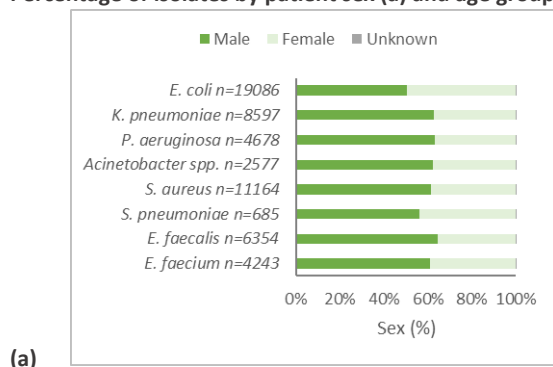
ICU: intensive care unit.

Lab: laboratories.

^a Number of laboratories reporting at least one isolate during the specific year. The total number of participating laboratories might be higher.

^b Isolates with missing information on hospital department are excluded, and results are presented only if data on hospital department are available for ≥70% of isolates.

Percentage of isolates by patient sex (a) and age group (b), by bacterial species, Italy, 2020



Total number of invasive isolates tested (n) and percentages of isolates with resistance phenotype (%), by bacterial species and antimicrobial group/agent, 2020 EU/EEA range, population-weighted mean and trend, Italy, 2016–2020

Bacterial species	Antimicrobial group/agent	2016		2017		2018		2019		2020		Trend 2016-2020 ^a
		n	%	n	%	n	%	n	%	n	%	
<i>E. coli</i>	Aminopenicillin (amoxicillin/ampicillin) resistance	3 114	66.9	4 078	67.1	7 533	64.5	4 457	68.1	4 214	64.5	-
	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	5 938	29.8	7 077	29.5	16 253	28.7	18 409	30.9	18 750	26.4	↓
	Carbapenem (imipenem/meropenem) resistance	6 106	0.3	7 280	0.3	15 452	0.4	17 086	0.4	18 001	0.5	↑#
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	5 950	43.3	6 945	44.9	16 043	41.7	18 417	40.6	18 840	37.6	↓
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	6 079	19.0	7 134	18.4	15 901	16.0	18 382	15.9	17 994	14.9	↓
	Combined resistance to third-generation cephalosporins, fluoroquinolones, and aminoglycosides ^b	5 763	12.9	6 454	13.7	15 622	11.4	17 961	11.6	17 593	9.8	↓
<i>K. pneumoniae</i>	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	2 246	55.8	2 546	54.6	5 832	53.6	7 699	57.6	8 400	54.3	-
	Carbapenem (imipenem/meropenem) resistance	2 303	33.8	2 633	29.5	5 660	26.8	7 325	28.5	8 293	29.5	↓
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	2 248	56.0	2 562	55.7	5 752	52.7	7 692	54.7	8 486	52.4	↓
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	2 300	36.1	2 571	34.5	5 693	27.0	7 682	32.6	8 084	31.6	↓
	Combined resistance to fluoroquinolones, third-generation cephalosporins and aminoglycosides ^b	2 174	32.7	2 352	31.6	5 587	24.8	7 560	30.3	7 842	29.5	-
<i>P. aeruginosa</i>	Piperacillin-tazobactam resistance	1 146	29.8	1 309	23.2	2 938	23.9	3 768	24.1	4 537	24.2	↓
	Ceftazidime resistance	1 160	23.0	1 332	20.0	2 974	19.9	3 798	19.0	4 473	19.3	↓#
	Carbapenem (imipenem/meropenem) resistance	1 206	23.3	1 433	19.6	3 014	15.8	3 794	13.7	4 615	15.9	↓
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	1 166	24.7	1 390	25.1	2 994	22.9	3 875	21.7	4 599	19.6	↓
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^c	1 203	19.1	1 428	18.0	2 983	12.8	3 859	11.4	ND	ND	NA
	Combined resistance to ≥3 antimicrobial groups (among piperacillin-tazobactam, ceftazidime, carbapenems, fluoroquinolones and aminoglycosides) ^c	1 205	19.8	1 434	17.2	3 006	14.9	3 882	13.1	4 593	11.2	↓
<i>Acinetobacter</i> species	Carbapenem (imipenem/meropenem) resistance	702	78.5	868	78.7	1 383	79.2	1 588	79.3	2 552	80.8	-
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	697	79.9	804	79.2	1 368	81.1	1 636	82.5	2 522	83.4	↑
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	704	76.4	836	76.1	1 369	77.0	1 637	78.8	2 496	80.2	↑
	Combined resistance to carbapenems, fluoroquinolones and aminoglycosides ^b	692	74.7	763	72.6	1 351	75.7	1 569	76.6	2 451	78.7	↑
<i>S. aureus</i>	MRSA ^d	2 981	33.6	3 591	33.9	8 263	34.0	9 681	34.3	10 923	33.5	-
	Penicillin non-wild-type ^e	399	6.5	522	10.5	928	9.2	1 017	11.9	516	13.4	↑
<i>S. pneumoniae</i>	Macrolide (azithromycin/clarithromycin/erythromycin) resistance	464	22.4	599	22.7	1 095	20.3	1 298	22.3	639	24.1	-
	Combined penicillin non-wild-type and resistance to macrolides ^e	361	4.4	474	5.3	879	4.7	989	6.7	491	7.7	↑#
<i>E. faecalis</i>	High-level gentamicin resistance	1 441	45.3	1 630	45.9	2 927	39.9	2 395	34.9	3 028	37.4	↓
<i>E. faecium</i>	Vancomycin resistance	941	13.4	1 049	14.6	2 273	18.9	2 839	21.3	4 166	23.6	↑

NA: not applicable as data were not reported for all years, a significant change in data source occurred during the period, or the number of isolates was < 20 in any year during the period.

ND: no data available.

^a ↑ and ↓ indicate statistically significantly increasing and decreasing trends, respectively; # indicates a significant trend in the overall data, but not in data that only included laboratories reporting continuously for all five years; – indicates no statistically significant trend.

^b The aminoglycoside group includes only gentamicin and tobramycin from 2020 onwards.

^c The aminoglycoside group includes only tobramycin from 2020 onwards.

^d MRSA is based on AST results for oxacillin or cefoxitin, but AST results reported as cloxacillin, dicloxacillin, flucloxacillin or meticillin are accepted as a marker for oxacillin resistance if AST results for oxacillin are not reported. Data from molecular confirmation tests (detection of *mecA* gene by PCR or a positive PBP2A-agglutination test) are given priority over phenotypic AST results.

^e Penicillin results are based on penicillin or, if not available, oxacillin. For *S. pneumoniae*, the term penicillin non-wild-type is used in this report, referring to *S. pneumoniae* isolates reported by the local laboratories as susceptible increased exposure (I) or resistant (R) to penicillin, assuming MIC to benzylpenicillin above those of wild-type isolates (>0.06 mg/L). The qualitative susceptibility categories (S/I/R) as reported by the laboratory are used, since quantitative susceptibility information is missing for a large part of the data. Laboratories not using EUCAST clinical breakpoints in the period 2016–2018 might define the cut-off values for the susceptibility categories differently.

LATVIA

Participating institutions:

Disease Prevention and Control Center of Latvia www.spkc.gov.lv

Population and hospitals contributing data: coverage, representativeness and blood-culture rate, Latvia, 2016–2020

Parameter	2016	2017	2018	2019	2020
Estimated national population coverage (%)	90	90	90	90	90
Geographical representativeness	High	High	High	High	High
Hospital representativeness	Medium	Medium	Medium	Medium	Medium
Patient and isolate representativeness	Medium	Medium	Medium	Medium	Medium
Blood culture sets/1 000 patient-days	6.6	6.1	8	9.5	13.8

Laboratories contributing data: use of clinical breakpoint guidelines and participation in EARS-Net EQA, Latvia, 2016–2020

Parameter	2016	2017	2018	2019	2020
Percentage of laboratories using EUCAST or EUCAST-harmonised guidelines	27	21	53	100 ^a	100 ^a
Percentage of laboratories participating in EARS-Net EQA	94	88	100	100	NA

EQA: external quality assessment.

NA: not applicable.

^a Starting with 2019 data, EARS-Net was restricted to laboratories using EUCAST or EUCAST-harmonised methodology and breakpoints.

Annual number of reporting laboratories,^a number of reported isolates and percentage of isolates reported from patients in ICUs,^b Latvia, 2016–2020

Bacterial species	2016			2017			2018			2019			2020		
	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)
<i>E. coli</i>	11	253	20	12	205	23	11	348	27	10	442	20	10	379	21
<i>K. pneumoniae</i>	8	95	37	7	116	41	13	204	36	9	198	32	9	189	29
<i>P. aeruginosa</i>	5	16	31	4	14	64	4	39	31	6	49	44	9	43	31
<i>Acinetobacter</i> spp.	7	82	62	7	34	62	7	51	65	8	46	61	7	52	54
<i>S. aureus</i>	14	286	21	11	229	22	14	376	20	11	422	20	10	355	21
<i>S. pneumoniae</i>	8	63	60	9	53	38	7	69	38	6	79	33	5	42	38
<i>E. faecalis</i>	12	89	37	8	74	38	10	89	38	10	100	25	9	98	28
<i>E. faecium</i>	6	56	46	5	39	54	7	49	41	8	58	43	9	62	48

ICU: intensive care unit.

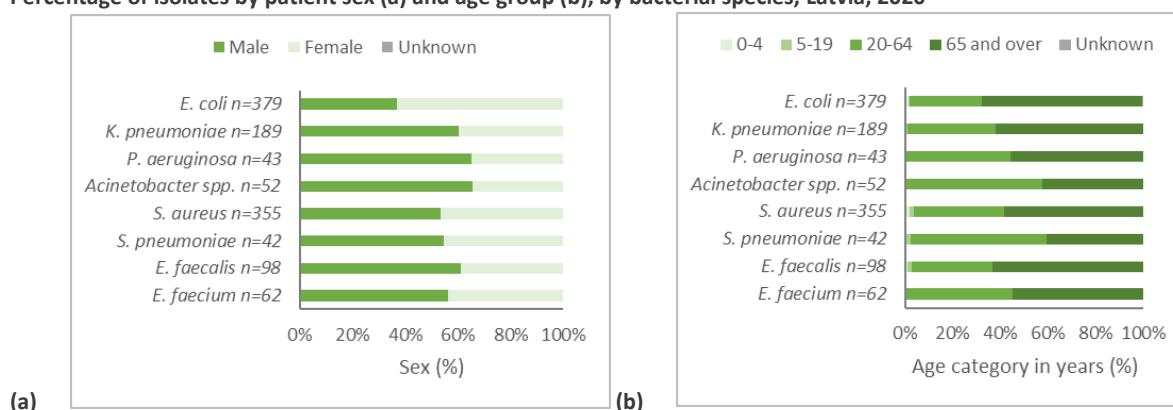
Lab: laboratories.

Note: a small number of isolates were tested ($n < 30$), and the percentage resistance should be interpreted with caution.

^a Number of laboratories reporting at least one isolate during the specific year. The total number of participating laboratories might be higher.

^b Isolates with missing information on hospital department are excluded, and results are presented only if data on hospital department are available for $\geq 70\%$ of isolates.

Percentage of isolates by patient sex (a) and age group (b), by bacterial species, Latvia, 2020



Total number of invasive isolates tested (n) and percentages of isolates with resistance phenotype (%), by bacterial species and antimicrobial group/agent, 2020 EU/EEA range, population-weighted mean and trend, Latvia, 2016–2020

Bacterial species	Antimicrobial group/agent	2016		2017		2018		2019		2020		Trend 2016-2020 ^a
		n	%	n	%	n	%	n	%	n	%	
<i>E. coli</i>	Aminopenicillin (amoxicillin/ampicillin) resistance	247	55.1	202	60.4	347	56.2	438	57.8	374	54.3	-
	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	253	24.1	205	22.0	348	20.4	442	19.7	378	24.1	-
	Carbapenem (imipenem/meropenem) resistance	246	0.0	203	0.0	346	0.0	439	0.0	378	0.0	-
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	245	27.8	201	30.3	344	24.1	442	24.9	378	27.5	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	244	12.7	201	13.4	348	8.9	440	11.6	377	11.4	-
	Combined resistance to third-generation cephalosporins, fluoroquinolones, and aminoglycosides ^b	242	10.3	197	11.2	344	7.0	440	9.3	376	10.6	-
<i>K. pneumoniae</i>	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	95	47.4	116	33.6	204	37.7	198	36.9	188	48.4	-
	Carbapenem (imipenem/meropenem) resistance	90	2.2	116	1.7	204	0.5	198	0.0	189	1.1	-
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	91	41.8	116	32.8	200	38.5	198	36.9	188	41.5	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	91	38.5	115	29.6	203	31.0	198	28.3	186	21.0	↓
	Combined resistance to fluoroquinolones, third-generation cephalosporins and aminoglycosides ^b	91	31.9	115	24.3	199	27.6	198	25.3	185	19.5	↓
<i>P. aeruginosa</i>	Piperacillin-tazobactam resistance	15	26.7	14	35.7	39	35.9	45	35.6	14	28.6	NA
	Ceftazidime resistance	15	26.7	14	42.9	39	33.3	49	32.7	42	23.8	NA
	Carbapenem (imipenem/meropenem) resistance	16	31.3	14	57.1	39	28.2	49	32.7	43	25.6	NA
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	16	31.3	14	64.3	39	23.1	49	28.6	39	30.8	NA
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^c	15	20.0	14	42.9	39	28.2	49	22.4	7	<10 isolates	NA
	Combined resistance to ≥3 antimicrobial groups (among piperacillin-tazobactam, ceftazidime, carbapenems, fluoroquinolones and aminoglycosides) ^c	16	18.8	14	42.9	39	30.8	49	22.4	43	11.6	NA
<i>Acinetobacter</i> species	Carbapenem (imipenem/meropenem) resistance	82	73.2	34	79.4	51	78.4	46	84.8	52	82.7	-
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	68	85.3	33	81.8	47	80.9	24	83.3	50	86.0	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	81	77.8	33	78.8	48	60.4	44	68.2	52	63.5	↓
	Combined resistance to carbapenems, fluoroquinolones and aminoglycosides ^b	67	67.2	32	75.0	44	56.8	22	50.0	50	64.0	-
<i>S. aureus</i>	MRSA ^d	284	4.2	210	5.7	315	5.7	421	7.4	353	9.3	↑
	Penicillin non-wild-type ^e	61	11.5	51	17.6	69	10.1	79	10.1	41	17.1	-
<i>S. pneumoniae</i>	Macrolide (azithromycin/clarithromycin/erythromycin) resistance	52	5.8	28	3.6	66	9.1	76	5.3	27	11.1	-
	Combined penicillin non-wild-type and resistance to macrolides ^e	51	3.9	28	3.6	66	6.1	76	3.9	27	3.7	-
<i>E. faecalis</i>	High-level gentamicin resistance	87	46.0	72	45.8	86	32.6	93	44.1	89	38.2	-
<i>E. faecium</i>	Vancomycin resistance	56	28.6	39	25.6	48	35.4	58	39.7	62	29.0	-

NA: not applicable as data were not reported for all years, a significant change in data source occurred during the period, or the number of isolates was < 20 in any year during the period.

< 10 isolates: no percentage is displayed if < 10 isolates were available for analysis.

Note: a small number of isolates were tested (n < 30), and the percentage resistance should be interpreted with caution.

^a ↑ and ↓ indicate statistically significantly increasing and decreasing trends, respectively; – indicates no statistically significant trend.

^b The aminoglycoside group includes only gentamicin and tobramycin from 2020 onwards.

^c The aminoglycoside group includes only tobramycin from 2020 onwards.

^d MRSA is based on AST results for oxacillin or cefoxitin, but AST results reported as cloxacillin, dicloxacillin, flucloxacillin or meticillin are accepted as a marker for oxacillin resistance if AST results for oxacillin are not reported. Data from molecular confirmation tests (detection of *mecA* gene by PCR or a positive PBP2A-agglutination test) are given priority over phenotypic AST results.

^e Penicillin results are based on penicillin or, if not available, oxacillin. For *S. pneumoniae*, the term penicillin non-wild-type is used in this report, referring to *S. pneumoniae* isolates reported by the local laboratories as susceptible increased exposure (I) or resistant (R) to penicillin, assuming MIC to benzylpenicillin above those of wild-type isolates (>0.06 mg/L). The qualitative susceptibility categories (S/I/R) as reported by the laboratory are used, since quantitative susceptibility information is missing for a large part of the data. Laboratories not using EUCAST clinical breakpoints in the period 2016–2018 might define the cut-off values for the susceptibility categories differently.

LITHUANIA

Participating institutions:

National Public Health Surveillance Laboratory www.nvspl.lt; Institute of Hygiene www.hi.lt

Population and hospitals contributing data: coverage, representativeness and blood-culture rate, Lithuania, 2016–2020

Parameter	2016	2017	2018	2019	2020
Estimated national population coverage (%)	100	100	100	100	100
Geographical representativeness	High	High	High	High	High
Hospital representativeness	High	High	High	High	High
Patient and isolate representativeness	High	High	High	High	High
Blood culture sets/1 000 patient-days	7.1	6.3	5.3	6.1	8.1

Laboratories contributing data: use of clinical breakpoint guidelines and participation in EARS-Net EQA, Lithuania, 2016–2020

Parameter	2016	2017	2018	2019	2020
Percentage of laboratories using EUCAST or EUCAST-harmonised guidelines	100	100	100	100 ^a	100 ^a
Percentage of laboratories participating in EARS-Net EQA	100	100	94	89	NA

EQA: external quality assessment.

NA: not applicable.

^a Starting with 2019 data, EARS-Net was restricted to laboratories using EUCAST or EUCAST-harmonised methodology and breakpoints.

Annual number of reporting laboratories,^a number of reported isolates and percentage of isolates reported from patients in ICUs,^b Lithuania, 2016–2020

Bacterial species	2016			2017			2018			2019			2020		
	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)
<i>E. coli</i>	17	797	21	16	852	19	17	1 109	17	18	1 132	20	17	1 142	18
<i>K. pneumoniae</i>	16	326	33	15	326	30	17	371	24	17	440	28	16	413	25
<i>P. aeruginosa</i>	13	74	36	13	89	36	13	101	32	17	104	32	15	121	26
<i>Acinetobacter</i> spp.	11	87	64	12	87	56	13	88	58	13	108	57	12	157	71
<i>S. aureus</i>	17	505	23	16	515	20	18	693	24	18	656	21	17	704	22
<i>S. pneumoniae</i>	12	99	28	14	109	27	13	93	29	16	120	38	14	96	22
<i>E. faecalis</i>	13	86	31	13	111	26	14	138	25	15	143	30	14	140	28
<i>E. faecium</i>	13	61	38	13	80	33	14	99	34	14	128	38	15	145	43

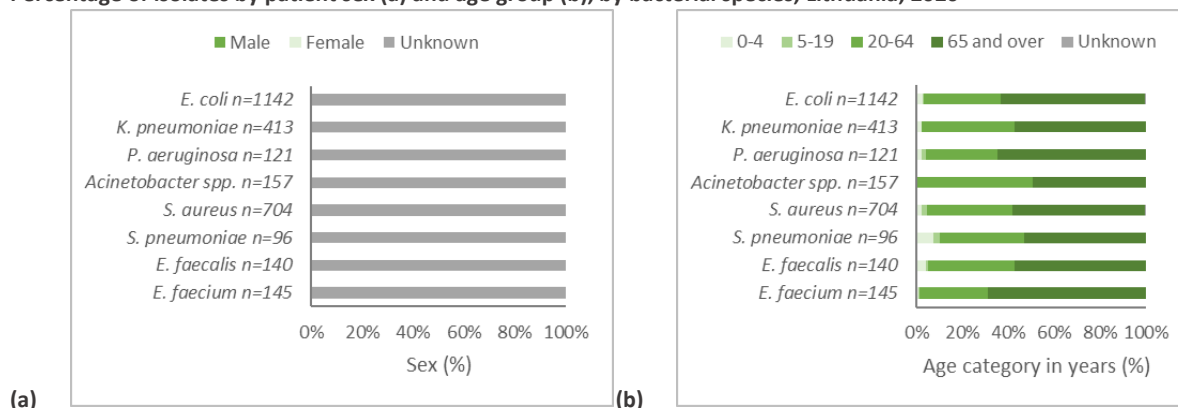
ICU: intensive care unit.

Lab: laboratories.

^a Number of laboratories reporting at least one isolate during the specific year. The total number of participating laboratories might be higher.

^b Isolates with missing information on hospital department are excluded, and results are presented only if data on hospital department are available for ≥70% of isolates.

Percentage of isolates by patient sex (a) and age group (b), by bacterial species, Lithuania, 2020



Total number of invasive isolates tested (n) and percentages of isolates with resistance phenotype (%), by bacterial species and antimicrobial group/agent, 2020 EU/EEA range, population-weighted mean and trend, Lithuania, 2016–2020

Bacterial species	Antimicrobial group/agent	2016		2017		2018		2019		2020		Trend 2016-2020 ^a
		n	%	n	%	n	%	n	%	n	%	
<i>E. coli</i>	Aminopenicillin (amoxicillin/ampicillin) resistance	794	59.2	845	57.8	1 106	59.0	1 129	59.1	1 138	56.9	-
	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	795	14.7	852	16.8	1 109	15.3	1 132	13.9	1 142	15.9	-
	Carbapenem (imipenem/meropenem) resistance	793	0.0	849	0.0	1 100	0.0	1 122	0.2	1 142	0.0	-
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	790	19.7	849	25.2	1 104	19.7	1 129	18.0	1 136	18.8	↓
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	791	8.0	848	8.3	1 103	7.9	1 129	7.6	1 141	10.3	-
	Combined resistance to third-generation cephalosporins, fluoroquinolones, and aminoglycosides ^b	783	2.6	845	4.4	1 098	4.6	1 126	4.5	1 135	6.4	↑
<i>K. pneumoniae</i>	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	326	56.7	326	63.2	371	55.8	440	55.0	413	42.6	↓
	Carbapenem (imipenem/meropenem) resistance	325	0.0	325	0.6	371	0.3	438	3.4	413	2.9	↑
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	324	54.6	326	64.7	370	56.8	438	52.1	413	45.3	↓
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	325	49.2	322	53.7	369	48.5	435	39.8	410	33.9	↓
	Combined resistance to fluoroquinolones, third-generation cephalosporins and aminoglycosides ^b	323	42.1	322	48.1	368	45.1	433	35.3	410	28.5	↓
<i>P. aeruginosa</i>	Piperacillin-tazobactam resistance	74	13.5	89	18.0	101	17.8	102	23.5	121	23.1	-
	Ceftazidime resistance	74	10.8	88	14.8	101	11.9	103	15.5	119	16.8	-
	Carbapenem (imipenem/meropenem) resistance	74	16.2	89	24.7	101	21.8	104	16.3	121	25.6	-
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	73	15.1	89	21.3	101	12.9	104	17.3	120	18.3	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^c	74	14.9	89	13.5	101	9.9	103	12.6	ND	ND	NA
	Combined resistance to ≥3 antimicrobial groups (among piperacillin-tazobactam, ceftazidime, carbapenems, fluoroquinolones and aminoglycosides) ^c	74	10.8	89	16.9	101	11.9	104	12.5	121	14.0	-
<i>Acinetobacter</i> species	Carbapenem (imipenem/meropenem) resistance	87	81.6	87	88.5	88	89.8	108	85.2	157	91.1	-
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	87	87.4	86	91.9	88	90.9	108	91.7	154	92.9	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	87	82.8	86	81.4	87	85.1	107	83.2	153	86.3	-
	Combined resistance to carbapenems, fluoroquinolones and aminoglycosides ^b	87	75.9	85	77.6	87	85.1	107	78.5	150	86.7	↑
<i>S. aureus</i>	MRSA ^d	503	11.3	514	8.8	691	8.4	656	9.3	704	9.8	-
	Penicillin non-wild-type ^e	99	16.2	109	15.6	93	19.4	120	10.8	96	13.5	-
<i>S. pneumoniae</i>	Macrolide (azithromycin/clarithromycin/erythromycin) resistance	94	18.1	107	15.9	92	20.7	119	10.1	96	14.6	-
	Combined penicillin non-wild-type and resistance to macrolides ^e	94	12.8	107	11.2	92	13.0	119	7.6	96	9.4	-
	High-level gentamicin resistance	45	35.6	60	36.7	65	27.7	78	41.0	68	13.2	↓
<i>E. faecium</i>	Vancomycin resistance	61	21.3	80	36.3	99	31.3	128	39.8	145	56.6	↑

NA: not applicable as data were not reported for all years, a significant change in data source occurred during the period, or the number of isolates was < 20 in any year during the period.

ND: no data available.

^a ↑ and ↓ indicate statistically significantly increasing and decreasing trends, respectively; – indicates no statistically significant trend.

^b The aminoglycoside group includes only gentamicin and tobramycin from 2020 onwards.

^c The aminoglycoside group includes only tobramycin from 2020 onwards.

^d MRSA is based on AST results for oxacillin or cefoxitin, but AST results reported as cloxacillin, dicloxacillin, flucloxacillin or meticillin are accepted as a marker for oxacillin resistance if AST results for oxacillin are not reported. Data from molecular confirmation tests (detection of *mecA* gene by PCR or a positive PBP2A-agglutination test) are given priority over phenotypic AST results.

^e Penicillin results are based on penicillin or, if not available, oxacillin. For *S. pneumoniae*, the term penicillin non-wild-type is used in this report, referring to *S. pneumoniae* isolates reported by the local laboratories as susceptible increased exposure (I) or resistant (R) to penicillin, assuming MIC to benzylpenicillin above those of wild-type isolates (>0.06 mg/L). The qualitative susceptibility categories (S/I/R) as reported by the laboratory are used, since quantitative susceptibility information is missing for a large part of the data. Laboratories not using EUCAST clinical breakpoints in the period 2016–2018 might define the cut-off values for the susceptibility categories differently.

LUXEMBOURG

Participating institutions:

National Health Laboratory

Microbiology Laboratory, Centre Hospitalier de Luxembourg

Population and hospitals contributing data: coverage, representativeness and blood-culture rate, Luxembourg, 2016–2020

Parameter	2016	2017	2018	2019	2020
Estimated national population coverage (%)	100	100	100	Unknown	99
Geographical representativeness	High	Unknown	High	Unknown	High
Hospital representativeness	Unknown	Unknown	High	Unknown	High
Patient and isolate representativeness	Unknown	Unknown	High	Unknown	High
Blood culture sets/1 000 patient-days	26.0	Unknown	28.2	Unknown	38.9

Laboratories contributing data: use of clinical breakpoint guidelines and participation in EARS-Net EQA, Luxembourg, 2016–2020

Parameter	2016	2017	2018	2019	2020
Percentage of laboratories using EUCAST or EUCAST-harmonised guidelines	100	100	100	100 ^a	100 ^a
Percentage of laboratories participating in EARS-Net EQA	100	100	100	100	NA

EQA: external quality assessment.

NA: not applicable.

^a Starting with 2019 data, EARS-Net was restricted to laboratories using EUCAST or EUCAST-harmonised methodology and breakpoints.

Annual number of reporting laboratories,^a number of reported isolates and percentage of isolates reported from patients in ICUs,^b Luxembourg, 2016–2020

Bacterial species	2016			2017			2018			2019			2020 ^c		
	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)
<i>E. coli</i>	4	419	11	4	433	8	4	424	11	4	492	8	3	428	8
<i>K. pneumoniae</i>	4	78	25	4	99	21	4	85	18	4	103	18	3	87	23
<i>P. aeruginosa</i>	4	40	15	4	56	21	4	59	7	4	56	18	3	51	14
<i>Acinetobacter</i> spp.	2	8	<10 isolates	2	8	<10 isolates	2	11	9	3	10	20	2	7	<10 isolates
<i>S. aureus</i>	4	188	25	4	200	17	4	181	13	4	209	15	3	195	18
<i>S. pneumoniae</i>	4	51	10	4	49	12	4	45	21	4	38	11	3	24	13
<i>E. faecalis</i>	4	48	24	4	87	27	4	51	20	4	82	24	3	95	37
<i>E. faecium</i>	4	31	20	4	34	32	4	29	18	4	37	32	3	42	20

< 10 isolates: no percentage is displayed if < 10 isolates were available for analysis.

Note: a small number of isolates were tested (n < 30), and the percentage resistance should be interpreted with caution.

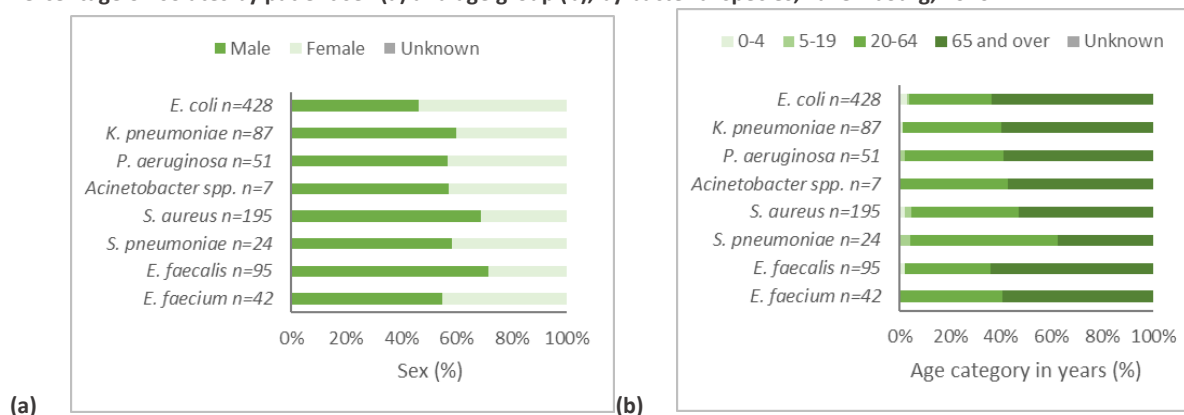
Lab: laboratories.

^a Number of laboratories reporting at least one isolate during the specific year. The total number of participating laboratories might be higher.

^b Isolates with missing information on hospital department are excluded, and results are presented only if data on hospital department are available for ≥70% of isolates.

^c For 2020, Luxembourg data corresponds to data reported from four different laboratories. Data on the number of laboratories will be adjusted in 2022 output.

Percentage of isolates by patient sex (a) and age group (b), by bacterial species, Luxembourg, 2020



Total number of invasive isolates tested (n) and percentages of isolates with resistance phenotype (%), by bacterial species and antimicrobial group/agent, 2020 EU/EEA range, population-weighted mean and trend, Luxembourg, 2016–2020

Bacterial species	Antimicrobial group/agent	2016		2017		2018		2019		2020		Trend
		n	%	n	%	n	%	n	%	n	%	2016-2020 ^a
<i>E. coli</i>	Aminopenicillin (amoxicillin/ampicillin) resistance	419	53.2	433	55.9	420	55.2	492	57.5	427	52.5	-
	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	418	13.6	433	9.7	424	12.5	492	12.6	428	11.4	-
	Carbapenem (imipenem/meropenem) resistance	418	0.0	433	0.0	424	0.0	492	0.6	428	0.0	-
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	418	28.9	433	22.9	418	21.8	492	20.5	428	21.7	↓
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	418	9.1	433	10.4	423	7.3	492	10.2	428	8.9	-
	Combined resistance to third-generation cephalosporins, fluoroquinolones, and aminoglycosides ^b	418	3.8	433	3.5	417	3.8	492	3.9	428	4.0	-
<i>K. pneumoniae</i>	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	78	35.9	99	27.3	85	29.4	103	25.2	87	26.4	-
	Carbapenem (imipenem/meropenem) resistance	78	0.0	99	0.0	85	0.0	103	1.0	87	1.1	-
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	78	35.9	99	28.3	85	24.7	103	27.2	87	31.0	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	78	26.9	99	18.2	85	20.0	103	17.5	87	20.7	-
	Combined resistance to fluoroquinolones, third-generation cephalosporins and aminoglycosides ^b	78	24.4	99	17.2	85	15.3	103	13.6	87	20.7	-
<i>P. aeruginosa</i>	Piperacillin-tazobactam resistance	40	12.5	54	11.1	56	12.5	44	2.3	51	5.9	-
	Ceftazidime resistance	40	5.0	56	12.5	59	8.5	56	3.6	50	4.0	-
	Carbapenem (imipenem/meropenem) resistance	31	6.5	56	10.7	54	11.1	31	9.7	47	8.5	-
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	40	12.5	56	12.5	59	22.0	56	8.9	50	22.0	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^c	40	15.0	56	5.4	53	3.8	56	1.8	40	2.5	↓
	Combined resistance to ≥3 antimicrobial groups (among piperacillin-tazobactam, ceftazidime, carbapenems, fluoroquinolones and aminoglycosides) ^c	40	2.5	56	5.4	59	3.4	56	0.0	50	4.0	-
<i>Acinetobacter</i> species	Carbapenem (imipenem/meropenem) resistance	8	<10 isolates	8	<10 isolates	6	<10 isolates	8	<10 isolates	7	<10 isolates	NA
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	8	<10 isolates	8	<10 isolates	11	0.0	10	10.0	7	<10 isolates	NA
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	8	<10 isolates	8	<10 isolates	11	0.0	10	0.0	7	<10 isolates	NA
	Combined resistance to carbapenems, fluoroquinolones and aminoglycosides ^b	8	<10 isolates	8	<10 isolates	6	<10 isolates	8	<10 isolates	7	<10 isolates	NA
<i>S. aureus</i>	MRSA ^d	187	10.2	200	9.5	181	7.7	209	6.2	195	3.1	↓
	Penicillin non-wild-type ^e	51	13.7	45	6.7	45	11.1	38	21.1	24	16.7	-
<i>S. pneumoniae</i>	Macrolide (azithromycin/clarithromycin/erythromycin) resistance	51	15.7	49	8.2	45	11.1	38	7.9	24	12.5	-
	Combined penicillin non-wild-type and resistance to macrolides ^e	51	7.8	45	4.4	45	4.4	38	2.6	24	0.0	-
<i>E. faecalis</i>	High-level gentamicin resistance	48	12.5	82	22.0	45	6.7	82	4.9	95	10.5	↓#
<i>E. faecium</i>	Vancomycin resistance	31	0.0	34	0.0	28	0.0	37	2.7	42	11.9	↑

NA: not applicable as data were not reported for all years, a significant change in data source occurred during the period, or the number of isolates was < 20 in any year during the period.

< 10 isolates: no percentage is displayed if < 10 isolates were available for analysis.

Note: a small number of isolates were tested (n < 30), and the percentage resistance should be interpreted with caution.

^a ↑ and ↓ indicate statistically significantly increasing and decreasing trends, respectively; # indicates a significant trend in the overall data, but not in data that only included laboratories reporting continuously for all five years; – indicates no statistically significant trend.

^b The aminoglycoside group includes only gentamicin and tobramycin from 2020 onwards.

^c The aminoglycoside group includes only tobramycin from 2020 onwards.

^d MRSA is based on AST results for oxacillin or cefoxitin, but AST results reported as cloxacillin, dicloxacillin, flucloxacillin or meticillin are accepted as a marker for oxacillin resistance if AST results for oxacillin are not reported. Data from molecular confirmation tests (detection of *mecA* gene by PCR or a positive PBP2A-agglutination test) are given priority over phenotypic AST results.

^e Penicillin results are based on penicillin or, if not available, oxacillin. For *S. pneumoniae*, the term penicillin non-wild-type is used in this report, referring to *S. pneumoniae* isolates reported by the local laboratories as susceptible increased exposure (I) or resistant (R) to penicillin, assuming MIC to benzylpenicillin above those of wild-type isolates (>0.06 mg/L). The qualitative susceptibility categories (S/I/R) as reported by the laboratory are used, since quantitative susceptibility information is missing for a large part of the data. Laboratories not using EUCAST clinical breakpoints in the period 2016–2018 might define the cut-off values for the susceptibility categories differently.

MALTA

Participating institutions:

Malta Mater Dei Hospital, Msida

Population and hospitals contributing data: coverage, representativeness and blood-culture rate, Malta, 2016–2020

Parameter	2016	2017	2018	2019	2020
Estimated national population coverage (%)	95	95	95	95	95
Geographical representativeness	High	High	High	High	High
Hospital representativeness	High	High	High	High	High
Patient and isolate representativeness	High	High	High	High	High
Blood culture sets/1 000 patient-days	25	26.3	29.2	28.5	35.2

Laboratories contributing data: use of clinical breakpoint guidelines and participation in EARS-Net EQA, Malta, 2016–2020

Parameter	2016	2017	2018	2019	2020
Percentage of laboratories using EUCAST or EUCAST-harmonised guidelines	100	100	100	100 ^a	100 ^a
Percentage of laboratories participating in EARS-Net EQA	100	100	100	100	NA

EQA: external quality assessment.

NA: not applicable.

^a Starting with 2019 data, EARS-Net was restricted to laboratories using EUCAST or EUCAST-harmonised methodology and breakpoints.

Annual number of reporting laboratories,^a number of reported isolates and percentage of isolates reported from patients in ICUs,^b Malta, 2016–2020

Bacterial species	2016			2017			2018			2019			2020		
	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)
<i>E. coli</i>	1	328	4	1	314	1	1	332	2	1	332	1	1	277	2
<i>K. pneumoniae</i>	1	102	10	1	117	10	1	137	13	1	129	10	1	132	6
<i>P. aeruginosa</i>	1	40	5	1	37	19	1	29	14	1	39	23	1	49	13
<i>Acinetobacter</i> spp.	1	7	<10 isolates	1	9	<10 isolates	1	9	<10 isolates	1	15	7	1	7	<10 isolates
<i>S. aureus</i>	1	97	9	1	97	1	1	90	10	1	75	7	1	92	6
<i>S. pneumoniae</i>	1	10	0	1	19	7	1	37	0	1	27	0	1	16	0
<i>E. faecalis</i>	1	33	3	1	29	5	1	32	6	1	30	3	1	28	20
<i>E. faecium</i>	1	12	25	1	13	10	1	15	0	1	13	8	1	23	24

ICU: intensive care unit.

Lab: laboratories.

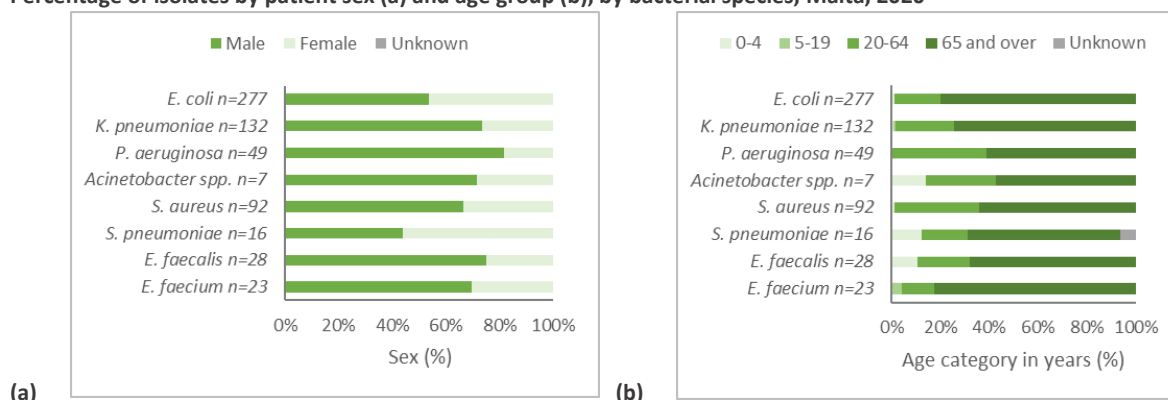
< 10 isolates: no percentage is displayed if < 10 isolates were available for analysis.

Note: a small number of isolates were tested (n < 30), and the percentage resistance should be interpreted with caution.

^a Number of laboratories reporting at least one isolate during the specific year. The total number of participating laboratories might be higher.

^b Isolates with missing information on hospital department are excluded, and results are presented only if data on hospital department are available for ≥70% of isolates.

Percentage of isolates by patient sex (a) and age group (b), by bacterial species, Malta, 2020



Total number of invasive isolates tested (n) and percentages of isolates with resistance phenotype (%), by bacterial species and antimicrobial group/agent, 2020 EU/EEA range, population-weighted mean and trend, Malta, 2016–2020

Bacterial species	Antimicrobial group/agent	2016		2017		2018		2019		2020		Trend 2016-2020 ^a
		n	%	n	%	n	%	n	%	n	%	
<i>E. coli</i>	Aminopenicillin (amoxicillin/ampicillin) resistance	328	60.1	314	59.6	332	59.6	332	64.8	277	58.5	-
	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	328	14.6	314	15.6	332	15.4	332	17.5	277	12.3	-
	Carbapenem (imipenem/meropenem) resistance	328	0.0	314	0.0	332	0.0	332	0.0	277	0.0	-
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	328	41.5	314	43.3	332	41.9	332	40.1	277	35.4	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	328	10.4	314	10.8	332	9.9	332	9.9	277	12.6	-
	Combined resistance to third-generation cephalosporins, fluoroquinolones, and aminoglycosides ^b	328	5.5	314	6.4	332	4.5	332	5.1	277	8.3	-
<i>K. pneumoniae</i>	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	102	21.6	117	35.0	137	53.3	129	37.2	132	38.6	↑
	Carbapenem (imipenem/meropenem) resistance	102	5.9	117	10.3	136	15.4	129	7.8	132	7.6	-
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	102	33.3	117	39.3	137	55.5	129	44.2	132	37.1	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	102	22.5	117	31.6	137	46.7	129	26.4	132	23.5	-
	Combined resistance to fluoroquinolones, third-generation cephalosporins and aminoglycosides ^b	102	14.7	117	28.2	137	43.8	129	22.5	132	18.9	-
<i>P. aeruginosa</i>	Piperacillin-tazobactam resistance	40	10.0	37	18.9	29	17.2	39	15.4	49	18.4	-
	Ceftazidime resistance	40	7.5	37	13.5	29	13.8	39	15.4	49	12.2	-
	Carbapenem (imipenem/meropenem) resistance	40	12.5	37	10.8	29	3.4	39	7.7	49	8.2	-
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	40	10.0	37	10.8	29	0.0	39	12.8	49	16.3	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^c	40	7.5	37	10.8	29	0.0	39	5.1	49	2.0	-
	Combined resistance to ≥3 antimicrobial groups (among piperacillin-tazobactam, ceftazidime, carbapenems, fluoroquinolones and aminoglycosides) ^c	40	5.0	37	8.1	29	3.4	39	7.7	49	10.2	-
<i>Acinetobacter</i> species	Carbapenem (imipenem/meropenem) resistance	7	<10 isolates	9	<10 isolates	9	<10 isolates	15	0.0	7	<10 isolates	NA
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	7	<10 isolates	9	<10 isolates	9	<10 isolates	15	6.7	7	<10 isolates	NA
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	7	<10 isolates	9	<10 isolates	8	<10 isolates	14	0.0	7	<10 isolates	NA
	Combined resistance to carbapenems, fluoroquinolones and aminoglycosides ^b	7	<10 isolates	9	<10 isolates	8	<10 isolates	14	0.0	7	<10 isolates	NA
<i>S. aureus</i>	MRSA ^d	97	37.1	95	42.1	88	36.4	75	24.0	92	19.6	↓
<i>S. pneumoniae</i>	Penicillin non-wild-type ^e	10	10.0	19	31.6	37	24.3	27	33.3	16	56.3	NA
	Macrolide (azithromycin/clarithromycin/erythromycin) resistance	9	<10 isolates	19	36.8	37	24.3	25	28.0	16	43.8	NA
	Combined penicillin non-wild-type and resistance to macrolides ^e	9	<10 isolates	19	26.3	37	13.5	25	20.0	16	37.5	NA
<i>E. faecalis</i>	High-level gentamicin resistance	33	39.4	29	34.5	31	22.6	30	26.7	28	25.0	-
<i>E. faecium</i>	Vancomycin resistance	12	8.3	13	0.0	15	26.7	13	0.0	23	21.7	NA

NA: not applicable as data were not reported for all years, a significant change in data source occurred during the period, or the number of isolates was < 20 in any year during the period.

< 10 isolates: no percentage is displayed if < 10 isolates were available for analysis.

Note: a small number of isolates were tested (n < 30), and the percentage resistance should be interpreted with caution.

^a ↑ and ↓ indicate statistically significantly increasing and decreasing trends, respectively; – indicates no statistically significant trend.

^b The aminoglycoside group includes only gentamicin and tobramycin from 2020 onwards.

^c The aminoglycoside group includes only tobramycin from 2020 onwards.

^d MRSA is based on AST results for oxacillin or ceftoxitin, but AST results reported as cloxacillin, dicloxacillin, flucloxacillin or meticillin are accepted as a marker for oxacillin resistance if AST results for oxacillin are not reported. Data from molecular confirmation tests (detection of *mecA* gene by PCR or a positive PBP2A-agglutination test) are given priority over phenotypic AST results.

^e Penicillin results are based on penicillin or, if not available, oxacillin. For *S. pneumoniae*, the term penicillin non-wild-type is used in this report, referring to *S. pneumoniae* isolates reported by the local laboratories as susceptible increased exposure (I) or resistant (R) to penicillin, assuming MIC to benzylpenicillin above those of wild-type isolates (>0.06 mg/L). The qualitative susceptibility categories (S/I/R) as reported by the laboratory are used, since quantitative susceptibility information is missing for a large part of the data. Laboratories not using EUCAST clinical breakpoints in the period 2016–2018 might define the cut-off values for the susceptibility categories differently.

NETHERLANDS

Participating institutions:

National Institute for Public Health and the Environment www.rivm.nl

Population and hospitals contributing data: coverage, representativeness and blood-culture rate, Netherlands, 2016–2020

Parameter	2016	2017	2018	2019	2020
Estimated national population coverage (%)	70	70	72	70	72
Geographical representativeness	High	High	High	High	High
Hospital representativeness	High	High	High	High	High
Patient and isolate representativeness	High	High	High	High	High
Blood culture sets/1 000 patient-days	Unknown	Unknown	Unknown	Unknown	Unknown

Laboratories contributing data: use of clinical breakpoint guidelines and participation in EARS-Net EQA, Netherlands, 2016–2020

Parameter	2016	2017	2018	2019	2020
Percentage of laboratories using EUCAST or EUCAST-harmonised guidelines	100	100	100	100 ^a	100 ^a
Percentage of laboratories participating in EARS-Net EQA	85	85	92	89	NA

EQA: external quality assessment.

NA: not applicable.

^a Starting with 2019 data, EARS-Net was restricted to laboratories using EUCAST or EUCAST-harmonised methodology and breakpoints.

Annual number of reporting laboratories,^a number of reported isolates and percentage of isolates reported from patients in ICUs,^b Netherlands, 2016–2020

Bacterial species	2016			2017			2018			2019			2020		
	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)
<i>E. coli</i>	36	7 251	7	37	7 515	6	39	8 276	5	35	7 302	5	38	7 498	4
<i>K. pneumoniae</i>	36	1 321	9	37	1 330	10	39	1 521	7	35	1 434	7	38	1 397	6
<i>P. aeruginosa</i>	36	660	13	37	738	14	39	808	11	35	683	12	37	749	11
<i>Acinetobacter</i> spp.	35	136	10	34	132	16	36	149	14	31	127	13	34	153	11
<i>S. aureus</i>	36	3 044	9	37	3 045	9	39	3 568	9	35	3 221	9	38	3 294	8
<i>S. pneumoniae</i>	36	1 736	9	37	1 708	9	39	1 938	8	35	1 552	7	38	997	6
<i>E. faecalis</i>	36	933	18	37	1 014	15	39	1 087	15	35	984	14	38	1 211	24
<i>E. faecium</i>	35	867	44	37	882	39	39	1 008	35	35	789	37	37	1 312	53

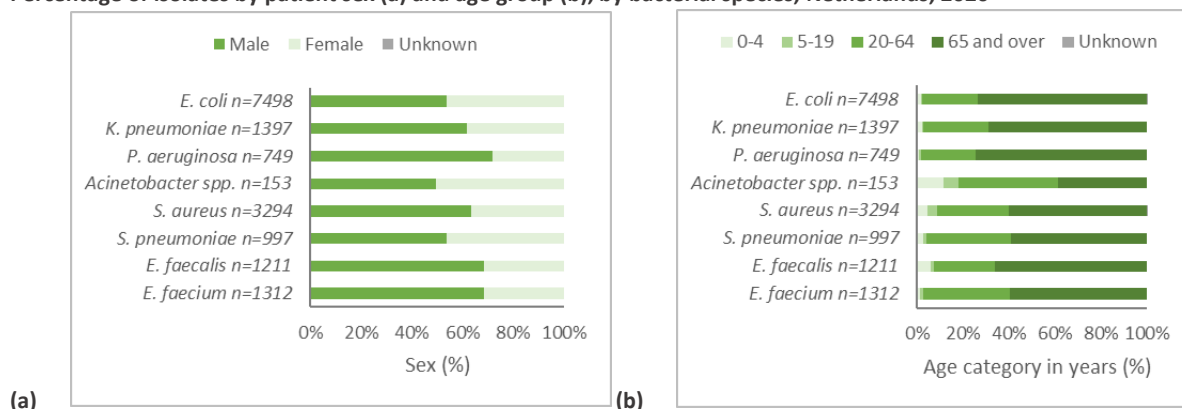
ICU: intensive care unit.

Lab: laboratories.

^a Number of laboratories reporting at least one isolate during the specific year. The total number of participating laboratories might be higher.

^b Isolates with missing information on hospital department are excluded, and results are presented only if data on hospital department are available for ≥70% of isolates.

Percentage of isolates by patient sex (a) and age group (b), by bacterial species, Netherlands, 2020



Total number of invasive isolates tested (n) and percentages of isolates with resistance phenotype (%), by bacterial species and antimicrobial group/agent, 2020 EU/EEA range, population-weighted mean and trend, Netherlands, 2016–2020

Bacterial species	Antimicrobial group/agent	2016		2017		2018		2019		2020		Trend 2016-2020 ^a
		n	%	n	%	n	%	n	%	n	%	
<i>E. coli</i>	Aminopenicillin (amoxicillin/ampicillin) resistance	7 246	46.1	7 512	46.0	8 272	46.0	7 301	45.4	7 494	42.7	↓
	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	7 250	6.6	7 509	6.4	8 270	7.3	7 300	7.5	7 494	6.6	-
	Carbapenem (imipenem/meropenem) resistance	7 245	0.0	7 506	0.0	8 272	0.0	7 299	0.0	7 487	0.0	-
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	7 249	12.9	7 511	14.4	8 274	14.7	7 298	14.6	7 490	13.3	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	7 248	6.2	7 512	5.9	8 275	6.3	7 301	7.0	7 495	6.4	-
	Combined resistance to third-generation cephalosporins, fluoroquinolones, and aminoglycosides ^b	7 247	2.3	7 504	2.1	8 268	2.2	7 296	2.6	7 486	1.9	-
<i>K. pneumoniae</i>	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	1 320	10.5	1 329	10.9	1 520	10.7	1 434	9.6	1 397	11.2	-
	Carbapenem (imipenem/meropenem) resistance	1 317	0.1	1 330	0.5	1 520	0.5	1 433	0.2	1 396	0.1	-
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	1 320	7.1	1 330	11.7	1 521	11.6	1 432	11.1	1 395	13.1	↑
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	1 320	6.8	1 330	7.4	1 521	7.0	1 434	6.0	1 397	7.3	-
	Combined resistance to fluoroquinolones, third-generation cephalosporins and aminoglycosides ^b	1 320	3.9	1 329	4.7	1 520	4.4	1 432	3.5	1 395	4.3	-
<i>P. aeruginosa</i>	Piperacillin-tazobactam resistance	635	4.1	696	7.0	764	6.2	621	5.8	701	6.1	-
	Ceftazidime resistance	660	3.3	738	3.5	805	2.7	662	3.5	748	2.9	-
	Carbapenem (imipenem/meropenem) resistance	660	4.4	736	4.5	805	5.1	682	5.1	746	3.6	-
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	659	6.1	738	9.1	808	8.9	682	10.4	749	9.1	↑
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^c	658	2.4	738	3.7	808	2.4	683	1.6	748	1.1	↓
	Combined resistance to ≥3 antimicrobial groups (among piperacillin-tazobactam, ceftazidime, carbapenems, fluoroquinolones and aminoglycosides) ^c	660	2.3	738	2.0	808	1.9	683	1.9	749	1.7	-
<i>Acinetobacter</i> species	Carbapenem (imipenem/meropenem) resistance	132	0.0	130	0.8	148	4.7	124	0.8	148	0.7	-
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	134	2.2	132	3.0	149	7.4	127	7.9	147	4.1	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	131	3.1	130	3.1	148	4.7	124	3.2	149	1.3	-
	Combined resistance to carbapenems, fluoroquinolones and aminoglycosides ^b	128	0.0	129	0.8	147	4.8	122	0.8	139	0.0	-
<i>S. aureus</i>	MRSA ^d	3 041	1.2	3 045	1.6	3 566	1.3	3 221	1.6	3 293	1.4	-
	Penicillin non-wild-type ^e	1 544	2.5	1 532	3.4	1 713	3.0	1 360	4.0	799	4.8	↑
<i>S. pneumoniae</i>	Macrolide (azithromycin/clarithromycin/erythromycin) resistance	1 602	3.1	1 597	5.1	1 806	3.9	1 406	4.8	919	3.5	-
	Combined penicillin non-wild-type and resistance to macrolides ^e	1 410	0.5	1 422	1.0	1 583	0.9	1 215	1.3	722	0.8	-
<i>E. faecalis</i>	High-level gentamicin resistance	661	25.3	708	23.6	757	22.5	604	20.0	544	29.6	-
<i>E. faecium</i>	Vancomycin resistance	866	1.0	881	1.4	1 006	1.3	786	0.9	1 310	0.5	-

^a ↑ and ↓ indicate statistically significantly increasing and decreasing trends, respectively; – indicates no statistically significant trend.

^b The aminoglycoside group includes only gentamicin and tobramycin from 2020 onwards.

^c The aminoglycoside group includes only tobramycin from 2020 onwards.

^d MRSA is based on AST results for oxacillin or cefoxitin, but AST results reported as cloxacillin, dicloxacillin, flucloxacillin or metacillin are accepted as a marker for oxacillin resistance if AST results for oxacillin are not reported. Data from molecular confirmation tests (detection of *mecA* gene by PCR or a positive PBP2A-agglutination test) are given priority over phenotypic AST results.

^e Penicillin results are based on penicillin or, if not available, oxacillin. For *S. pneumoniae*, the term penicillin non-wild-type is used in this report, referring to *S. pneumoniae* isolates reported by the local laboratories as susceptible increased exposure (I) or resistant (R) to penicillin, assuming MIC to benzylpenicillin above those of wild-type isolates (>0.06 mg/L). The qualitative susceptibility categories (S/I/R) as reported by the laboratory are used, since quantitative susceptibility information is missing for a large part of the data. Laboratories not using EUCAST clinical breakpoints in the period 2016–2018 might define the cut-off values for the susceptibility categories differently.

NORWAY

Participating institutions:

University Hospital of North Norway

Norwegian Institute of Public Health

St. Olav University Hospital, Trondheim

Population and hospitals contributing data: coverage, representativeness and blood-culture rate, Norway, 2016–2020

Parameter	2016	2017	2018	2019	2020
Estimated national population coverage (%)	100	100	94	94	94
Geographical representativeness	High	High	High	High	High
Hospital representativeness	Unknown	High	High	High	High
Patient and isolate representativeness	Unknown	High	High	High	High
Blood culture sets/1 000 patient-days	63.2	Unknown	47.4	86.7	91.9

Laboratories contributing data: use of clinical breakpoint guidelines and participation in EARS-Net EQA, Norway, 2016–2020

Parameter	2016	2017	2018	2019	2020
Percentage of laboratories using EUCAST or EUCAST-harmonised guidelines	100	100	100	100 ^a	100 ^a
Percentage of laboratories participating in EARS-Net EQA	100	100	89	89	NA

EQA: external quality assessment.

NA: not applicable.

^a Starting with 2019 data, EARS-Net was restricted to laboratories using EUCAST or EUCAST-harmonised methodology and breakpoints.

Annual number of reporting laboratories,^a number of reported isolates and percentage of isolates reported from patients in ICUs,^b Norway, 2016–2020

Bacterial species	2016			2017			2018			2019			2020		
	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)
<i>E. coli</i>	18	3 618	4	18	3 734	4	18	3 880	3	18	4 075	3	18	3 764	4
<i>K. pneumoniae</i>	18	811	5	18	781	5	18	738	5	18	832	5	18	703	5
<i>P. aeruginosa</i>	18	227	5	18	205	5	18	250	5	18	296	4	18	283	5
<i>Acinetobacter</i> spp.	12	33	6	12	31	10	11	32	13	12	23	5	10	31	0
<i>S. aureus</i>	18	1 485	5	18	1 507	6	18	1 630	6	18	1 723	6	18	1 605	6
<i>S. pneumoniae</i>	18	504	3	18	482	6	18	506	6	18	507	5	18	243	3
<i>E. faecalis</i>	18	530	7	18	526	7	18	525	6	18	551	6	18	546	6
<i>E. faecium</i>	18	215	16	18	209	10	18	174	10	18	197	7	17	183	6

ICU: intensive care unit.

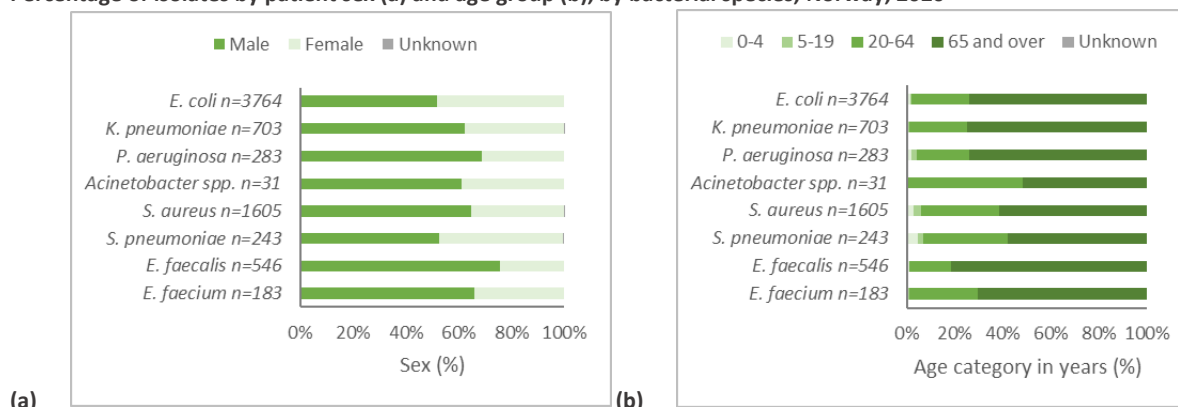
Lab: laboratories.

Note: a small number of isolates were tested ($n < 30$), and the percentage resistance should be interpreted with caution.

^a Number of laboratories reporting at least one isolate during the specific year. The total number of participating laboratories might be higher.

^b Isolates with missing information on hospital department are excluded, and results are presented only if data on hospital department are available for $\geq 70\%$ of isolates.

Percentage of isolates by patient sex (a) and age group (b), by bacterial species, Norway, 2020



Total number of invasive isolates tested (n) and percentages of isolates with resistance phenotype (%), by bacterial species and antimicrobial group/agent, 2020 EU/EEA range, population-weighted mean and trend, Norway, 2016–2020

Bacterial species	Antimicrobial group/agent	2016		2017		2018		2019		2020		Trend 2016-2020 ^a
		n	%	n	%	n	%	n	%	n	%	
<i>E. coli</i>	Aminopenicillin (amoxicillin/ampicillin) resistance	3 615	42.9	3 731	42.2	3 880	42.3	4 072	41.0	3 758	39.8	↓
	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	3 617	5.6	3 734	5.9	3 879	6.8	4 075	6.2	3 762	5.8	-
	Carbapenem (imipenem/meropenem) resistance	3 616	0.1	3 733	0.1	3 879	0.0	4 040	0.0	3 646	0.0	-
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	3 611	10.9	3 731	13.6	3 877	12.9	4 068	11.3	3 735	10.0	↓
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	3 614	5.5	3 732	7.2	3 880	5.7	4 074	5.6	3 763	5.7	-
	Combined resistance to third-generation cephalosporins, fluoroquinolones, and aminoglycosides ^b	3 609	1.9	3 729	2.4	3 876	2.0	4 068	1.7	3 734	1.6	↓
<i>K. pneumoniae</i>	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	811	5.8	781	5.8	737	7.5	832	7.7	702	10.1	↑
	Carbapenem (imipenem/meropenem) resistance	810	0.0	781	0.0	736	0.1	826	0.2	687	0.1	-
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	808	4.3	781	10.2	735	13.1	832	8.8	696	11.2	↑
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	809	3.3	781	4.2	737	5.3	831	6.1	702	7.3	↑
	Combined resistance to fluoroquinolones, third-generation cephalosporins and aminoglycosides ^b	807	2.6	781	3.2	735	3.8	831	3.9	696	4.7	↑
<i>P. aeruginosa</i>	Piperacillin-tazobactam resistance	215	7.4	183	6.0	227	5.7	270	4.1	254	5.9	-
	Ceftazidime resistance	224	7.1	197	5.1	240	6.3	282	3.9	277	5.4	-
	Carbapenem (imipenem/meropenem) resistance	225	6.7	205	3.4	250	4.8	296	7.4	282	6.4	-
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	227	5.7	205	4.9	250	10.4	296	5.7	282	8.5	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^c	213	0.9	183	0.5	236	0.8	292	0.3	281	0.4	-
	Combined resistance to ≥3 antimicrobial groups (among piperacillin-tazobactam, ceftazidime, carbapenems, fluoroquinolones and aminoglycosides) ^c	227	2.6	205	1.5	250	2.4	296	2.0	282	2.5	-
<i>Acinetobacter</i> species	Carbapenem (imipenem/meropenem) resistance	33	0.0	31	0.0	32	0.0	23	0.0	31	0.0	-
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	33	3.0	31	0.0	32	0.0	23	0.0	31	0.0	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	32	3.1	31	0.0	32	0.0	23	4.3	30	0.0	-
	Combined resistance to carbapenems, fluoroquinolones and aminoglycosides ^b	32	0.0	31	0.0	32	0.0	23	0.0	30	0.0	-
<i>S. aureus</i>	MRSA ^d	1 448	1.2	1 462	1.0	1 547	0.9	1 644	1.1	1 552	1.7	-
	Penicillin non-wild-type ^e	500	4.4	480	4.8	500	5.0	504	6.3	242	7.4	↑
<i>S. pneumoniae</i>	Macrolide (azithromycin/clarithromycin/erythromycin) resistance	473	5.3	439	5.5	460	7.6	459	5.7	215	5.1	-
	Combined penicillin non-wild-type and resistance to macrolides ^e	469	2.3	439	2.5	454	3.5	457	3.5	214	2.8	-
<i>E. faecalis</i>	High-level gentamicin resistance	221	15.8	216	14.4	216	13.4	182	12.1	161	12.4	-
<i>E. faecium</i>	Vancomycin resistance	213	1.9	202	4.5	171	2.3	196	1.0	180	0.6	-

Note: a small number of isolates were tested (n < 30), and the percentage resistance should be interpreted with caution.

^a ↑ and ↓ indicate statistically significantly increasing and decreasing trends, respectively; – indicates no statistically significant trend.

^b The aminoglycoside group includes only gentamicin and tobramycin from 2020 onwards.

^c The aminoglycoside group includes only tobramycin from 2020 onwards.

^d MRSA is based on AST results for oxacillin or ceftoxitin, but AST results reported as cloxacillin, dicloxacillin, flucloxacillin or meticillin are accepted as a marker for oxacillin resistance if AST results for oxacillin are not reported. Data from molecular confirmation tests (detection of *mecA* gene by PCR or a positive PBP2A-agglutination test) are given priority over phenotypic AST results.

^e Penicillin results are based on penicillin or, if not available, oxacillin. For *S. pneumoniae*, the term penicillin non-wild-type is used in this report, referring to *S. pneumoniae* isolates reported by the local laboratories as susceptible increased exposure (I) or resistant (R) to penicillin, assuming MIC to benzylpenicillin above those of wild-type isolates (>0.06 mg/L). The qualitative susceptibility categories (S/I/R) as reported by the laboratory are used, since quantitative susceptibility information is missing for a large part of the data. Laboratories not using EUCAST clinical breakpoints in the period 2016–2018 might define the cut-off values for the susceptibility categories differently.

POLAND

Participating institutions:

National Medicines Institute, Department of Epidemiology and Clinical Microbiology

National Reference Centre for Susceptibility Testing

Population and hospitals contributing data: coverage, representativeness and blood-culture rate, Poland, 2016–2020

Parameter	2016	2017	2018	2019	2020
Estimated national population coverage (%)	20	19	17	17	16
Geographical representativeness	Medium/High	Medium/High	Medium	Medium	Medium
Hospital representativeness	High	High	Medium	Medium	Medium
Patient and isolate representativeness	High	High	Medium	Medium	Medium
Blood culture sets/1 000 patient-days	30.3	38.1	38.6	39.8	45.6

Laboratories contributing data: use of clinical breakpoint guidelines and participation in EARS-Net EQA, Poland, 2016–2020

Parameter	2016	2017	2018	2019	2020
Percentage of laboratories using EUCAST or EUCAST-harmonised guidelines	100	100	100	100 ^a	100 ^a
Percentage of laboratories participating in EARS-Net EQA	92	96	93	98	NA

EQA: external quality assessment.

NA: not applicable.

^a Starting with 2019 data, EARS-Net was restricted to laboratories using EUCAST or EUCAST-harmonised methodology and breakpoints.

Annual number of reporting laboratories,^a number of reported isolates and percentage of isolates reported from patients in ICUs,^b Poland, 2016–2020

Bacterial species	2016			2017			2018			2019			2020		
	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)
<i>E. coli</i>	67	2 735	15	65	2 881	30	55	2 627	27	54	2 809	31	49	2 179	25
<i>K. pneumoniae</i>	66	1 142	36	65	1 203	43	53	1 221	47	55	1 172	45	49	1 091	35
<i>P. aeruginosa</i>	60	403	32	64	417	46	54	394	45	54	421	40	48	317	38
<i>Acinetobacter</i> spp.	53	394	51	56	352	60	48	290	63	46	319	64	44	373	55
<i>S. aureus</i>	65	1 842	18	66	1 848	33	57	1 986	30	55	1 843	34	50	1 676	29
<i>S. pneumoniae</i>	57	343	15	60	374	30	53	369	28	49	364	29	40	165	33
<i>E. faecalis</i>	65	743	32	65	758	48	53	733	43	53	773	48	49	790	36
<i>E. faecium</i>	55	405	31	60	410	44	49	385	44	53	443	43	48	529	38

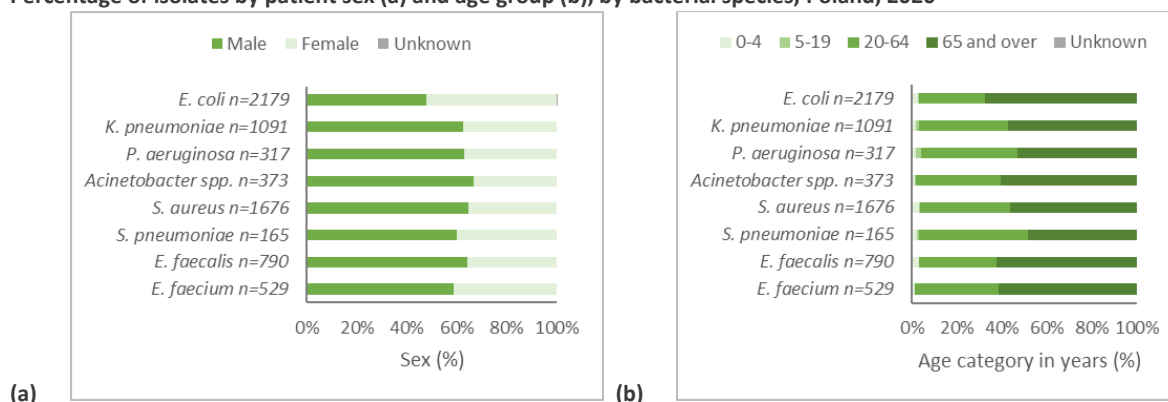
ICU: intensive care unit.

Lab: laboratories.

^a Number of laboratories reporting at least one isolate during the specific year. The total number of participating laboratories might be higher.

^b Isolates with missing information on hospital department are excluded, and results are presented only if data on hospital department are available for ≥70% of isolates.

Percentage of isolates by patient sex (a) and age group (b), by bacterial species, Poland, 2020



Total number of invasive isolates tested (n) and percentages of isolates with resistance phenotype (%), by bacterial species and antimicrobial group/agent, 2020 EU/EEA range, population-weighted mean and trend, Poland, 2016–2020

Bacterial species	Antimicrobial group/agent	2016		2017		2018		2019		2020		Trend 2016-2020 ^a
		n	%	n	%	n	%	n	%	n	%	
<i>E. coli</i>	Aminopenicillin (amoxicillin/ampicillin) resistance	1 034	64.5	913	69.4	890	64.3	836	61.6	502	56.2	↓
	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	2 719	13.7	2 866	16.7	2 620	17.6	2 803	17.1	2 172	17.4	↑
	Carbapenem (imipenem/meropenem) resistance	2 553	0.0	2 741	0.0	2 500	0.1	2 683	0.0	2 080	0.0	-
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	2 637	33.1	1 832	35.9	2 567	34.7	2 753	33.0	2 149	33.0	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	2 521	13.3	2 719	14.0	2 449	15.1	2 614	12.6	2 033	14.5	-
	Combined resistance to third-generation cephalosporins, fluoroquinolones, and aminoglycosides ^b	2 411	8.5	1 666	8.2	2 386	10.5	2 564	9.3	1 998	9.4	-
<i>K. pneumoniae</i>	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	1 142	64.4	1 203	63.0	1 219	64.6	1 166	58.3	1 088	63.0	-
	Carbapenem (imipenem/meropenem) resistance	1 123	2.1	1 161	6.4	1 183	8.1	1 155	7.7	1 074	8.2	↑
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	1 119	66.8	739	66.3	1 207	68.2	1 159	61.3	1 085	65.2	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	1 075	56.7	1 165	55.5	1 178	54.2	1 128	47.5	1 019	50.0	↓
	Combined resistance to fluoroquinolones, third-generation cephalosporins and aminoglycosides ^b	1 052	53.6	703	52.6	1 162	51.5	1 112	45.0	1 012	47.4	↓
<i>P. aeruginosa</i>	Piperacillin-tazobactam resistance	370	27.6	374	31.0	366	34.4	409	26.4	266	32.3	-
	Ceftazidime resistance	401	19.5	415	24.6	390	26.9	418	20.1	312	21.8	-
	Carbapenem (imipenem/meropenem) resistance	397	26.2	393	24.2	374	33.2	409	24.4	316	28.5	-
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	400	31.0	358	37.2	389	39.1	417	34.1	270	32.6	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^c	367	25.6	384	25.5	384	26.0	402	19.7	239	19.7	↓#
	Combined resistance to ≥3 antimicrobial groups (among piperacillin-tazobactam, ceftazidime, carbapenems, fluoroquinolones and aminoglycosides) ^c	403	20.3	417	22.1	394	29.2	420	22.6	309	22.0	-
<i>Acinetobacter</i> species	Carbapenem (imipenem/meropenem) resistance	391	66.0	344	67.4	278	67.3	317	71.0	372	78.2	↑
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	393	83.0	348	83.0	268	86.9	304	85.5	366	88.3	↑#
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	387	72.6	344	72.7	285	67.4	315	70.8	363	70.8	-
	Combined resistance to carbapenems, fluoroquinolones and aminoglycosides ^b	383	59.3	333	59.5	251	62.9	299	63.2	355	64.2	-
<i>S. aureus</i>	MRSA ^d	1 772	16.4	1 805	15.2	1 959	15.9	1 841	14.9	1 351	13.8	-
	Penicillin non-wild-type ^e	337	19.3	290	16.6	343	15.7	310	15.5	158	10.8	↓
<i>S. pneumoniae</i>	Macrolide (azithromycin/clarithromycin/erythromycin) resistance	277	30.3	253	24.5	309	24.9	312	25.0	123	22.8	-
	Combined penicillin non-wild-type and resistance to macrolides ^e	271	16.6	241	14.1	285	10.9	268	13.4	116	9.5	-
<i>E. faecalis</i>	High-level gentamicin resistance	666	43.1	660	41.2	645	41.6	706	40.2	703	51.6	↑
<i>E. faecium</i>	Vancomycin resistance	405	26.2	400	31.5	374	35.8	432	44.0	527	38.5	↑

^a ↑ and ↓ indicate statistically significantly increasing and decreasing trends, respectively; # indicates a significant trend in the overall data, but not in data that only included laboratories reporting continuously for all five years; – indicates no statistically significant trend.

^b The aminoglycoside group includes only gentamicin and tobramycin from 2020 onwards.

^c The aminoglycoside group includes only tobramycin from 2020 onwards.

^d MRSA is based on AST results for oxacillin or cefoxitin, but AST results reported as cloxacillin, dicloxacillin, flucloxacillin or metacillin are accepted as a marker for oxacillin resistance if AST results for oxacillin are not reported. Data from molecular confirmation tests (detection of *mecA* gene by PCR or a positive PBP2A-agglutination test) are given priority over phenotypic AST results.

^e Penicillin results are based on penicillin or, if not available, oxacillin. For *S. pneumoniae*, the term penicillin non-wild-type is used in this report, referring to *S. pneumoniae* isolates reported by the local laboratories as susceptible increased exposure (I) or resistant (R) to penicillin, assuming MIC to benzylpenicillin above those of wild-type isolates (>0.06 mg/L). The qualitative susceptibility categories (S/I/R) as reported by the laboratory are used, since quantitative susceptibility information is missing for a large part of the data. Laboratories not using EUCAST clinical breakpoints in the period 2016–2018 might define the cut-off values for the susceptibility categories differently.

PORTUGAL

Participating institutions:

National Institute of Health Doutor Ricardo Jorge www.insarij.pt

Ministry of Health Directorate-General of Health

Directorate-General of Health

Population and hospitals contributing data: coverage, representativeness and blood-culture rate, Portugal, 2016–2020

Parameter	2016	2017	2018	2019	2020
Estimated national population coverage (%)	97	97	97	97	97
Geographical representativeness	High	High	High	High	High
Hospital representativeness	High	High	High	High	High
Patient and isolate representativeness	High	High	High	High	High
Blood culture sets/1 000 patient-days	Unknown	148.1	206.9	244.2	244.2

Laboratories contributing data: use of clinical breakpoint guidelines and participation in EARS-Net EQA, Portugal, 2016–2020

Parameter	2016	2017	2018	2019	2020
Percentage of laboratories using EUCAST or EUCAST-harmonised guidelines	99	100	98	100 ^a	100 ^a
Percentage of laboratories participating in EARS-Net EQA	88	88	83	93	NA

EQA: external quality assessment.

NA: not applicable.

^a Starting with 2019 data, EARS-Net was restricted to laboratories using EUCAST or EUCAST-harmonised methodology and breakpoints.

Annual number of reporting laboratories,^a number of reported isolates and percentage of isolates reported from patients in ICUs,^b Portugal, 2016–2020

Bacterial species	2016			2017			2018			2019			2020		
	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)
<i>E. coli</i>	60	5 786	4	62	6 452	4	59	5 921	4	58	6 433	4	63	5 858	4
<i>K. pneumoniae</i>	59	2 352	12	61	2 743	10	58	2 604	10	55	2 709	9	60	2 790	9
<i>P. aeruginosa</i>	57	1 230	13	57	1 220	13	55	1 115	12	54	1 061	11	57	1 061	9
<i>Acinetobacter</i> spp.	39	207	22	36	174	16	39	127	18	30	99	14	31	104	9
<i>S. aureus</i>	59	3 482	7	64	3 789	5	59	3 940	7	59	3 308	6	65	3 319	6
<i>S. pneumoniae</i>	57	928	3	54	1 056	1	55	1 062	Unknown	53	983	Unknown	48	588	Unknown
<i>E. faecalis</i>	56	972	2	58	1 014	8	56	979	9	54	945	9	58	990	10
<i>E. faecium</i>	45	411	2	46	467	16	47	440	16	43	411	15	43	406	12

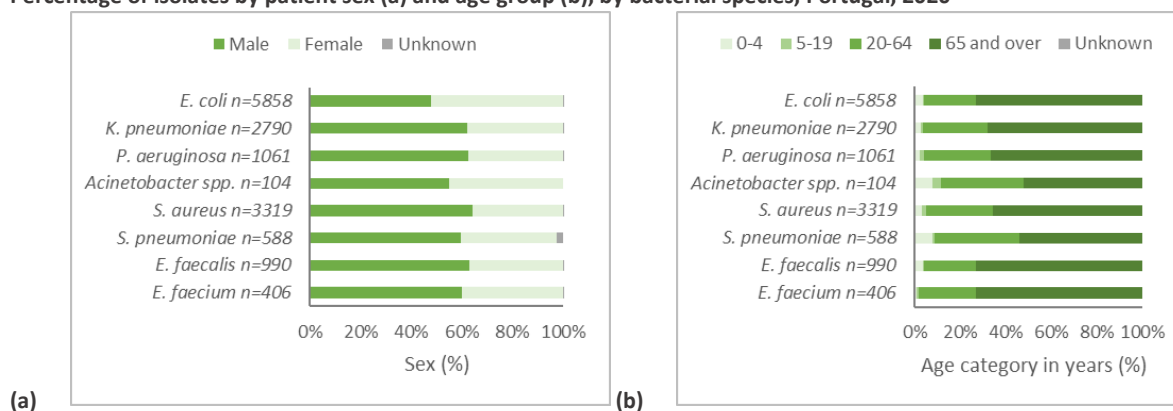
ICU: intensive care unit.

Lab: laboratories.

^a Number of laboratories reporting at least one isolate during the specific year. The total number of participating laboratories might be higher.

^b Isolates with missing information on hospital department are excluded, and results are presented only if data on hospital department are available for ≥70% of isolates.

Percentage of isolates by patient sex (a) and age group (b), by bacterial species, Portugal, 2020



Total number of invasive isolates tested (n) and percentages of isolates with resistance phenotype (%), by bacterial species and antimicrobial group/agent, 2020 EU/EEA range, population-weighted mean and trend, Portugal, 2016–2020

Bacterial species	Antimicrobial group/agent	2016		2017		2018		2019		2020		Trend 2016-2020 ^a
		n	%	n	%	n	%	n	%	n	%	
<i>E. coli</i>	Aminopenicillin (amoxicillin/ampicillin) resistance	5 772	59.2	6 245	56.2	5 895	55.1	5 933	58.5	5 849	54.4	↓
	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	5 784	16.1	6 441	15.6	5 881	14.7	6 390	16.1	5 793	14.4	-
	Carbapenem (imipenem/meropenem) resistance	5 760	0.0	6 384	0.3	5 797	0.5	6 372	0.1	5 833	0.2	-
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	5 783	28.9	6 424	27.3	5 868	25.5	6 431	26.5	5 845	23.9	↓
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	5 765	13.1	6 387	11.9	5 825	12.2	6 428	12.1	5 788	11.7	↓
	Combined resistance to third-generation cephalosporins, fluoroquinolones, and aminoglycosides ^b	5 762	7.7	6 365	6.6	5 746	6.2	6 384	6.3	5 716	6.1	↓
<i>K. pneumoniae</i>	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	2 349	46.7	2 743	44.9	2 579	50.0	2 697	47.6	2 762	47.6	-
	Carbapenem (imipenem/meropenem) resistance	2 340	5.2	2 720	8.6	2 563	11.7	2 690	10.9	2 780	11.6	↑
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	2 350	41.7	2 736	45.7	2 592	43.8	2 704	45.8	2 779	42.7	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	2 337	35.0	2 717	33.5	2 572	34.4	2 708	32.2	2 759	28.2	↓
	Combined resistance to fluoroquinolones, third-generation cephalosporins and aminoglycosides ^b	2 332	27.2	2 711	28.4	2 538	26.7	2 692	26.5	2 734	23.8	↓
<i>P. aeruginosa</i>	Piperacillin-tazobactam resistance	1 230	22.7	1 206	24.2	1 096	21.9	1 054	20.3	1 060	17.5	↓
	Ceftazidime resistance	1 228	18.0	1 216	18.6	1 090	18.6	1 054	17.6	977	14.4	↓#
	Carbapenem (imipenem/meropenem) resistance	1 227	19.2	1 215	18.3	1 108	15.7	1 052	17.8	1 057	13.4	↓
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	1 227	20.1	1 208	23.7	1 104	23.7	1 057	21.6	1 059	18.5	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^c	1 230	11.6	1 210	12.1	1 109	11.9	1 060	9.9	877	5.4	↓
	Combined resistance to ≥3 antimicrobial groups (among piperacillin-tazobactam, ceftazidime, carbapenems, fluoroquinolones and aminoglycosides) ^c	1 230	14.8	1 214	16.1	1 108	15.3	1 056	14.1	1 060	10.8	↓#
<i>Acinetobacter</i> species	Carbapenem (imipenem/meropenem) resistance	206	51.9	172	40.7	127	30.7	90	31.1	104	15.4	↓
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	206	50.5	172	38.4	123	34.1	88	26.1	101	17.8	↓
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	206	39.3	168	28.6	126	25.4	93	24.7	104	12.5	↓
	Combined resistance to carbapenems, fluoroquinolones and aminoglycosides ^b	206	37.9	166	24.1	123	22.0	83	20.5	101	8.9	↓
<i>S. aureus</i>	MRSA ^d	3 454	43.6	3 728	39.2	3 810	38.1	3 265	34.8	3 299	29.7	↓
	Penicillin non-wild-type ^e	884	12.2	997	12.8	986	13.4	887	13.9	513	13.8	-
<i>S. pneumoniae</i>	Macrolide (azithromycin/clarithromycin/erythromycin) resistance	912	14.4	1024	14.8	985	15.5	952	12.8	565	15.6	-
	Combined penicillin non-wild-type and resistance to macrolides ^e	868	6.6	978	7.1	922	8.0	865	7.5	492	8.5	-
<i>E. faecalis</i>	High-level gentamicin resistance	851	33.8	931	25.8	778	26.6	881	22.2	862	19.8	↓
<i>E. faecium</i>	Vancomycin resistance	411	7.5	461	7.2	436	4.4	410	9.0	399	7.8	-

^a ↑ and ↓ indicate statistically significantly increasing and decreasing trends, respectively; # indicates a significant trend in the overall data, but not in data that only included laboratories reporting continuously for all five years; – indicates no statistically significant trend.

^b The aminoglycoside group includes only gentamicin and tobramycin from 2020 onwards.

^c The aminoglycoside group includes only tobramycin from 2020 onwards.

^d MRSA is based on AST results for oxacillin or cefoxitin, but AST results reported as cloxacillin, dicloxacillin, flucloxacillin or meticillin are accepted as a marker for oxacillin resistance if AST results for oxacillin are not reported. Data from molecular confirmation tests (detection of *mecA* gene by PCR or a positive PBP2A-agglutination test) are given priority over phenotypic AST results.

^e Penicillin results are based on penicillin or, if not available, oxacillin. For *S. pneumoniae*, the term penicillin non-wild-type is used in this report, referring to *S. pneumoniae* isolates reported by the local laboratories as susceptible increased exposure (I) or resistant (R) to penicillin, assuming MIC to benzylpenicillin above those of wild-type isolates (>0.06 mg/L). The qualitative susceptibility categories (S/I/R) as reported by the laboratory are used, since quantitative susceptibility information is missing for a large part of the data. Laboratories not using EUCAST clinical breakpoints in the period 2016–2018 might define the cut-off values for the susceptibility categories differently.

ROMANIA

Participating institutions:
National Institute of Public Health

Population and hospitals contributing data: coverage, representativeness and blood-culture rate, Romania, 2016–2020

Parameter	2016	2017	2018	2019	2020
Estimated national population coverage (%)	Unknown	Unknown	11	11	21
Geographical representativeness	Unknown	Unknown	Poor	Poor	Poor
Hospital representativeness	Unknown	Unknown	Poor	Poor	Poor
Patient and isolate representativeness	Unknown	Unknown	Poor	Poor	Poor
Blood culture sets/1 000 patient-days	Unknown	Unknown	34	21	26.4

Laboratories contributing data: use of clinical breakpoint guidelines and participation in EARS-Net EQA, Romania, 2016–2020

Parameter	2016	2017	2018	2019	2020
Percentage of laboratories using EUCAST or EUCAST-harmonised guidelines	31	38	69	100 ^a	100 ^a
Percentage of laboratories participating in EARS-Net EQA	87	93	93	100	NA

EQA: external quality assessment.

NA: not applicable.

^a Starting with 2019 data, EARS-Net was restricted to laboratories using EUCAST or EUCAST-harmonised methodology and breakpoints.

Annual number of reporting laboratories,^a number of reported isolates and percentage of isolates reported from patients in ICUs,^b Romania, 2016–2020

Bacterial species	2016			2017			2018			2019			2020		
	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)
<i>E. coli</i>	13	420	10	14	518	14	17	654	13	15	671	12	15	455	17
<i>K. pneumoniae</i>	13	344	40	14	339	43	17	443	44	15	488	43	16	478	54
<i>P. aeruginosa</i>	13	93	39	14	132	46	17	156	40	14	192	44	15	148	53
<i>Acinetobacter</i> spp.	13	160	54	12	183	73	17	218	73	15	268	75	15	298	72
<i>S. aureus</i>	14	495	25	14	535	23	17	626	24	14	634	23	16	418	30
<i>S. pneumoniae</i>	8	60	12	11	81	22	12	93	24	11	107	15	11	42	20
<i>E. faecalis</i>	13	115	37	14	128	37	17	178	25	14	166	35	15	167	58
<i>E. faecium</i>	13	78	47	13	64	45	15	79	43	14	144	48	16	122	53

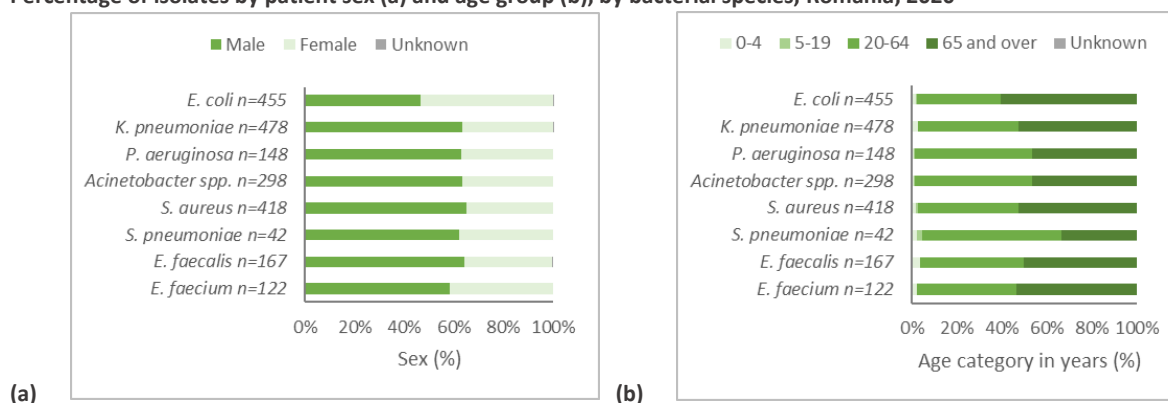
ICU: intensive care unit.

Lab: laboratories.

^a Number of laboratories reporting at least one isolate during the specific year. The total number of participating laboratories might be higher.

^b Isolates with missing information on hospital department are excluded, and results are presented only if data on hospital department are available for ≥70% of isolates.

Percentage of isolates by patient sex (a) and age group (b), by bacterial species, Romania, 2020



Total number of invasive isolates tested (n) and percentages of isolates with resistance phenotype (%), by bacterial species and antimicrobial group/agent, 2020 EU/EEA range, population-weighted mean and trend, Romania, 2016–2020

Bacterial species	Antimicrobial group/agent	2016		2017		2018		2019		2020		Trend
		n	%	n	%	n	%	n	%	n	%	2016-2020 ^a
<i>E. coli</i>	Aminopenicillin (amoxicillin/ampicillin) resistance	376	72.3	494	68.2	542	62.2	538	63.0	316	62.7	↓
	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	418	23.4	518	18.7	654	20.2	664	20.3	452	19.7	-
	Carbapenem (imipenem/meropenem) resistance	411	1.0	510	0.4	653	0.0	666	0.6	454	0.7	-
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	418	30.6	518	26.4	646	29.1	654	28.3	450	26.0	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	414	15.0	513	15.2	649	12.8	594	11.6	367	10.9	↓
	Combined resistance to third-generation cephalosporins, fluoroquinolones, and aminoglycosides ^b	410	11.7	513	9.7	641	7.2	576	7.3	360	5.8	↓
<i>K. pneumoniae</i>	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	344	68.0	339	62.5	443	61.4	479	64.1	477	67.9	-
	Carbapenem (imipenem/meropenem) resistance	334	31.4	334	22.5	441	29.5	470	32.3	474	48.3	↑
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	342	60.8	337	64.1	441	57.4	471	62.0	474	66.2	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	336	61.9	338	58.6	436	50.9	411	53.0	399	49.6	↓
	Combined resistance to fluoroquinolones, third-generation cephalosporins and aminoglycosides ^b	335	55.2	336	55.4	434	46.3	402	52.0	397	47.9	↓
<i>P. aeruginosa</i>	Piperacillin-tazobactam resistance	86	48.8	131	52.7	135	45.9	178	52.8	121	42.1	-
	Ceftazidime resistance	86	44.2	127	55.9	152	46.7	180	52.2	144	41.0	-
	Carbapenem (imipenem/meropenem) resistance	93	51.6	131	63.4	156	55.1	184	55.4	148	43.9	↓#
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	89	51.7	132	62.1	155	52.3	184	52.2	140	46.4	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^c	87	50.6	132	57.6	146	50.7	176	48.9	124	37.1	↓#
Combined resistance to ≥3 antimicrobial groups (among piperacillin-tazobactam, ceftazidime, carbapenems, fluoroquinolones and aminoglycosides) ^c	90	48.9	132	59.1	154	49.4	185	49.7	144	39.6	↓#	
<i>Acinetobacter</i> species	Carbapenem (imipenem/meropenem) resistance	160	85.0	182	87.4	218	85.3	264	88.3	297	93.3	↑
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	157	91.1	183	89.1	218	88.1	262	91.2	297	95.3	↑
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	152	89.5	183	83.6	210	80.0	241	83.8	253	90.1	-
	Combined resistance to carbapenems, fluoroquinolones and aminoglycosides ^b	152	82.9	182	81.3	210	77.6	236	83.5	251	88.8	↑
<i>S. aureus</i>	MRSA ^d	477	50.5	507	44.4	600	43.0	625	46.7	406	47.3	-
	Penicillin non-wild-type ^e	56	41.1	79	29.1	90	40.0	86	19.8	39	38.5	-
<i>S. pneumoniae</i>	Macrolide (azithromycin/clarithromycin/erythromycin) resistance	59	37.3	76	26.3	93	32.3	92	17.4	37	27.0	-
	Combined penicillin non-wild-type and resistance to macrolides ^e	56	30.4	75	24.0	90	26.7	74	9.5	34	23.5	↓#
<i>E. faecalis</i>	High-level gentamicin resistance	87	56.3	89	44.9	168	37.5	155	40.6	148	43.2	-
<i>E. faecium</i>	Vancomycin resistance	77	39.0	64	34.4	77	40.3	140	35.7	112	39.3	-

^a ↑ and ↓ indicate statistically significantly increasing and decreasing trends, respectively; # indicates a significant trend in the overall data, but not in data that only included laboratories reporting continuously for all five years; – indicates no statistically significant trend.

^b The aminoglycoside group includes only gentamicin and tobramycin from 2020 onwards.

^c The aminoglycoside group includes only tobramycin from 2020 onwards.

^d MRSA is based on AST results for oxacillin or cefoxitin, but AST results reported as cloxacillin, dicloxacillin, flucloxacillin or meticillin are accepted as a marker for oxacillin resistance if AST results for oxacillin are not reported. Data from molecular confirmation tests (detection of *mecA* gene by PCR or a positive PBP2A-agglutination test) are given priority over phenotypic AST results.

^e Penicillin results are based on penicillin or, if not available, oxacillin. For *S. pneumoniae*, the term penicillin non-wild-type is used in this report, referring to *S. pneumoniae* isolates reported by the local laboratories as susceptible increased exposure (I) or resistant (R) to penicillin, assuming MIC to benzylpenicillin above those of wild-type isolates (>0.06 mg/L). The qualitative susceptibility categories (S/I/R) as reported by the laboratory are used, since quantitative susceptibility information is missing for a large part of the data. Laboratories not using EUCAST clinical breakpoints in the period 2016–2018 might define the cut-off values for the susceptibility categories differently.

SLOVAKIA

Participating institutions:

National Reference Centre for Antimicrobial Resistance

Public Health Authority of the Slovak Republic

Regional Public Health Authority Banska Bystrica

Population and hospitals contributing data: coverage, representativeness and blood-culture rate, Slovakia, 2016–2020

Parameter	2016	2017	2018	2019	2020
Estimated national population coverage (%)	70	68	64	56	56
Geographical representativeness	High	High	High	High	High
Hospital representativeness	High	High	High	High	High
Patient and isolate representativeness	Unknown	Unknown	High	High	High
Blood culture sets/1 000 patient-days	20.3	20.8	23.7	36.1	27.0

Laboratories contributing data: use of clinical breakpoint guidelines and participation in EARS-Net EQA, Slovakia, 2016–2020

Parameter	2016	2017	2018	2019	2020
Percentage of laboratories using EUCAST or EUCAST-harmonised guidelines	100	100	100	100 ^a	100 ^a
Percentage of laboratories participating in EARS-Net EQA	100	100	100	100	NA

EQA: external quality assessment.

NA: not applicable.

^a Starting with 2019 data, EARS-Net was restricted to laboratories using EUCAST or EUCAST-harmonised methodology and breakpoints.

Annual number of reporting laboratories,^a number of reported isolates and percentage of isolates reported from patients in ICUs,^b Slovakia, 2016–2020

Bacterial species	2016			2017			2018			2019			2020		
	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)
<i>E. coli</i>	13	829	15	13	882	15	12	983	14	10	851	14	11	732	17
<i>K. pneumoniae</i>	13	466	28	13	468	32	11	505	33	10	370	26	11	405	35
<i>P. aeruginosa</i>	12	191	37	13	211	30	11	259	32	10	201	30	11	246	35
<i>Acinetobacter</i> spp.	13	115	32	13	126	39	11	146	36	8	97	44	11	95	37
<i>S. aureus</i>	13	572	26	13	614	21	12	627	25	10	567	18	11	540	22
<i>S. pneumoniae</i>	5	13	31	10	40	30	9	47	13	6	40	20	5	15	27
<i>E. faecalis</i>	13	233	24	13	226	29	12	256	32	10	212	32	11	199	30
<i>E. faecium</i>	12	126	33	11	122	32	11	168	33	10	139	32	10	121	31

ICU: intensive care unit.

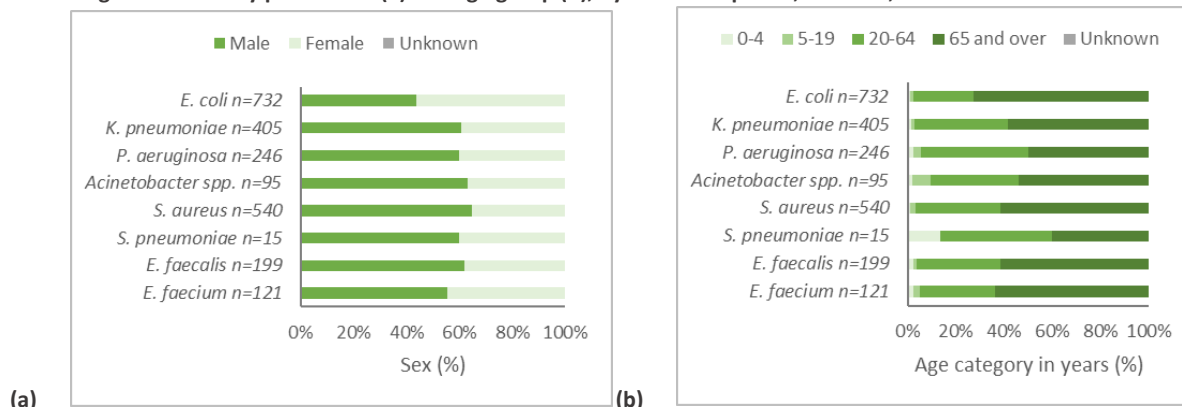
Lab: laboratories.

Note: a small number of isolates were tested ($n < 30$), and the percentage resistance should be interpreted with caution.

^a Number of laboratories reporting at least one isolate during the specific year. The total number of participating laboratories might be higher.

^b Isolates with missing information on hospital department are excluded, and results are presented only if data on hospital department are available for $\geq 70\%$ of isolates.

Percentage of isolates by patient sex (a) and age group (b), by bacterial species, Slovakia, 2020



Total number of invasive isolates tested (n) and percentages of isolates with resistance phenotype (%), by bacterial species and antimicrobial group/agent, 2020 EU/EEA range, population-weighted mean and trend, Slovakia, 2016–2020

Bacterial species	Antimicrobial group/agent	2016		2017		2018		2019		2020		Trend 2016-2020 ^a
		n	%	n	%	n	%	n	%	n	%	
<i>E. coli</i>	Aminopenicillin (amoxicillin/ampicillin) resistance	817	62.3	853	64.9	967	61.7	849	57.8	728	57.1	↓
	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	824	29.7	870	30.9	973	30.1	846	23.0	727	27.1	↓
	Carbapenem (imipenem/meropenem) resistance	751	0.0	844	0.0	924	0.0	785	0.1	705	0.1	-
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	826	40.4	882	43.2	969	42.1	850	34.0	729	34.2	↓
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	828	20.2	875	22.5	969	21.6	847	16.6	731	18.5	↓#
	Combined resistance to third-generation cephalosporins, fluoroquinolones, and aminoglycosides ^b	822	14.8	863	17.7	965	16.6	842	12.7	724	14.9	-
<i>K. pneumoniae</i>	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	465	61.3	459	63.2	497	55.9	367	57.5	399	54.4	↓
	Carbapenem (imipenem/meropenem) resistance	435	2.5	450	4.4	488	3.5	351	4.6	392	8.2	↑#
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	466	66.3	466	66.7	497	61.0	367	56.9	403	53.8	↓
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	466	62.4	468	61.1	496	54.8	369	49.3	405	48.9	↓
	Combined resistance to fluoroquinolones, third-generation cephalosporins and aminoglycosides ^b	465	55.7	457	57.1	491	49.5	366	45.1	399	44.4	↓
<i>P. aeruginosa</i>	Piperacillin-tazobactam resistance	165	27.3	180	33.3	236	28.0	175	28.0	213	33.3	-
	Ceftazidime resistance	164	31.1	180	35.6	237	32.1	178	31.5	214	32.7	-
	Carbapenem (imipenem/meropenem) resistance	182	42.3	202	47.0	248	44.0	197	39.1	231	48.9	-
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	190	47.4	211	46.9	252	52.4	201	46.3	246	49.6	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^c	191	33.0	211	36.0	254	37.4	199	33.2	242	33.1	-
	Combined resistance to ≥3 antimicrobial groups (among piperacillin-tazobactam, ceftazidime, carbapenems, fluoroquinolones and aminoglycosides) ^c	183	33.3	202	38.1	248	35.5	197	30.5	231	35.5	-
<i>Acinetobacter</i> species	Carbapenem (imipenem/meropenem) resistance	109	28.4	120	31.7	141	44.0	96	55.2	91	30.8	↑#
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	115	46.1	126	52.4	141	56.0	94	61.7	95	38.9	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	115	40.9	125	40.0	144	44.4	97	46.4	95	28.4	-
	Combined resistance to carbapenems, fluoroquinolones and aminoglycosides ^b	109	24.8	119	25.2	139	36.0	93	41.9	91	24.2	-
<i>S. aureus</i>	MRSA ^d	571	27.1	613	29.2	610	26.6	563	27.2	540	24.8	-
	Penicillin non-wild-type ^e	13	7.7	39	25.6	46	13.0	40	5.0	14	14.3	NA
<i>S. pneumoniae</i>	Macrolide (azithromycin/clarithromycin/erythromycin) resistance	12	8.3	31	35.5	45	24.4	36	11.1	15	20.0	NA
	Combined penicillin non-wild-type and resistance to macrolides ^e	12	0.0	30	23.3	44	11.4	36	2.8	14	7.1	NA
	High-level gentamicin resistance	213	45.1	213	25.8	215	40.0	201	32.8	195	35.9	-
<i>E. faecium</i>	Vancomycin resistance	125	26.4	122	32.0	161	32.3	137	29.2	120	40.0	-

NA: not applicable as data were not reported for all years, a significant change in data source occurred during the period, or the number of isolates was < 20 in any year during the period.

Note: a small number of isolates were tested (n < 30), and the percentage resistance should be interpreted with caution.

^a ↑ and ↓ indicate statistically significantly increasing and decreasing trends, respectively; # indicates a significant trend in the overall data, but not in data that only included laboratories reporting continuously for all five years; – indicates no statistically significant trend.

^b The aminoglycoside group includes only gentamicin and tobramycin from 2020 onwards.

^c The aminoglycoside group includes only tobramycin from 2020 onwards.

^d MRSA is based on AST results for oxacillin or cefoxitin, but AST results reported as cloxacillin, dicloxacillin, flucloxacillin or metacillin are accepted as a marker for oxacillin resistance if AST results for oxacillin are not reported. Data from molecular confirmation tests (detection of *mecA* gene by PCR or a positive PBP2A-agglutination test) are given priority over phenotypic AST results.

^e Penicillin results are based on penicillin or, if not available, oxacillin. For *S. pneumoniae*, the term penicillin non-wild-type is used in this report, referring to *S. pneumoniae* isolates reported by the local laboratories as susceptible increased exposure (I) or resistant (R) to penicillin, assuming MIC to benzylpenicillin above those of wild-type isolates (>0.06 mg/L). The qualitative susceptibility categories (S/I/R) as reported by the laboratory are used, since quantitative susceptibility information is missing for a large part of the data. Laboratories not using EUCAST clinical breakpoints in the period 2016–2018 might define the cut-off values for the susceptibility categories differently.

SLOVENIA

Participating institutions:

National Institute of Public Health www.nijz.si

Medical faculty, University of Ljubljana

National Laboratory of Health, Environment and Food

Population and hospitals contributing data: coverage, representativeness and blood-culture rate, Slovenia, 2016–2020

Parameter	2016	2017	2018	2019	2020
Estimated national population coverage (%)	99	99	99	99	99
Geographical representativeness	High	High	High	High	High
Hospital representativeness	High	High	High	High	High
Patient and isolate representativeness	High	High	High	High	High
Blood culture sets/1 000 patient-days	35	41.2	36.8	40.4	47.1

Laboratories contributing data: use of clinical breakpoint guidelines and participation in EARS-Net EQA, Slovenia, 2016–2020

Parameter	2016	2017	2018	2019	2020
Percentage of laboratories using EUCAST or EUCAST-harmonised guidelines	91	91	91	100 ^a	100 ^a
Percentage of laboratories participating in EARS-Net EQA	100	100	100	91	NA

EQA: external quality assessment.

NA: not applicable.

^a Starting with 2019 data, EARS-Net was restricted to laboratories using EUCAST or EUCAST-harmonised methodology and breakpoints.

Annual number of reporting laboratories,^a number of reported isolates and percentage of isolates reported from patients in ICUs,^b Slovenia, 2016–2020

Bacterial species	2016			2017			2018			2019			2020		
	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)
<i>E. coli</i>	10	1 420	11	10	1 435	9	10	1 668	7	10	1 610	6	10	1 617	6
<i>K. pneumoniae</i>	10	267	20	10	312	20	10	289	14	10	303	14	10	291	17
<i>P. aeruginosa</i>	10	143	40	10	138	30	10	174	24	10	175	26	10	186	35
<i>Acinetobacter</i> spp.	7	60	37	4	36	50	8	39	33	8	40	38	7	36	39
<i>S. aureus</i>	10	534	12	10	576	13	10	606	9	10	656	10	10	711	14
<i>S. pneumoniae</i>	10	269	12	10	319	10	10	271	13	10	283	10	10	172	9
<i>E. faecalis</i>	10	161	25	10	171	19	10	162	15	9	141	24	9	182	15
<i>E. faecium</i>	9	111	42	9	149	41	9	134	32	10	137	32	9	177	32

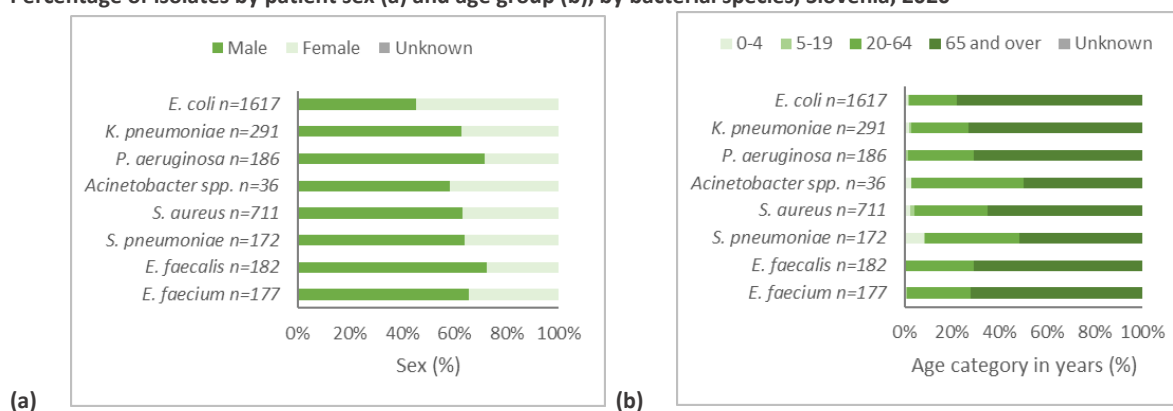
ICU: intensive care unit.

Lab: laboratories.

^a Number of laboratories reporting at least one isolate during the specific year. The total number of participating laboratories might be higher.

^b Isolates with missing information on hospital department are excluded, and results are presented only if data on hospital department are available for ≥70% of isolates.

Percentage of isolates by patient sex (a) and age group (b), by bacterial species, Slovenia, 2020



Total number of invasive isolates tested (n) and percentages of isolates with resistance phenotype (%), by bacterial species and antimicrobial group/agent, 2020 EU/EEA range, population-weighted mean and trend, Slovenia, 2016–2020

Bacterial species	Antimicrobial group/agent	2016		2017		2018		2019		2020		Trend 2016-2020 ^a
		n	%	n	%	n	%	n	%	n	%	
<i>E. coli</i>	Aminopenicillin (amoxicillin/ampicillin) resistance	1 420	57.1	1 435	51.6	1 668	53.5	1 610	51.7	1 617	51.3	↓
	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	1 420	12.5	1 435	12.5	1 668	11.3	1 610	9.8	1 617	10.6	↓
	Carbapenem (imipenem/meropenem) resistance	1 420	0.0	1 435	0.0	1 668	0.0	1 610	0.0	1 617	0.0	-
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	1 420	25.6	1 383	24.9	1 668	22.8	1 610	19.0	1 617	18.1	↓
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	1 420	10.6	1 435	11.4	1 668	9.4	1 610	7.8	1 616	6.8	↓
	Combined resistance to third-generation cephalosporins, fluoroquinolones, and aminoglycosides ^b	1 420	6.9	1 383	6.3	1 668	4.7	1 610	4.0	1 616	3.6	↓
<i>K. pneumoniae</i>	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	267	22.8	312	23.7	289	14.9	303	16.5	291	15.8	↓
	Carbapenem (imipenem/meropenem) resistance	267	0.0	312	0.0	289	0.7	303	0.3	291	0.0	-
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	267	29.6	306	30.4	289	27.3	303	19.5	291	24.7	↓
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	267	16.5	312	16.0	289	12.8	303	8.3	290	10.0	↓
	Combined resistance to fluoroquinolones, third-generation cephalosporins and aminoglycosides ^b	267	13.1	306	16.0	289	10.0	303	7.6	290	7.6	↓
<i>P. aeruginosa</i>	Piperacillin-tazobactam resistance	143	19.6	138	13.0	174	16.1	175	14.9	186	14.5	-
	Ceftazidime resistance	143	17.5	138	13.0	174	14.9	175	16.0	186	13.4	-
	Carbapenem (imipenem/meropenem) resistance	143	19.6	138	17.4	174	14.9	175	20.0	186	13.4	-
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	143	20.3	123	20.3	174	21.8	175	18.9	186	15.6	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^c	143	13.3	138	8.7	174	6.9	175	4.0	56	3.6	↓
	Combined resistance to ≥3 antimicrobial groups (among piperacillin-tazobactam, ceftazidime, carbapenems, fluoroquinolones and aminoglycosides) ^c	143	15.4	138	10.9	174	11.5	175	12.0	186	8.6	-
<i>Acinetobacter</i> species	Carbapenem (imipenem/meropenem) resistance	60	43.3	36	41.7	39	17.9	40	22.5	36	19.4	↓
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	60	55.0	36	47.2	39	28.2	40	27.5	36	27.8	↓
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	60	43.3	36	41.7	39	20.5	40	25.0	36	25.0	↓
	Combined resistance to carbapenems, fluoroquinolones and aminoglycosides ^b	60	38.3	36	41.7	39	17.9	40	20.0	36	16.7	↓
<i>S. aureus</i>	MRSA ^d	534	11.0	576	9.0	606	11.7	656	7.5	711	9.8	-
	Penicillin non-wild-type ^e	269	6.7	319	10.0	271	9.6	283	11.0	172	13.4	↑
<i>S. pneumoniae</i>	Macrolide (azithromycin/clarithromycin/erythromycin) resistance	269	13.4	216	15.7	271	10.3	283	9.9	172	14.5	-
	Combined penicillin non-wild-type and resistance to macrolides ^e	269	3.3	216	6.5	271	4.8	283	4.9	172	7.6	-
<i>E. faecalis</i>	High-level gentamicin resistance	152	43.4	167	33.5	161	20.5	138	22.5	179	18.4	↓
<i>E. faecium</i>	Vancomycin resistance	111	0.0	149	0.7	134	0.0	137	2.9	177	1.1	-

^a ↑ and ↓ indicate statistically significantly increasing and decreasing trends, respectively; – indicates no statistically significant trend.

^b The aminoglycoside group includes only gentamicin and tobramycin from 2020 onwards.

^c The aminoglycoside group includes only tobramycin from 2020 onwards.

^d MRSA is based on AST results for oxacillin or cefoxitin, but AST results reported as cloxacillin, dicloxacillin, flucloxacillin or meticillin are accepted as a marker for oxacillin resistance if AST results for oxacillin are not reported. Data from molecular confirmation tests (detection of *mecA* gene by PCR or a positive PBP2A-agglutination test) are given priority over phenotypic AST results.

^e Penicillin results are based on penicillin or, if not available, oxacillin. For *S. pneumoniae*, the term penicillin non-wild-type is used in this report, referring to *S. pneumoniae* isolates reported by the local laboratories as susceptible increased exposure (I) or resistant (R) to penicillin, assuming MIC to benzylpenicillin above those of wild-type isolates (>0.06 mg/L). The qualitative susceptibility categories (S/I/R) as reported by the laboratory are used, since quantitative susceptibility information is missing for a large part of the data. Laboratories not using EUCAST clinical breakpoints in the period 2016–2018 might define the cut-off values for the susceptibility categories differently.

SPAIN

Participating institutions:

Health Institute Carlos III www.isciii.es

National Centre for Microbiology

Population and hospitals contributing data: coverage, representativeness and blood-culture rate, Spain, 2016–2020

Parameter	2016	2017	2018	2019	2020
Estimated national population coverage (%)	38	37	31	32	36
Geographical representativeness	High	High	Medium	Medium	Medium
Hospital representativeness	High	High	High	High	High
Patient and isolate representativeness	High	High	High	High	High
Blood culture sets/1 000 patient-days	60.4	Unknown	57.3	67.6	109.5

Laboratories contributing data: use of clinical breakpoint guidelines and participation in EARS-Net EQA, Spain, 2016–2020

Parameter	2016	2017	2018	2019	2020
Percentage of laboratories using EUCAST or EUCAST-harmonised guidelines	46	58	71	100 ^a	100 ^a
Percentage of laboratories participating in EARS-Net EQA	98	90	95	91	NA

EQA: external quality assessment.

NA: not applicable.

^a Starting with 2019 data, EARS-Net was restricted to laboratories using EUCAST or EUCAST-harmonised methodology and breakpoints.

Annual number of reporting laboratories,^a number of reported isolates and percentage of isolates reported from patients in ICUs,^b Spain, 2016–2020

Bacterial species	2016			2017			2018			2019			2020		
	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)
<i>E. coli</i>	38	6 804	6	37	6 032	Unknown	39	7 933	Unknown	39	8 353	Unknown	43	7 888	Unknown
<i>K. pneumoniae</i>	38	1 680	Unknown	36	1 514	Unknown	38	1 995	Unknown	39	2 403	Unknown	42	2 221	Unknown
<i>P. aeruginosa</i>	37	843	Unknown	36	869	Unknown	38	1 122	Unknown	39	1 108	Unknown	41	1 213	Unknown
<i>Acinetobacter</i> spp.	24	106	41	22	92	Unknown	18	81	Unknown	21	83	Unknown	21	91	Unknown
<i>S. aureus</i>	37	1 973	Unknown	37	1 925	Unknown	39	2 531	Unknown	41	2 719	Unknown	42	2 521	Unknown
<i>S. pneumoniae</i>	36	672	Unknown	34	752	Unknown	37	1 033	Unknown	37	1 038	Unknown	41	611	Unknown
<i>E. faecalis</i>	37	988	Unknown	36	969	Unknown	38	1 163	Unknown	38	1 301	Unknown	41	1 516	Unknown
<i>E. faecium</i>	35	630	Unknown	35	599	Unknown	37	769	Unknown	37	848	Unknown	42	1 100	Unknown

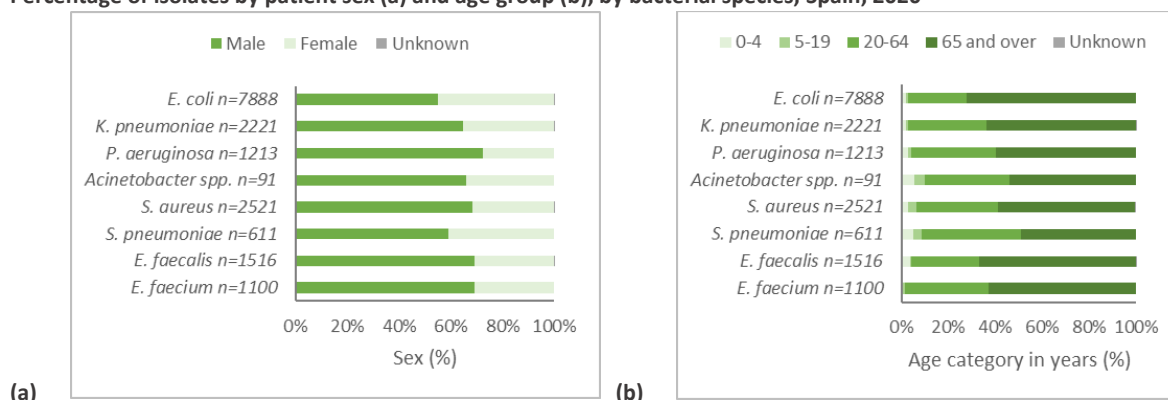
ICU: intensive care unit.

Lab: laboratories.

^a Number of laboratories reporting at least one isolate during the specific year. The total number of participating laboratories might be higher.

^b Isolates with missing information on hospital department are excluded, and results are presented only if data on hospital department are available for ≥70% of isolates.

Percentage of isolates by patient sex (a) and age group (b), by bacterial species, Spain, 2020



Total number of invasive isolates tested (n) and percentages of isolates with resistance phenotype (%), by bacterial species and antimicrobial group/agent, 2020 EU/EEA range, population-weighted mean and trend, Spain, 2016–2020

Bacterial species	Antimicrobial group/agent	2016		2017		2018		2019		2020		Trend 2016-2020 ^a
		n	%	n	%	n	%	n	%	n	%	
<i>E. coli</i>	Aminopenicillin (amoxicillin/ampicillin) resistance	6 795	64.1	5 947	62.4	7 599	62.9	7 831	61.2	7 214	57.6	↓
	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	6 800	15.0	6 027	12.8	7 923	13.8	8 345	14.1	7 695	14.1	-
	Carbapenem (imipenem/meropenem) resistance	6 794	0.1	6 026	0.0	7 924	0.0	8 346	1.9	7 797	0.4	↑
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	6 797	32.8	5 781	32.5	7 616	32.1	8 192	29.5	7 750	28.6	↓
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	6 800	14.5	6 029	13.7	7 924	14.1	8 304	13.6	7 778	13.6	-
	Combined resistance to third-generation cephalosporins, fluoroquinolones, and aminoglycosides ^b	6 791	6.2	5 774	5.5	7 598	6.4	8 138	6.3	7 464	6.3	-
<i>K. pneumoniae</i>	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	1 677	22.4	1 513	21.3	1 994	25.5	2 396	25.3	2 163	26.8	↑#
	Carbapenem (imipenem/meropenem) resistance	1 677	2.1	1 510	2.8	1 995	3.8	2 398	4.8	2 205	4.7	↑
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	1 676	22.7	1 486	22.5	1 927	23.8	2 375	24.0	2 201	25.7	↑#
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	1 678	15.5	1 513	17.4	1 995	19.3	2 370	18.2	2 207	20.2	↑#
	Combined resistance to fluoroquinolones, third-generation cephalosporins and aminoglycosides ^b	1 674	12.4	1 484	12.8	1 926	15.7	2 339	15.5	2 129	16.4	↑#
<i>P. aeruginosa</i>	Piperacillin-tazobactam resistance	817	7.8	813	7.4	1 076	9.1	1 077	14.2	1 159	11.0	↑
	Ceftazidime resistance	836	10.2	862	9.6	1 087	8.7	1 098	11.1	1 152	9.6	-
	Carbapenem (imipenem/meropenem) resistance	842	21.4	861	18.4	1 120	18.5	1 107	21.8	1 211	16.6	-
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	843	23.0	868	19.9	1 102	20.1	1 105	18.7	1 196	18.1	↓
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^c	843	15.3	864	12.4	1 121	11.6	1 083	15.0	1 182	8.7	↓
	Combined resistance to ≥3 antimicrobial groups (among piperacillin-tazobactam, ceftazidime, carbapenems, fluoroquinolones and aminoglycosides) ^c	843	14.0	863	10.7	1 120	10.6	1 107	13.3	1 197	9.1	↓
<i>Acinetobacter</i> species	Carbapenem (imipenem/meropenem) resistance	106	62.3	92	66.3	81	54.3	83	56.6	91	61.5	-
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	106	68.9	92	68.5	81	56.8	82	54.9	91	62.6	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	106	50.9	92	52.2	81	49.4	83	47.0	91	53.8	-
	Combined resistance to carbapenems, fluoroquinolones and aminoglycosides ^b	106	44.3	92	48.9	81	44.4	82	47.6	91	51.6	-
<i>S. aureus</i>	MRSA ^d	1 945	25.8	1 856	25.1	2 444	24.2	2 711	22.4	2 292	23.3	↓
	Penicillin non-wild-type ^e	643	25.0	735	22.3	981	18.5	958	19.8	540	20.7	↓
<i>S. pneumoniae</i>	Macrolide (azithromycin/clarithromycin/erythromycin) resistance	630	24.9	717	21.8	1 007	18.0	975	21.0	586	22.2	-
	Combined penicillin non-wild-type and resistance to macrolides ^e	612	13.7	701	12.4	957	9.6	905	10.9	524	11.8	-
<i>E. faecalis</i>	High-level gentamicin resistance	952	37.5	873	36.9	1 002	34.8	1 051	36.7	1 326	33.9	-
<i>E. faecium</i>	Vancomycin resistance	628	2.1	570	1.8	764	2.5	846	1.2	1 075	1.2	-

^a ↑ and ↓ indicate statistically significantly increasing and decreasing trends, respectively; # indicates a significant trend in the overall data, but not in data that only included laboratories reporting continuously for all five years; – indicates no statistically significant trend.

^b The aminoglycoside group includes only gentamicin and tobramycin from 2020 onwards.

^c The aminoglycoside group includes only tobramycin from 2020 onwards.

^d MRSA is based on AST results for oxacillin or cefoxitin, but AST results reported as cloxacillin, dicloxacillin, flucloxacillin or meticillin are accepted as a marker for oxacillin resistance if AST results for oxacillin are not reported. Data from molecular confirmation tests (detection of *mecA* gene by PCR or a positive PBP2A-agglutination test) are given priority over phenotypic AST results.

^e Penicillin results are based on penicillin or, if not available, oxacillin. For *S. pneumoniae*, the term penicillin non-wild-type is used in this report, referring to *S. pneumoniae* isolates reported by the local laboratories as susceptible increased exposure (I) or resistant (R) to penicillin, assuming MIC to benzylpenicillin above those of wild-type isolates (>0.06 mg/L). The qualitative susceptibility categories (S/I/R) as reported by the laboratory are used, since quantitative susceptibility information is missing for a large part of the data. Laboratories not using EUCAST clinical breakpoints in the period 2016–2018 might define the cut-off values for the susceptibility categories differently.

SWEDEN

Participating institutions:

The Public Health Agency of Sweden www.folkhalsomyndigheten.se

Population and hospitals contributing data: coverage, representativeness and blood-culture rate, Sweden, 2016–2020

Parameter	2016	2017	2018	2019	2020
Estimated national population coverage (%)	75	57	51	78	78
Geographical representativeness	High	High	High	High	High
Hospital representativeness	High	High	High	High	High
Patient and isolate representativeness	High	High	High	High	High
Blood culture sets/1 000 patient-days	139	156.7	107	105.6	105.6

Laboratories contributing data: use of clinical breakpoint guidelines and participation in EARS-Net EQA, Sweden, 2016–2020

Parameter	2016	2017	2018	2019	2020
Percentage of laboratories using EUCAST or EUCAST-harmonised guidelines	100	100	100	100 ^a	100 ^a
Percentage of laboratories participating in EARS-Net EQA	100	100	100	95	NA

EQA: external quality assessment.

NA: not applicable.

^a Starting with 2019 data, EARS-Net was restricted to laboratories using EUCAST or EUCAST-harmonised methodology and breakpoints.

Annual number of reporting laboratories,^a number of reported isolates and percentage of isolates reported from patients in ICUs,^b Sweden, 2016–2020

Bacterial species	2016			2017			2018			2019			2020		
	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)	Lab. (n)	Isolates (n)	Isolates from ICU (%)
<i>E. coli</i>	14	6 970	Unknown	10	5 807	Unknown	9	5 392	Unknown	19	9 424	Unknown	20	9 852	Unknown
<i>K. pneumoniae</i>	15	1 537	Unknown	10	1 034	Unknown	9	1 089	Unknown	19	1 795	Unknown	20	1 843	Unknown
<i>P. aeruginosa</i>	13	473	Unknown	10	446	Unknown	9	412	Unknown	19	707	Unknown	20	735	Unknown
<i>Acinetobacter</i> spp.	12	86	Unknown	1	54	Unknown	1	55	Unknown	1	113	Unknown	1	126	Unknown
<i>S. aureus</i>	15	3 903	Unknown	11	3 800	Unknown	9	3 640	Unknown	20	6 173	Unknown	20	6 891	Unknown
<i>S. pneumoniae</i>	14	904	Unknown	11	755	Unknown	9	676	Unknown	19	1 071	Unknown	20	551	Unknown
<i>E. faecalis</i>	14	1 019	Unknown	11	1 630	Unknown	9	687	Unknown	19	1 297	Unknown	20	1 443	Unknown
<i>E. faecium</i>	14	561	Unknown	11	622	Unknown	9	428	Unknown	19	703	Unknown	20	789	Unknown

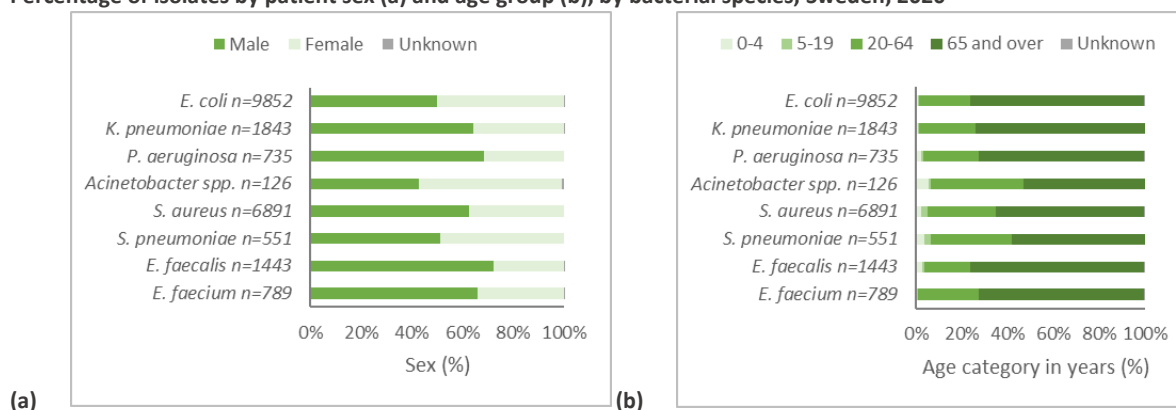
ICU: intensive care unit.

Lab: laboratories.

^a Number of laboratories reporting at least one isolate during the specific year. The total number of participating laboratories might be higher.

^b Isolates with missing information on hospital department are excluded, and results are presented only if data on hospital department are available for ≥70% of isolates.

Percentage of isolates by patient sex (a) and age group (b), by bacterial species, Sweden, 2020



Total number of invasive isolates tested (n) and percentages of isolates with resistance phenotype (%), by bacterial species and antimicrobial group/agent, 2020 EU/EEA range, population-weighted mean and trend, Sweden, 2016–2020

Bacterial species	Antimicrobial group/agent	2016		2017		2018		2019		2020		Trend
		n	%	n	%	n	%	n	%	n	%	2016-2020 ^a
<i>E. coli</i>	Aminopenicillin (amoxicillin/ampicillin) resistance	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	6 958	8.3	5 790	7.4	5 390	8.3	9 419	7.8	9 852	7.9	-
	Carbapenem (imipenem/meropenem) resistance	6 927	0.1	5 769	0.0	5 388	0.0	9 413	0.0	9 846	0.0	↓#
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	6 947	13.7	5 762	15.8	5 378	18.1	9 412	15.9	9 798	14.1	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	6 949	7.2	5 758	6.5	5 378	7.7	9 410	6.0	9 840	5.9	↓
	Combined resistance to third-generation cephalosporins, fluoroquinolones, and aminoglycosides ^b	6 939	3.1	5 746	2.0	5 368	3.1	9 405	2.2	9 792	2.1	↓
<i>K. pneumoniae</i>	Third-generation cephalosporin (cefotaxime/ceftriaxone/ceftazidime) resistance	1 537	4.9	1 034	5.6	1 089	5.5	1 795	8.3	1 842	8.1	↑
	Carbapenem (imipenem/meropenem) resistance	1 531	0.1	1 033	0.1	1 088	0.2	1 793	0.1	1 843	0.3	-
	Fluoroquinolone (ciprofloxacin/levofloxacin/ofloxacin) resistance	1 533	5.4	1 034	9.8	1 087	10.1	1 789	10.5	1 830	10.2	↑
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	1 141	3.4	1 033	4.7	1 087	3.0	1 794	4.2	1 839	3.6	-
	Combined resistance to fluoroquinolones, third-generation cephalosporins and aminoglycosides ^b	1 141	2.1	1 033	3.3	1 086	2.6	1 789	3.2	1 827	2.4	-
<i>P. aeruginosa</i>	Piperacillin-tazobactam resistance	472	7.4	446	6.3	411	7.8	706	6.8	735	5.4	-
	Ceftazidime resistance	473	7.4	446	4.5	412	6.1	706	5.1	735	5.0	-
	Carbapenem (imipenem/meropenem) resistance	472	11.0	446	9.0	412	4.4	706	9.8	733	4.2	↓#
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	469	6.0	445	9.0	408	7.1	706	9.2	733	7.4	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^c	471	0.8	444	0.9	411	1.0	707	2.3	464	0.6	-
	Combined resistance to ≥3 antimicrobial groups (among piperacillin-tazobactam, ceftazidime, carbapenems, fluoroquinolones and aminoglycosides) ^c	472	5.3	446	3.1	412	1.9	706	3.5	735	1.4	↓#
<i>Acinetobacter</i> species	Carbapenem (imipenem/meropenem) resistance	84	1.2	54	0.0	54	3.7	112	3.6	126	7.1	↑#
	Fluoroquinolone (ciprofloxacin/levofloxacin) resistance	86	4.7	54	0.0	55	7.3	113	8.0	126	7.1	-
	Aminoglycoside (gentamicin/netilmicin/tobramycin) resistance ^b	85	5.9	51	0.0	55	5.5	113	5.3	125	8.0	-
	Combined resistance to carbapenems, fluoroquinolones and aminoglycosides ^b	84	1.2	51	0.0	54	3.7	112	2.7	125	7.2	↑#
<i>S. aureus</i>	MRSA ^d	3 450	2.3	3 787	1.2	3 639	1.9	5 948	1.8	6 871	2.3	-
	Penicillin non-wild-type ^e	882	7.1	750	6.1	676	5.2	1 070	6.5	544	8.5	-
<i>S. pneumoniae</i>	Macrolide (azithromycin/clarithromycin/erythromycin) resistance	899	5.3	750	4.7	674	4.5	1 069	6.5	549	6.6	-
	Combined penicillin non-wild-type and resistance to macrolides ^e	877	4.0	745	3.0	674	2.7	1 068	3.7	542	2.8	-
<i>E. faecalis</i>	High-level gentamicin resistance	722	13.4	945	13.3	627	12.8	1 225	10.0	1 238	10.1	↓#
<i>E. faecium</i>	Vancomycin resistance	546	0.4	530	0.0	428	1.4	693	1.0	600	0.2	-

NA: not applicable as data were not reported for all years, a significant change in data source occurred during the period, or the number of isolates was < 20 in any year during the period.

ND: no data available.

^a ↑ and ↓ indicate statistically significantly increasing and decreasing trends, respectively; # indicates a significant trend in the overall data, but not in data that only included laboratories reporting continuously for all five years; – indicates no statistically significant trend.

^b The aminoglycoside group includes only gentamicin and tobramycin from 2020 onwards.

^c The aminoglycoside group includes only tobramycin from 2020 onwards.

^d MRSA is based on AST results for oxacillin or cefoxitin, but AST results reported as cloxacillin, dicloxacillin, flucloxacillin or meticillin are accepted as a marker for oxacillin resistance if AST results for oxacillin are not reported. Data from molecular confirmation tests (detection of *mecA* gene by PCR or a positive PBP2A-agglutination test) are given priority over phenotypic AST results.

^e Penicillin results are based on penicillin or, if not available, oxacillin. For *S. pneumoniae*, the term penicillin non-wild-type is used in this report, referring to *S. pneumoniae* isolates reported by the local laboratories as susceptible increased exposure (I) or resistant (R) to penicillin, assuming MIC to benzylpenicillin above those of wild-type isolates (>0.06 mg/L). The qualitative susceptibility categories (S/I/R) as reported by the laboratory are used, since quantitative susceptibility information is missing for a large part of the data. Laboratories not using EUCAST clinical breakpoints in the period 2016–2018 might define the cut-off values for the susceptibility categories differently.