



Rijksinstituut voor Volksgezondheid
en Milieu
*Ministerie van Volksgezondheid,
Welzijn en Sport*

CarMap 2022

Antimicrobial resistance among
medically important bacteria
in Aruba



Contents

	Pagina
1 Introduction	3
2 Methods and description of data from the Infectious Diseases Surveillance Information System for Antimicrobial Resistance (ISIS-AR)	4
3 Primary care	5
3.1 <i>Escherichia coli</i>	6
3.2 <i>Klebsiella pneumoniae</i>	8
3.3 <i>Proteus mirabilis</i>	10
3.4 <i>Pseudomonas aeruginosa</i>	12
3.5 <i>Staphylococcus aureus</i>	14
3.6 β -haemolytic <i>Streptococcus</i> spp. group B	16
4 Hospital departments	17
4.1 Outpatient departments	17
4.1.1 <i>Escherichia coli</i>	18
4.1.2 <i>Klebsiella pneumoniae</i>	20
4.1.3 <i>Proteus mirabilis</i>	22
4.1.4 <i>Pseudomonas aeruginosa</i>	24
4.1.5 <i>Staphylococcus aureus</i>	25
4.2 Inpatient hospital departments (excl. ICU)	27
4.2.1 <i>Escherichia coli</i>	28
4.2.2 <i>Klebsiella pneumoniae</i>	30
4.2.3 <i>Proteus mirabilis</i>	32
4.2.4 <i>Pseudomonas aeruginosa</i>	34
4.2.5 <i>Enterobacter cloacae</i> complex	35
4.2.6 <i>Acinetobacter</i> spp.	36
4.2.7 <i>Enterococcus faecalis</i> and <i>Enterococcus faecium</i>	37
4.2.8 <i>Staphylococcus aureus</i> and coagulase negative <i>Staphylococcus</i> spp. (incl. <i>S. epidermidis</i>)	39
4.2.9 β -haemolytic <i>Streptococcus</i> spp. group A and group B	41
4.2.10 <i>Streptococcus anginosus</i> and <i>Streptococcus mitis</i> / <i>Streptococcus oralis</i>	43
4.3 Intensive Care Units	45
4.3.1 <i>Escherichia coli</i>	46
4.3.2 <i>Klebsiella pneumoniae</i>	48
4.3.3 <i>Proteus mirabilis</i>	50
4.3.4 <i>Pseudomonas aeruginosa</i>	52
4.3.5 <i>Enterobacter cloacae</i> complex	53
4.3.6 <i>Acinetobacter</i> spp.	54
4.3.7 <i>Enterococcus faecalis</i> and <i>Enterococcus faecium</i>	55
4.3.8 <i>Staphylococcus aureus</i> and coagulase negative <i>Staphylococcus</i> spp. (incl. <i>S. epidermidis</i>)	57
5 Highly resistant microorganisms (HRMO)	59
5.1 Carbapenem-resistant and carbapenemase-producing <i>Enterobacterales</i> (CRE/CPE)	59
5.2 Vancomycin-resistant Enterococci (VRE)	62
5.3 Methicillin-resistant <i>Staphylococcus aureus</i> (MRSA)	63
5.4 Carbapenem-resistant and carbapenemase-producing <i>Pseudomonas aeruginosa</i> (CRPA/CPA)	64
5.5 Extended spectrum beta-lactamases (ESBL)	66

1 Introduction

This is CarMap 2022, a RIVM/Netherlands Antilles report on the trends in antimicrobial resistance in Aruba in 2021 and previous years. CarMap is a cooperative effort of the Centre for Infectious Disease Control Netherlands (CIb) at the National Institute for Public Health and Environment (RIVM) and the participating laboratories at the Netherlands Antilles.

The major aim of CarMap is to analyse trends in antimicrobial resistance on the Netherlands Antilles and if there is a difference in antimicrobial resistance between the different islands of the Netherlands Antilles. Furthermore, it aims to compare data from the Netherlands Antilles to data from the Netherlands. Based on this comparison, the islands of the Netherlands Antilles are able to conclude if the Dutch health guidelines still need to be adhered to or if they should deviate from it.

2 Methods and description of data from the Infectious Diseases Surveillance Information System for Antimicrobial Resistance (ISIS-AR)

Since 2021, routinely available antimicrobial susceptibility data of isolates from the medical microbiology laboratories in the Netherlands Antilles, including minimal inhibitory concentration (MIC) values and disk zone diameters, have been collected in the Infectious Diseases Surveillance Information System for Antimicrobial Resistance (ISIS-AR). This surveillance system is a combined initiative of the Ministry of Health, Welfare and Sport and the Dutch Society of Medical Microbiology (NVMM), and is coordinated by the centre of Infectious Disease Control at the National Institute for Public Health and the Environment (RIVM) in Bilthoven.

In 2021, only Aruba of the Netherlands Antilles was connected to ISIS-AR so therefore no comparison between the islands of the Netherlands Antilles could be made. In 2021, 46 Dutch laboratories were connected to ISIS-AR, all performing antimicrobial susceptibility testing (AST) according to EUCAST guidelines. Of these 46 Dutch laboratories, 34 provided complete data on the last five years (2017 to 2021). Only data from these 34 laboratories were selected to avoid bias in time trends due to incomplete data.

All data provided to ISIS-AR are carefully validated¹. Data confirmed or probable technical errors are, after consultation with the laboratory that provided the data, corrected or excluded from the analyses referred to in this report. The selection of isolates from the Netherlands Antilles data as well as the calculation of resistance levels and time trends are executed using the same methods as those used for the NethMap report. One exception has been made: resistance levels were also calculated for pathogens for which less than 100 isolates in each year were available for analysis. Further information on these methods can be found in Chapter 4.1 of the Nethmap 2021 report, available on the [website of the RIVM](#).

References

¹Altorf-van der Kuil W, Schoffelen AF, de Greeff SC, et al. (2017) National laboratory-based surveillance system for antimicrobial resistance: a successful tool to support the control of antimicrobial resistance in the Netherlands. *Euro Surveill* 22(46).

3 Primary care

The distribution of pathogens in diagnostic urine, wound or pus, respiratory, and genital samples from general practitioners' (GP) patients in 2021 is presented in table 3.0.0.1. The resistance levels in 2021 for *Escherichia coli*, *Klebsiella pneumoniae*, *Proteus mirabilis*, and *Pseudomonas aeruginosa* isolates from urine samples are presented in their respective subchapters. In accordance with age categories used in the guidelines of the Dutch College of General Practitioners (NHG) for urinary tract infections, resistance levels and five-year trends for urine isolates are calculated separately for patients aged ≤ 12 years and patients aged >12 years.

The resistance levels in 2021 for *S. aureus* isolates from wound or pus samples and β -haemolytic *Streptococcus* spp. group B isolates from urine or genital samples are presented in their respective subchapters. No data from β -haemolytic *Streptococcus* spp. group A isolates from GP patients are available.

Five-year trends in resistance are shown in figure 3.1.0.1 (*E. coli*), figure 3.2.0.1 (*K. pneumoniae*), figure 3.3.0.1 (*P. mirabilis*), figure 3.4.0.1 (*P. aeruginosa*), figure 3.5.0.1 (*S. aureus*), and figure 3.6.0.1 (β -haemolytic *Streptococcus* spp. groep B).

GPs usually send urine, wound, or pus samples for culture and susceptibility testing in case of antimicrobial therapy failure or (with regard to urine samples) complicated urinary tract infection. As a result, the presented resistance levels are likely to be higher than those for all patients with urinary tract infections caused by *Enterobacteriales* or *P. aeruginosa* or wound infections or pus caused by *S. aureus*. Bias due to selective sampling of patients is expected to be limited for β -haemolytic *Streptococcus* spp. groep B, because initial therapy of urinary tract infections does not affect *Streptococcus* spp. and genital samples are taken as part of routine diagnostics.

Because of the potential bias in results for *Enterobacteriales*, *P. aeruginosa* and *S. aureus*, the patients from whom samples were taken are hereafter referred to as 'selected general practitioners' patients'.

Table 3.0.0.1 Distribution of isolated pathogens in diagnostic urine samples (by patient age category) and diagnostic wound or pus, respiratory, and genital samples from selected general practitioners' patients, ISIS-AR 2021

Pathogen	Urine		Wound or pus	Respiratory tract	Genital
	Age ≤ 12	Age >12			
	N	N	N	N	N
<i>E. coli</i>	19	451	7	1	39
<i>K. pneumoniae</i>	4	82	11	1	10
<i>P. mirabilis</i>	5	75	15	0	23
Other <i>Enterobacteriales</i> ¹	6	52	23	2	8
<i>P. aeruginosa</i>	3	9	45	1	1
Other non-fermenters ²	1	9	6	1	2
Other Gram-negatives ³	0	0	1	1	0
<i>S. aureus</i>	0	9	80	5	18
β -haemolytic <i>Streptococcus</i> spp. group A	0	0	0	0	1
β -haemolytic <i>Streptococcus</i> spp. group B	2	82	12	2	155
Other Gram-positives ⁴	4	57	44	11	48

¹ In order of frequency: *Citrobacter* spp., *Morganella* spp., *Enterobacter* spp., *Klebsiella* spp. (non-pneumoniae), *Providencia* spp., *Serratia* spp., *Raoultella* spp., *Proteus* spp. (non-mirabilis), *Pantoea* spp., *Shigella* spp., *Salmonella* spp.

² In order of frequency: *Acinetobacter* spp., *S. maltophilia*, *Pseudomonas* spp. (non-aeruginosa), *B. cepacia*.

³ In order of frequency: *H. influenzae*, *H. parainfluenzae*.

⁴ In order of frequency: *Staphylococcus* spp. (non-aureus), *Enterococcus* spp., *S. pneumoniae*, *S. mitis*/*S. oralis*, *S. anginosus*, *A. urinae*.

3.1 *Escherichia coli*

Table 3.1.0.1 Resistance levels among diagnostic urine isolates of *E. coli* from selected general practitioners' patients aged ≤ 12 , ISIS-AR 2021

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
amoxicillin/ampicillin	19	8	42 (23 - 64)	10386	31 (30 - 32)
co-amoxiclav non-uuti	19	6	32 (15 - 55)	10429	24 (23 - 25)
cefuroxime	19	0	0 (NA - NA)	8957	4 (4 - 4)
cefotaxime/ceftriaxone non-men	19	0	0 (NA - NA)	10367	2 (2 - 2)
ceftazidime	19	0	0 (NA - NA)	10464	2 (1 - 2)
ciprofloxacin	19	4	21 (8 - 45)	10429	5 (4 - 5)
gentamicin	19	3	16 (5 - 39)	10388	3 (3 - 4)
tobramycin	19	3	16 (5 - 39)	9686	3 (3 - 4)
nitrofurantoin	19	0	0 (NA - NA)	10430	0 (0 - 0)
HRMO	19	1	5 (1 - 29)	10443	3 (2 - 3)

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

NA = not applicable.

non-uuti = According to breakpoint for indications other than uncomplicated urinary tract infection.

non-men = According to breakpoint for indications other than meningitis.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

Table 3.1.0.2 Resistance levels among diagnostic urine isolates of *E. coli* from selected general practitioners' patients aged >12 , ISIS-AR 2021

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
amoxicillin/ampicillin	446	172	39 (34 - 43)	106216	34 (34 - 34)
co-amoxiclav non-uuti	445	140	31 (27 - 36)	106854	26 (26 - 27)
cefuroxime	446	47	11 (8 - 14)	90183	7 (7 - 7)
cefotaxime/ceftriaxone non-men	443	18	4 (3 - 6)	105748	3 (3 - 3)
ceftazidime	445	18	4 (3 - 6)	106750	2 (2 - 2)
ciprofloxacin	445	92	21 (17 - 25)	106856	9 (9 - 9)
gentamicin	446	39	9 (6 - 12)	106232	4 (3 - 4)
tobramycin	446	38	9 (6 - 11)	99093	4 (3 - 4)
nitrofurantoin	445	5	1 (0 - 3)	106888	2 (2 - 2)
HRMO	445	37	8 (6 - 11)	106371	4 (4 - 4)

non-uuti = According to breakpoint for indications other than uncomplicated urinary tract infection.

non-men = According to breakpoint for indications other than meningitis.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

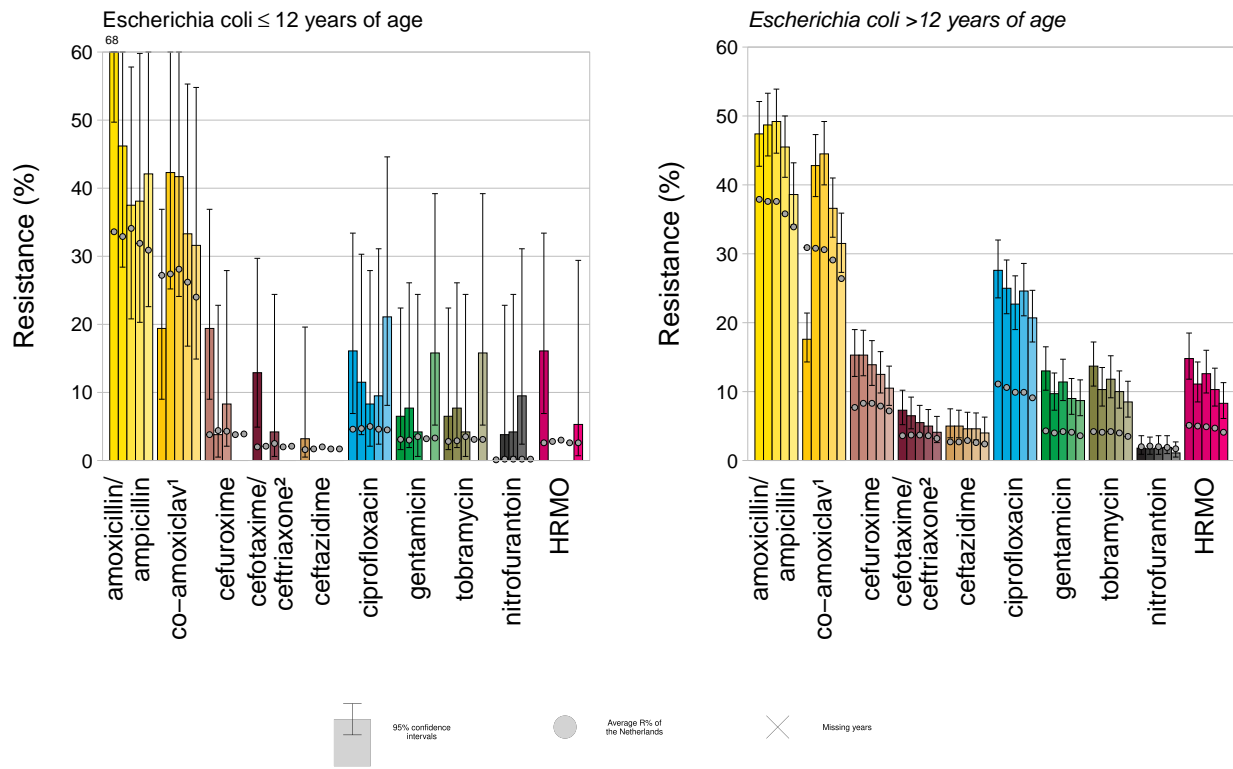


Figure 3.1.0.1 Trends in antibiotic resistance (from left to right 2017 to 2021) among diagnostic urine isolates of *E. coli* from selected general practitioners' patients in ISIS-AR, by age category*^{**, **}

* A hack took place between the period November 2019 and April 2020 rendering Aruba data from that period unreliable. Data were restored and corrected as much as possible but errors may still be present.

** Y axis of the figures differs from the standard format.

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

¹ non-uti = According to breakpoint for indications other than uncomplicated urinary tract infection.

² non-men = According to breakpoint for indications other than meningitis.

3.2 *Klebsiella pneumoniae*

Table 3.2.0.1 Resistance levels among diagnostic urine isolates of *K. pneumoniae* from selected general practitioners' patients aged ≤ 12 , ISIS-AR 2021

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
ceftazidime	3	0	0 (NA - NA)	278	4 (2 - 7)
ciprofloxacin	3	0	0 (NA - NA)	273	1 (1 - 4)
tobramycin	3	0	0 (NA - NA)	259	1 (0 - 3)
HRMO	3	0	0 (NA - NA)	279	3 (2 - 6)

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

NA = not applicable.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

Table 3.2.0.2 Resistance levels among diagnostic urine isolates of *K. pneumoniae* from selected general practitioners' patients aged >12 , ISIS-AR 2021

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
co-amoxiclav non-uuti	79	9	11 (6 - 20)	15523	17 (17 - 18)
cefuroxime	79	4	5 (2 - 13)	13151	11 (11 - 12)
cefotaxime/ceftriaxone non-men	78	6	8 (3 - 16)	15430	3 (3 - 4)
ceftazidime	78	2	3 (1 - 10)	15517	3 (3 - 3)
ciprofloxacin	79	7	9 (4 - 17)	15525	10 (10 - 11)
gentamicin	79	2	3 (1 - 10)	15455	1 (1 - 1)
tobramycin	79	3	4 (1 - 11)	14388	2 (2 - 2)
HRMO	78	6	8 (3 - 16)	15502	4 (4 - 4)

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

non-uuti = According to breakpoint for indications other than uncomplicated urinary tract infection.

non-men = According to breakpoint for indications other than meningitis.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

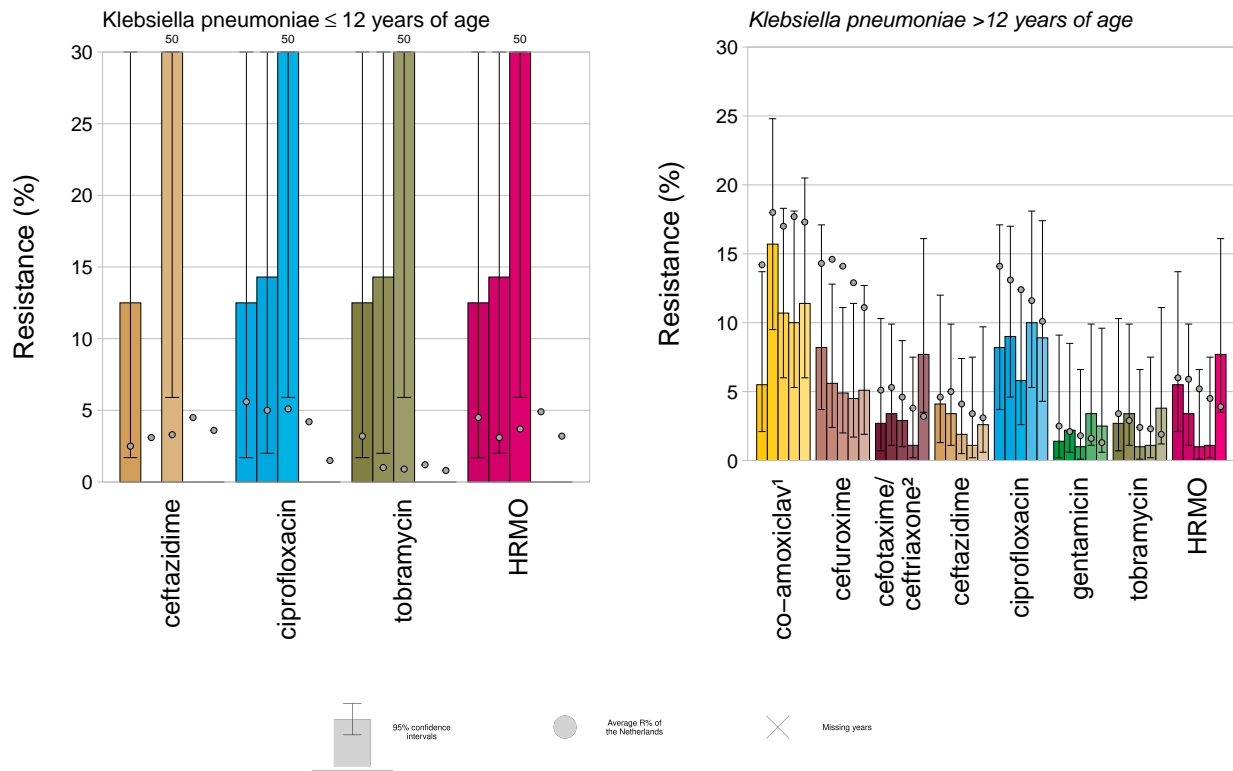


Figure 3.2.0.1 Trends in antibiotic resistance (from left to right 2017 to 2021) among diagnostic urine isolates of *K. pneumoniae* from selected general practitioners' patients in ISIS-AR, by age category*

* A hack took place between the period November 2019 and April 2020 rendering Aruba data from that period unreliable. Data were restored and corrected as much as possible but errors may still be present.

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

¹ non-uuti = According to breakpoint for indications other than uncomplicated urinary tract infection.

² non-men = According to breakpoint for indications other than meningitis.

3.3 *Proteus mirabilis*

Table 3.3.0.1 Resistance levels among diagnostic urine isolates of *P. mirabilis* from selected general practitioners' patients aged ≤ 12 , ISIS-AR 2021

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
co-amoxiclav non-uuti	5	0	0 (NA - NA)	695	4 (3 - 6)
cefuroxime	5	0	0 (NA - NA)	597	1 (0 - 2)
ceftazidime	5	0	0 (NA - NA)	695	0 (0 - 1)
ciprofloxacin	5	1	20 (3 - 69)	695	4 (3 - 6)
gentamicin	5	1	20 (3 - 69)	591	3 (2 - 5)
tobramycin	5	0	0 (NA - NA)	562	2 (1 - 4)
HRMO	5	1	20 (3 - 69)	553	1 (1 - 3)

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

NA = not applicable.

non-uuti = According to breakpoint for indications other than uncomplicated urinary tract infection.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

Table 3.3.0.2 Resistance levels among diagnostic urine isolates of *P. mirabilis* from selected general practitioners' patients aged >12 , ISIS-AR 2021

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
amoxicillin/ampicillin	73	10	14 (8 - 24)	9964	20 (19 - 21)
co-amoxiclav non-uuti	73	4	5 (2 - 14)	9985	5 (5 - 6)
cefuroxime	73	0	0 (NA - NA)	8432	1 (1 - 1)
cefotaxime/ceftriaxone non-men	73	0	0 (NA - NA)	9908	0 (0 - 1)
ceftazidime	73	1	1 (0 - 9)	10007	0 (0 - 0)
ciprofloxacin	73	1	1 (0 - 9)	9989	10 (9 - 10)
gentamicin	73	1	1 (0 - 9)	8668	5 (5 - 6)
tobramycin	73	1	1 (0 - 9)	8282	3 (3 - 4)
HRMO	73	0	0 (NA - NA)	8366	3 (3 - 4)

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

NA = not applicable.

non-uuti = According to breakpoint for indications other than uncomplicated urinary tract infection.

non-men = According to breakpoint for indications other than meningitis.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

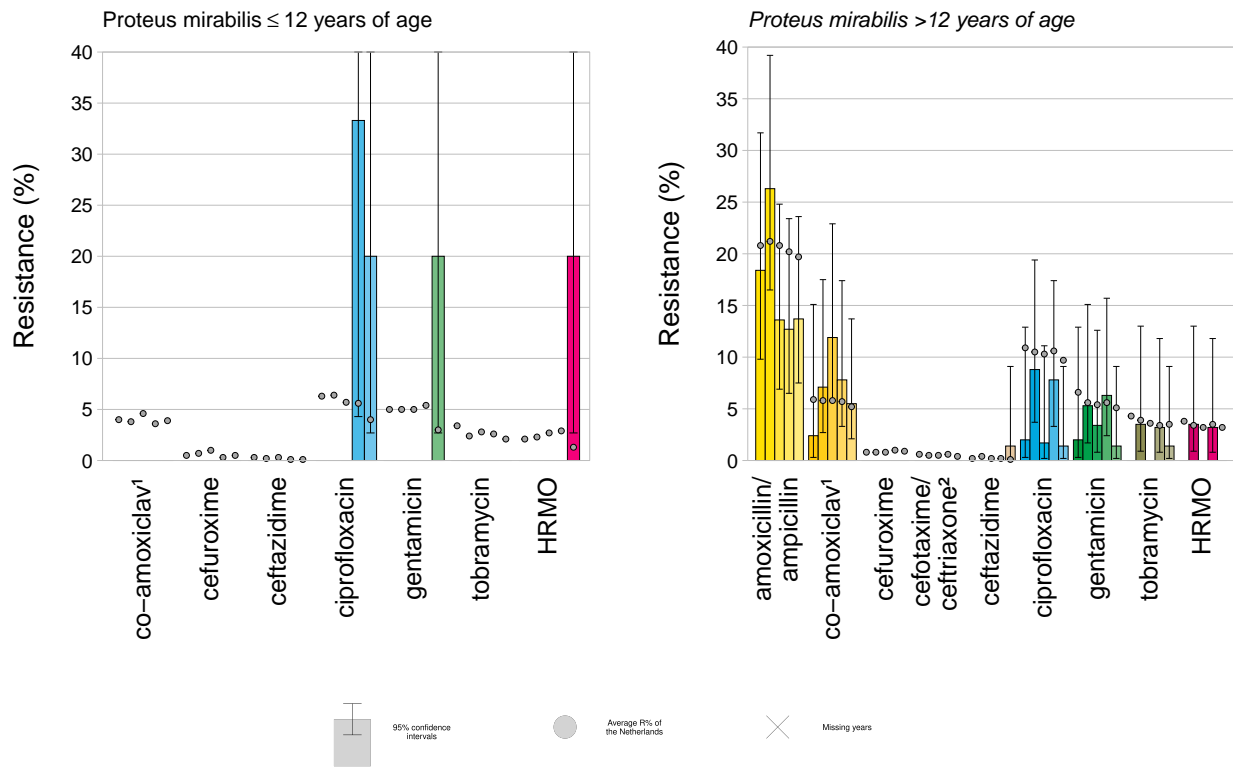


Figure 3.3.0.1 Trends in antibiotic resistance (from left to right 2017 to 2021) among diagnostic urine isolates of *P. mirabilis* from selected general practitioners' patients in ISIS-AR, by age category**

* A hack took place between the period November 2019 and April 2020 rendering Aruba data from that period unreliable. Data were restored and corrected as much as possible but errors may still be present.

** Y axis of the figures differs from the standard format.

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

¹ non-uti = According to breakpoint for indications other than uncomplicated urinary tract infection.

² non-men = According to breakpoint for indications other than meningitis.

3.4 *Pseudomonas aeruginosa*

Table 3.4.0.1 Resistance levels among diagnostic urine isolates of *P. aeruginosa* from selected general practitioners' patients aged ≤ 12 , ISIS-AR 2021

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
piperacillin-tazobactam	2	0	0 (NA - NA)	204	1 (0 - 4)
ceftazidime	2	0	0 (NA - NA)	223	1 (0 - 4)
imipenem	2	0	0 (NA - NA)	217	0 (0 - 3)
meropenem non-men	2	0	0 (NA - NA)	223	0 (0 - 0)
ciprofloxacin	2	0	0 (NA - NA)	223	0 (0 - 3)
tobramycin	2	0	0 (NA - NA)	194	1 (0 - 4)
HRMO	2	0	0 (NA - NA)	198	0 (0 - 0)

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

NA = not applicable.

non-men = According to breakpoint for indications other than meningitis.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

Table 3.4.0.2 Resistance levels among diagnostic urine isolates of *P. aeruginosa* from selected general practitioners' patients aged >12 , ISIS-AR 2021

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
piperacillin-tazobactam	9	0	0 (NA - NA)	4690	3 (3 - 4)
ceftazidime	9	0	0 (NA - NA)	5018	1 (1 - 2)
imipenem	9	0	0 (NA - NA)	4681	5 (4 - 5)
meropenem non-men	9	0	0 (NA - NA)	5033	0 (0 - 1)
ciprofloxacin	9	0	0 (NA - NA)	5042	9 (8 - 10)
tobramycin	9	0	0 (NA - NA)	4642	1 (0 - 1)
HRMO	9	0	0 (NA - NA)	4599	1 (1 - 1)

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

NA = not applicable.

non-men = According to breakpoint for indications other than meningitis.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

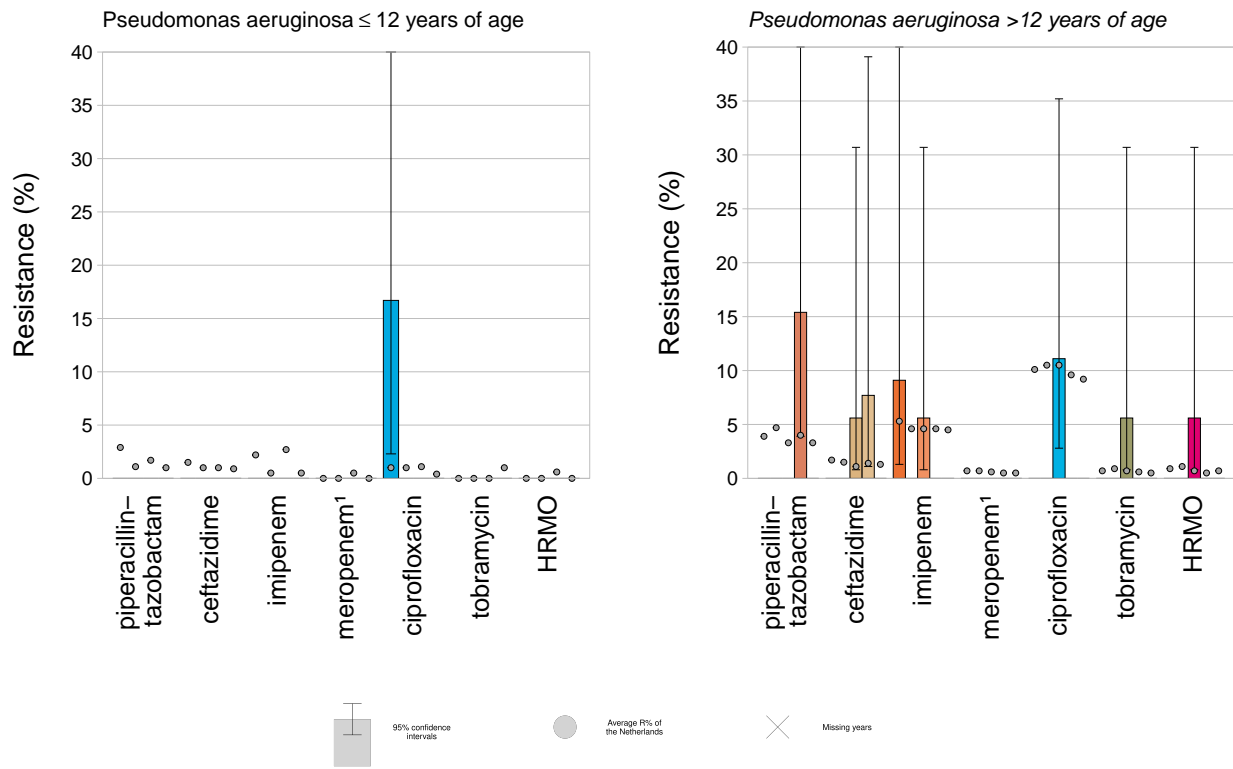


Figure 3.4.0.1 Trends in antibiotic resistance (from left to right 2017 to 2021) among diagnostic urine isolates of *P. aeruginosa* from selected general practitioners' patients in ISIS-AR, by age category*,**

* A hack took place between the period November 2019 and April 2020 rendering Aruba data from that period unreliable. Data were restored and corrected as much as possible but errors may still be present.

** Y axis of the figures differs from the standard format.

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

¹ non-men = According to breakpoint for indications other than meningitis.

3.5 *Staphylococcus aureus*

Table 3.5.0.1 Resistance levels among diagnostic wound or pus isolates of *S. aureus* from selected general practitioners' patients, ISIS-AR 2021

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
flucloxacillin ¹	80	16	20 (13 - 30)	9439	3 (2 - 3)
ciprofloxacin ²	80	3	4 (1 - 11)	8580	3 (3 - 4)
erythromycin	62	10	16 (9 - 27)	9405	14 (13 - 14)
clindamycin incl. inducible resistance ³	80	4	5 (2 - 13)	9439	12 (11 - 13)
doxycycline/tetracycline	80	7	9 (4 - 17)	9407	4 (3 - 4)
co-trimoxazole	80	1	1 (0 - 8)	9408	2 (2 - 3)

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

¹ Resistance to flucloxacillin was estimated based on laboratory S/R interpretation for cefoxitin, or, if no cefoxitin test was available, for oxacillin/flucloxacillin (see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information).

² Resistance to ciprofloxacin is intended to be a class indicator for resistance to fluorquinolones.

³ To estimate clindamycin resistance including induced resistance, the laboratory S/I/R interpretation was used (see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information).

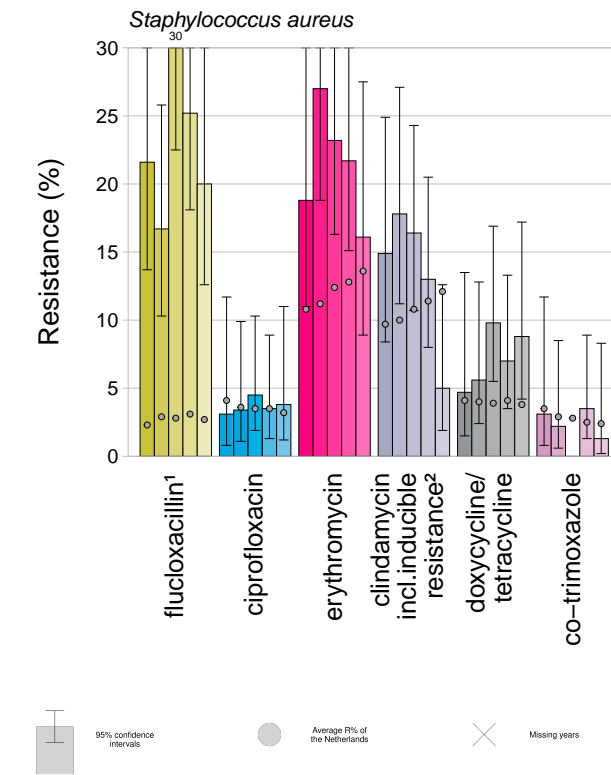


Figure 3.5.0.1 Trends in antibiotic resistance (from left to right 2017 to 2021) among diagnostic wound or pus isolates of *S. aureus* from selected general practitioners' patients in ISIS-AR*

* A hack took place between the period November 2019 and April 2020 rendering Aruba data from that period unreliable. Data were restored and corrected as much as possible but errors may still be present.

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

¹ Resistance to flucloxacillin was estimated based on laboratory S/R interpretation for cefoxitin, or, if no cefoxitin test was available, for oxacillin/flucloxacillin (see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information).

² To estimate clindamycin resistance including induced resistance, the laboratory S/I/R interpretation was used (see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information).

3.6 β -haemolytic *Streptococcus* spp. group B

Table 3.6.0.1 Resistance levels among diagnostic urine or genital isolates of β -haemolytic *Streptococcus* spp. group B from selected general practitioners' patients, ISIS-AR 2021

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
erythromycin	164	40	24 (18 - 32)	5562	18 (17 - 19)
clindamycin incl. inducible resistance ¹	223	29	13 (9 - 18)	5465	15 (14 - 16)
doxycycline/tetracycline	224	180	80 (75 - 85)	3894	75 (74 - 76)

¹ To estimate clindamycin resistance including induced resistance, the laboratory S/I/R interpretation was used (see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information).

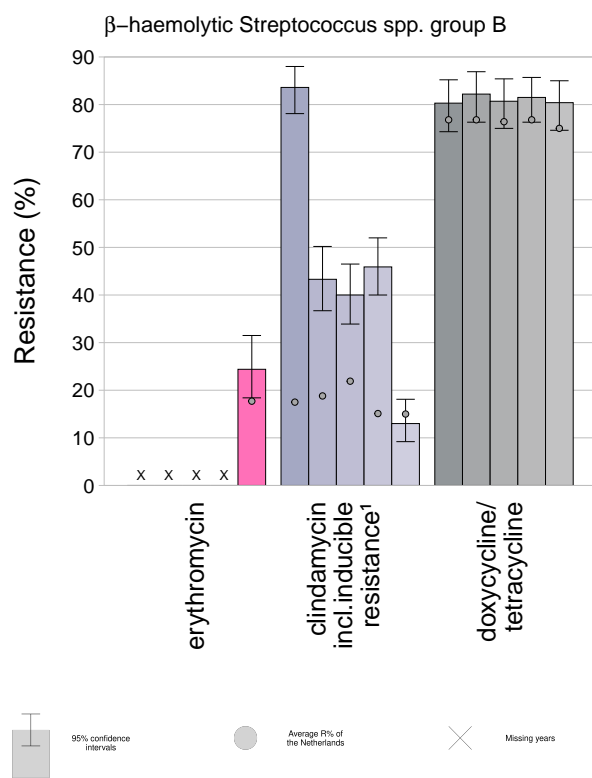


Figure 3.6.0.1 Trends in antibiotic resistance (from left to right 2017 to 2021) among diagnostic urine or genital isolates of β -haemolytic *Streptococcus* spp. group B from selected general practitioners' patients in ISIS-AR^{*,**}

* A hack took place between the period November 2019 and April 2020 rendering Aruba data from that period unreliable. Data were restored and corrected as much as possible but errors may still be present.

** Y axis of the figures differs from the standard format.

¹ To estimate clindamycin resistance including induced resistance, the laboratory S/I/R interpretation was used (see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information).

4 Hospital departments

In this section, resistance levels among isolates from patients in outpatient departments (section 4.1), inpatient departments (excluding intensive care units, section 4.2), and intensive care units (section 4.3) are presented.

4.1 Outpatient departments

The distribution of pathogens isolated from diagnostic samples (lower respiratory tract, urine, and wound or pus) from patients attending outpatient departments in 2021 is presented in table 4.1.0.1. The resistance levels for a selection of pathogens isolated from these patients in 2021 for *Escherichia coli*, *Klebsiella pneumoniae*, *Proteus mirabilis*, *Pseudomonas aeruginosa* and *S. aureus* isolates are presented in their respective subchapters. Five-year trends in resistance are shown in figure 4.1.1.1 (*E. coli*), figure 4.1.2.1 (*K. pneumoniae*), figure 4.1.3.1 (*P. mirabilis*), figure 4.1.4.1 (*P. aeruginosa*), and figure 4.1.5.1 (*S. aureus*).

In outpatient departments on the Netherlands Antilles, a sample is taken from the majority of patients presenting with infections and susceptibility testing is performed as part of routine diagnostics. Therefore, bias due to selective sampling will be lower than in GP patients and resistance percentages in this section are considered representative of resistance in outpatient departments.

Table 4.1.0.1 Distribution of isolated pathogens in diagnostic samples from patients attending outpatient departments, ISIS-AR2021

Pathogen	Lower respiratory tract	Urine	Wound or pus
	N	N	N
<i>E. coli</i>	1	224	9
<i>K. pneumoniae</i>	3	59	15
<i>P. mirabilis</i>	3	62	39
Other <i>Enterobacteriales</i> ¹	0	63	63
<i>P. aeruginosa</i>	12	20	48
Other non-fermenters ²	5	14	7
Other Gram-negatives ³	6	0	0
<i>S. aureus</i>	8	6	85
Other Gram-positives ⁴	9	88	87

¹ In order of frequency: *Enterobacter spp.*, *Citrobacter spp.*, *Morganella spp.*, *Serratia spp.*, *Klebsiella spp.* (*non-pneumoniae*), *Providencia spp.*, *Proteus spp.* (*non-mirabilis*).

² In order of frequency: *Acinetobacter spp.*, *S. maltophilia*, *Pseudomonas spp.* (*non-aeruginosa*), *M. catarrhalis*, *B. cepacia*.

³ In order of frequency: *H. influenzae*, *H. parainfluenzae*.

⁴ In order of frequency: *S. mitis/S. oralis*, β -haemolytic *Streptococcus spp.* group G, β -haemolytic *Streptococcus spp.* group B, *S. pneumoniae*, *S. dysgalactiae subsp. equisimilis*, *S. anginosus*, β -haemolytic *Streptococcus spp.* group A, *Staphylococcus spp.* (*non-aureus*), *Enterococcus spp.*, *A. urinae*.

4.1.1 *Escherichia coli***Table 4.1.1.1** Resistance levels among diagnostic isolates of *E. coli* from patients attending outpatient departments, ISIS-AR 2021

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
amoxicillin/ampicillin	230	127	55 (49 - 62)	20828	41 (40 - 41)
co-amoxiclav non-uuti	230	95	41 (35 - 48)	20902	31 (31 - 32)
piperacillin-tazobactam	226	18	8 (5 - 12)	19927	4 (3 - 4)
cefuroxime	231	44	19 (14 - 25)	20364	11 (10 - 11)
cefotaxime/ceftriaxone non-men	228	19	8 (5 - 13)	20727	5 (5 - 6)
ceftazidime	230	20	9 (6 - 13)	20817	4 (4 - 4)
meropenem/imipenem non-men	230	1	0 (0 - 3)	20824	0 (0 - 0)
ciprofloxacin	231	75	32 (27 - 39)	20908	15 (14 - 15)
gentamicin	230	36	16 (12 - 21)	20834	5 (5 - 5)
tobramycin	231	34	15 (11 - 20)	18969	5 (5 - 5)
nitrofurantoin	231	7	3 (1 - 6)	20692	2 (2 - 3)
gentamicin + co-amoxiclav non-uuti	230	29	13 (9 - 18)	20824	4 (4 - 4)
gentamicin + cefuroxime	230	12	5 (3 - 9)	20287	2 (2 - 2)
gentamicin + cefotaxime/ceftriaxone non-men	228	5	2 (1 - 5)	20716	1 (1 - 1)
ciprofloxacin + co-amoxiclav non-uuti	230	38	17 (12 - 22)	20897	9 (8 - 9)
ciprofloxacin + cefuroxime	231	31	13 (10 - 18)	20359	5 (5 - 6)
ciprofloxacin + cefotaxime/ceftriaxone non-men	228	15	7 (4 - 11)	20720	4 (3 - 4)
HRMO	230	37	16 (12 - 21)	20721	7 (7 - 7)

non-uuti = According to breakpoint for indications other than uncomplicated urinary tract infection.

non-men = According to breakpoint for indications other than meningitis.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

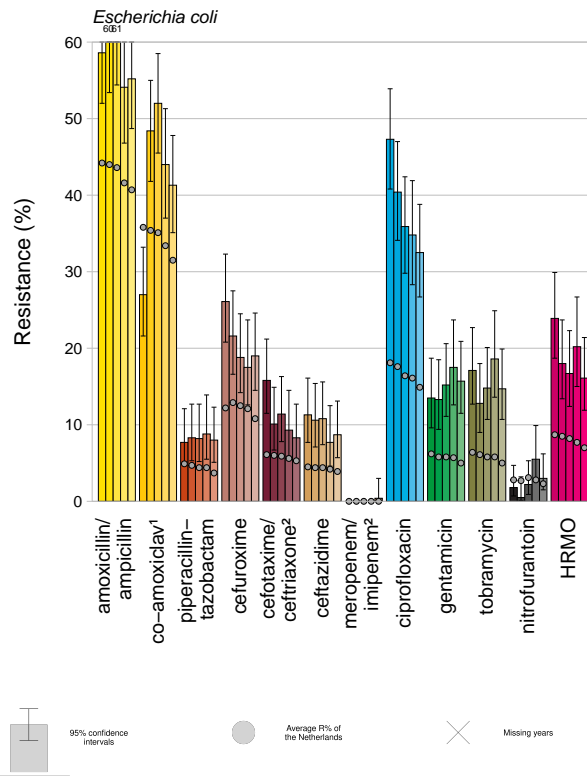


Figure 4.1.1.1 Trends in antibiotic resistance (from left to right 2017 to 2021) among diagnostic isolates of *E. coli* patients attending outpatient departments in ISIS-AR^{*,**}

* A hack took place between the period November 2019 and April 2020 rendering Aruba data from that period unreliable. Data were restored and corrected as much as possible but errors may still be present.

** Y axis of the figures differs from the standard format.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

¹ non-uuti = According to breakpoint for indications other than uncomplicated urinary tract infection.

² non-men = According to breakpoint for indications other than meningitis.

4.1.2 *Klebsiella pneumoniae***Table 4.1.2.1** Resistance levels among diagnostic isolates of *K. pneumoniae* from patients attending outpatient departments, ISIS-AR 2021

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
co-amoxiclav non-uuti	76	9	12 (6 - 21)	4716	19 (18 - 20)
piperacillin-tazobactam	76	4	5 (2 - 13)	4496	14 (13 - 15)
cefuroxime	77	7	9 (4 - 18)	4595	14 (13 - 15)
cefotaxime/ceftriaxone non-men	76	5	7 (3 - 15)	4697	7 (6 - 7)
ceftazidime	77	3	4 (1 - 11)	4707	6 (6 - 7)
meropenem/imipenem non-men	77	0	0 (NA - NA)	4705	0 (0 - 0)
ciprofloxacin	77	6	8 (4 - 16)	4713	12 (11 - 13)
gentamicin	77	1	1 (0 - 9)	4710	3 (2 - 3)
tobramycin	77	1	1 (0 - 9)	4289	4 (3 - 4)
gentamicin + co-amoxiclav non-uuti	76	1	1 (0 - 9)	4710	2 (2 - 3)
gentamicin + cefuroxime	77	1	1 (0 - 9)	4587	2 (2 - 2)
gentamicin + cefotaxime/ceftriaxone non-men	76	1	1 (0 - 9)	4697	2 (2 - 2)
ciprofloxacin + co-amoxiclav non-uuti	76	2	3 (1 - 10)	4712	5 (4 - 6)
ciprofloxacin + cefuroxime	77	3	4 (1 - 11)	4590	8 (7 - 8)
ciprofloxacin + cefotaxime/ceftriaxone non-men	76	2	3 (1 - 10)	4693	4 (4 - 5)
HRMO	77	7	9 (4 - 18)	4695	8 (7 - 8)

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

NA = not applicable.

non-uuti = According to breakpoint for indications other than uncomplicated urinary tract infection.

non-men = According to breakpoint for indications other than meningitis.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

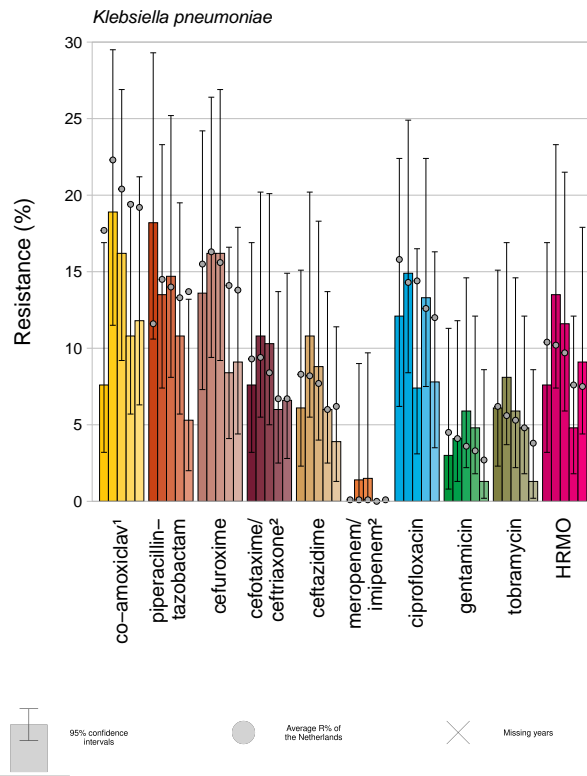


Figure 4.1.2.1 Trends in antibiotic resistance (from left to right 2017 to 2021) among diagnostic isolates of *K. pneumoniae* patients attending outpatient departments in ISIS-AR*

* A hack took place between the period November 2019 and April 2020 rendering Aruba data from that period unreliable. Data were restored and corrected as much as possible but errors may still be present.

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

¹ non-uuti = According to breakpoint for indications other than uncomplicated urinary tract infection.

² non-men = According to breakpoint for indications other than meningitis.

4.1.3 *Proteus mirabilis***Table 4.1.3.1** Resistance levels among diagnostic isolates of *P. mirabilis* from patients attending outpatient departments, ISIS-AR 2021

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
amoxicillin/ampicillin	102	18	18 (11 - 26)	3433	23 (21 - 24)
co-amoxiclav non-uuti	102	5	5 (2 - 11)	3440	7 (6 - 8)
piperacillin-tazobactam	102	0	0 (NA - NA)	3283	0 (0 - 1)
cefuroxime	102	1	1 (0 - 7)	3355	1 (1 - 2)
cefotaxime/ceftriaxone non-men	102	2	2 (0 - 7)	3415	1 (1 - 1)
ceftazidime	102	0	0 (NA - NA)	3434	0 (0 - 0)
meropenem non-men	102	0	0 (NA - NA)	3426	0 (0 - 0)
ciprofloxacin	102	4	4 (1 - 10)	3439	12 (11 - 13)
gentamicin	102	3	3 (1 - 9)	2814	7 (6 - 8)
tobramycin	102	2	2 (0 - 7)	2731	5 (4 - 6)
gentamicin + cefuroxime	102	0	0 (NA - NA)	2731	0 (0 - 1)
gentamicin + cefotaxime/ceftriaxone non-men	102	0	0 (NA - NA)	2795	0 (0 - 0)
ciprofloxacin + cefuroxime	102	1	1 (0 - 7)	3354	1 (0 - 1)
ciprofloxacin + cefotaxime/ceftriaxone non-men	102	0	0 (NA - NA)	3414	0 (0 - 1)
HRMO	102	3	3 (1 - 9)	2793	4 (4 - 5)

NA = not applicable.

non-uuti = According to breakpoint for indications other than uncomplicated urinary tract infection.

non-men = According to breakpoint for indications other than meningitis.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

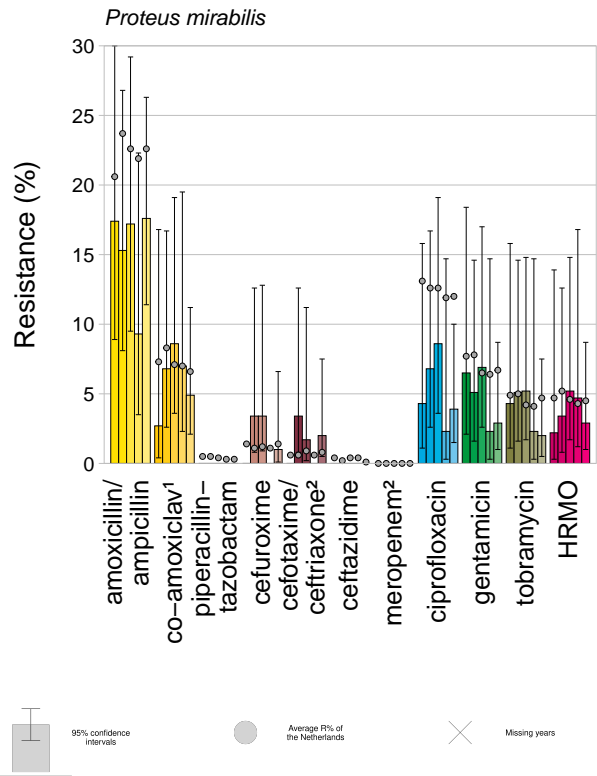


Figure 4.1.3.1 Trends in antibiotic resistance (from left to right 2017 to 2021) among diagnostic isolates of *P. mirabilis* patients attending outpatient departments in ISIS-AR*

* A hack took place between the period November 2019 and April 2020 rendering Aruba data from that period unreliable. Data were restored and corrected as much as possible but errors may still be present.

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

¹ non-uuti = According to breakpoint for indications other than uncomplicated urinary tract infection.

² non-men = According to breakpoint for indications other than meningitis.

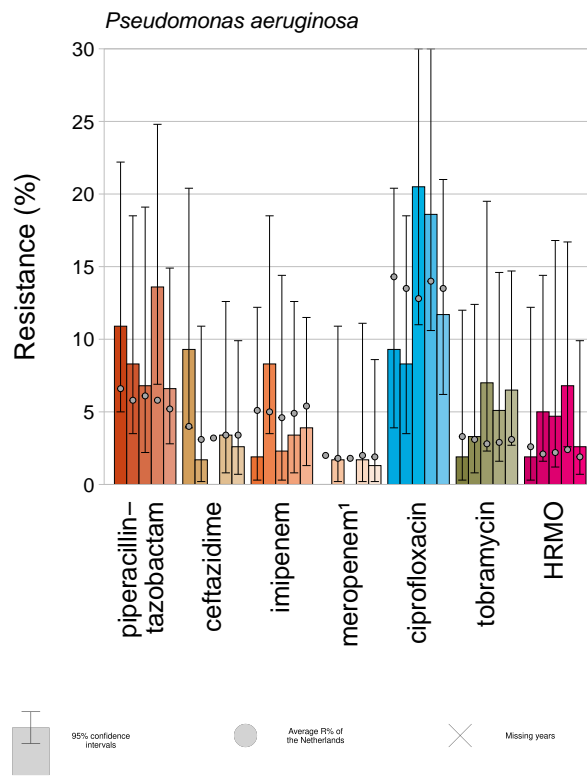
4.1.4 *Pseudomonas aeruginosa***Table 4.1.4.1** Resistance levels among diagnostic isolates of *P. aeruginosa* from patients attending outpatient departments, ISIS-AR 2021

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
piperacillin-tazobactam	76	5	7 (3 - 15)	5241	5 (5 - 6)
ceftazidime	76	2	3 (1 - 10)	5867	3 (3 - 4)
imipenem	76	3	4 (1 - 12)	5059	5 (5 - 6)
meropenem non-men	77	1	1 (0 - 9)	5875	2 (2 - 2)
ciprofloxacin	77	9	12 (6 - 21)	5890	14 (13 - 14)
tobramycin	77	5	6 (3 - 15)	5765	3 (3 - 4)
HRMO	76	2	3 (1 - 10)	5082	2 (2 - 2)

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

non-men = According to breakpoint for indications other than meningitis.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

**Figure 4.1.4.1** Trends in antibiotic resistance (from left to right 2017 to 2021) among diagnostic isolates of *P. aeruginosa* patients attending outpatient departments in ISIS-AR*

* A hack took place between the period November 2019 and April 2020 rendering Aruba data from that period unreliable. Data were restored and corrected as much as possible but errors may still be present.

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

¹ non-men = According to breakpoint for indications other than meningitis.

4.1.5 *Staphylococcus aureus***Table 4.1.5.1** Resistance levels among diagnostic isolates of *S. aureus* from patients attending outpatient departments, ISIS-AR 2021

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
flucloxacillin ¹	98	14	14 (9 - 23)	16115	2 (1 - 2)
ciprofloxacin ²	98	22	22 (15 - 32)	13035	4 (4 - 5)
gentamicin	98	5	5 (2 - 12)	14999	1 (1 - 1)
erythromycin	60	9	15 (8 - 26)	15529	16 (15 - 17)
clindamycin incl. inducible resistance ³	97	3	3 (1 - 9)	15975	14 (14 - 15)
doxycycline/tetracycline	98	11	11 (6 - 19)	14085	4 (3 - 4)
linezolid	98	2	2 (1 - 8)	14972	0 (0 - 0)
co-trimoxazole	98	9	9 (5 - 17)	15610	2 (2 - 2)

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

¹ Resistance to flucloxacillin was estimated based on laboratory S/R interpretation for cefoxitin, or, if no cefoxitin test was available, for oxacillin/flucloxacillin (see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information).

² Resistance to ciprofloxacin is intended to be a class indicator for resistance to fluorquinolones.

³ To estimate clindamycin resistance including induced resistance, the laboratory S/I/R interpretation was used (see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information).

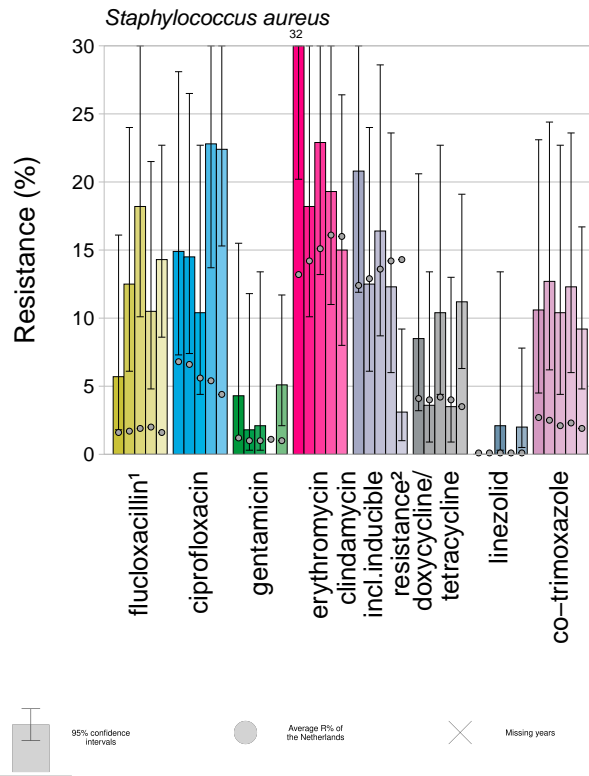


Figure 4.1.5.1 Trends in antibiotic resistance (from left to right 2017 to 2021) among diagnostic isolates of *S. aureus* patients attending outpatient departments in ISIS-AR*

* A hack took place between the period November 2019 and April 2020 rendering Aruba data from that period unreliable. Data were restored and corrected as much as possible but errors may still be present.

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

¹ Resistance to flucloxacillin was estimated based on laboratory S/R interpretation for cefoxitin, or, if no cefoxitin test was available, for oxacillin/flucloxacillin (see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information).

² To estimate clindamycin resistance including induced resistance, the laboratory S/I/R interpretation was used (see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information).

4.2 Inpatient hospital departments (excl. ICU)

The distribution of pathogens isolated from diagnostic samples (blood or cerebrospinal fluid, lower respiratory tract, urine, and wound or pus) from patients admitted to inpatient hospital departments (excl. ICU) in 2021 is presented in table 4.2.0.1.

The resistance levels for a selection of pathogens isolated from these patients in 2021 for *Escherichia coli*, *Klebsiella pneumoniae*, *Proteus mirabilis*, *Pseudomonas aeruginosa*, *Enterobacter cloacae* complex, *Acinetobacter* spp., *Enterococcus faecalis*, *Enterococcus faecium*, *Staphylococcus aureus*, coagulase-negative *Staphylococcus* spp. (incl. *S. epidermidis*), β -haemolytic *Streptococcus* spp. group A, β -haemolytic *Streptococcus* spp. group B, *Streptococcus anginosus*, and *Streptococcus mitis/oralis* isolates are presented in their respective subchapters.

Five-year trends in resistance are shown in figure 4.2.1.1 (*E. coli*), figure 4.2.2.1 (*K. pneumoniae*), figure 4.2.3.1 (*P. mirabilis*), figure 4.2.4.1 (*P. aeruginosa*), figure 4.2.5.1 (*E. cloacae* complex), figure 4.2.6.1 (*Acinetobacter* spp.), figure 4.2.7.1 (*E. faecalis* and *E. faecium*), figure 4.2.8.1 (*S. aureus* and CNS), figure 4.2.9.1 (β -haemolytic *Streptococcus* spp. group A and B), and figure 4.2.10.1 (*S. anginosus* and *S. mitis/S. oralis*).

In inpatient hospital departments on the Netherlands Antilles, a sample is taken from the majority of patients presenting with infections and susceptibility testing is performed as part of routine diagnostics. Therefore, bias due to selective sampling of patients is expected to be limited.

Table 4.2.0.1 Distribution of isolated pathogens in diagnostic samples from patients admitted to inpatient departments (excl. intensive care units), ISIS-AR 2021

Pathogen	Blood or cerebrospinal fluid	Lower respiratory tract	Urine	Wound or pus
	N	N	N	N
<i>E. coli</i>	78	1	360	70
<i>K. pneumoniae</i>	27	2	108	39
<i>P. mirabilis</i>	8	3	83	52
<i>E. cloacae</i> complex	5	1	20	25
Other <i>Enterobacterales</i> ¹	15	3	80	58
<i>P. aeruginosa</i>	9	14	43	62
<i>Acinetobacter</i> spp.	7	1	8	5
Other non-fermenters ²	6	2	4	5
<i>B. fragilis</i> complex	7	0	0	2
Other Gram-negatives ³	4	1	1	2
<i>E. faecalis</i>	8	0	55	57
<i>E. faecium</i>	1	0	1	3
<i>S. aureus</i>	44	10	26	175
CNS ⁴	356	2	32	51
β -haemolytic <i>Streptococcus</i> spp. group A	1	0	1	3
β -haemolytic <i>Streptococcus</i> spp. group B	14	2	37	43
<i>S. anginosus</i>	6	0	1	14
<i>S. mitis/S. oralis</i>	5	3	5	5
Other Gram-positives ⁵	27	2	16	15

¹ In order of frequency: *Morganella* spp., *Citrobacter* spp., *Providencia* spp., *Serratia* spp., *Klebsiella* spp. (non-pneumoniae), *Proteus* spp. (non-mirabilis), *Enterobacter* spp. (non-cloacae complex), *Salmonella* spp., *Pantoea* spp., *Cronobacter* spp.

² In order of frequency: *Pseudomonas* spp. (non-aeruginosa), *S. maltophilia*, *M. catarrhalis*.

³ In order of frequency: *H. influenzae*, *H. parainfluenzae*.

⁴ Coagulase-negative *Staphylococcus* spp., including *S. epidermidis*.

⁵ In order of frequency: *Staphylococcus* spp. (non-aureus, non-CNS), *S. pneumoniae*, *S. dysgalactiae* subsp. *equisimilis*, *Enterococcus* spp. (non-faecalis, non-faecium), *A. urinae*.

4.2.1 *Escherichia coli***Table 4.2.1.1** Resistance levels among diagnostic isolates of *E. coli* from patients admitted to inpatient departments (excl. intensive care units), ISIS-AR 2021

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
amoxicillin/ampicillin	506	251	50 (45 - 54)	27687	40 (39 - 40)
co-amoxiclav non-uuti	506	210	42 (37 - 46)	27712	31 (30 - 31)
piperacillin-tazobactam	504	36	7 (5 - 10)	26425	4 (4 - 4)
cefuroxime	506	89	18 (15 - 21)	27095	12 (11 - 12)
cefotaxime/ceftriaxone non-men	505	49	10 (7 - 13)	27551	6 (5 - 6)
ceftazidime	506	42	8 (6 - 11)	27678	4 (4 - 5)
meropenem/imipenem non-men	506	1	0 (0 - 1)	27685	0 (0 - 0)
ciprofloxacin	506	127	25 (22 - 29)	27717	12 (12 - 12)
gentamicin	506	59	12 (9 - 15)	27697	5 (4 - 5)
tobramycin	506	62	12 (10 - 15)	25137	5 (4 - 5)
nitrofurantoin	506	10	2 (1 - 4)	26717	1 (1 - 1)
gentamicin + co-amoxiclav non-uuti	506	48	9 (7 - 12)	27687	3 (3 - 4)
gentamicin + cefuroxime	506	20	4 (3 - 6)	27074	2 (2 - 2)
gentamicin + cefotaxime/ceftriaxone non-men	505	15	3 (2 - 5)	27538	1 (1 - 1)
ciprofloxacin + co-amoxiclav non-uuti	506	74	15 (12 - 18)	27708	7 (7 - 7)
ciprofloxacin + cefuroxime	506	58	11 (9 - 15)	27091	5 (5 - 5)
ciprofloxacin + cefotaxime/ceftriaxone non-men	505	39	8 (6 - 10)	27547	4 (3 - 4)
HRMO	506	71	14 (11 - 17)	27544	7 (7 - 7)

non-uuti = According to breakpoint for indications other than uncomplicated urinary tract infection.

non-men = According to breakpoint for indications other than meningitis.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

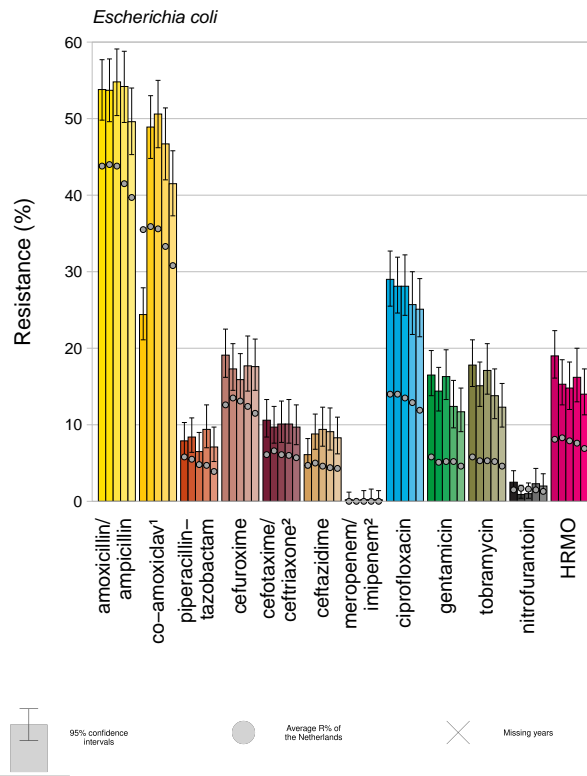


Figure 4.2.1.1 Trends in antibiotic resistance (from left to right 2017 to 2021) among diagnostic isolates of *E. coli* from patients admitted to inpatient departments (excl. intensive care units) in ISIS-AR^{*,**}

* A hack took place between the period November 2019 and April 2020 rendering Aruba data from that period unreliable. Data were restored and corrected as much as possible but errors may still be present.

** Y axis of the figures differs from the standard format.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

¹ non-uuti = According to breakpoint for indications other than uncomplicated urinary tract infection.

² non-men = According to breakpoint for indications other than meningitis.

4.2.2 *Klebsiella pneumoniae***Table 4.2.2.1** Resistance levels among diagnostic isolates of *K. pneumoniae* from patients admitted to inpatient departments (excl. intensive care units), ISIS-AR 2021

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
co-amoxiclav non-uuti	172	28	16 (11 - 23)	5910	21 (20 - 22)
piperacillin-tazobactam	172	22	13 (9 - 19)	5641	16 (15 - 17)
cefuroxime	172	18	10 (7 - 16)	5811	13 (12 - 14)
cefotaxime/ceftriaxone non-men	172	12	7 (4 - 12)	5903	8 (7 - 9)
ceftazidime	172	11	6 (4 - 11)	5907	8 (7 - 8)
meropenem/imipenem non-men	172	0	0 (NA - NA)	5907	0 (0 - 0)
ciprofloxacin	172	18	10 (7 - 16)	5909	10 (9 - 11)
gentamicin	172	4	2 (1 - 6)	5910	4 (3 - 4)
tobramycin	172	6	3 (2 - 8)	5344	4 (4 - 5)
gentamicin + co-amoxiclav non-uuti	172	4	2 (1 - 6)	5907	3 (3 - 4)
gentamicin + cefuroxime	172	4	2 (1 - 6)	5808	3 (3 - 4)
gentamicin + cefotaxime/ceftriaxone non-men	172	3	2 (1 - 5)	5901	3 (3 - 4)
ciprofloxacin + co-amoxiclav non-uuti	172	8	5 (2 - 9)	5907	6 (5 - 6)
ciprofloxacin + cefuroxime	172	12	7 (4 - 12)	5808	7 (6 - 8)
ciprofloxacin + cefotaxime/ceftriaxone non-men	172	10	6 (3 - 10)	5900	5 (5 - 6)
HRMO	172	11	6 (4 - 11)	5901	9 (8 - 10)

NA = not applicable.

non-uuti = According to breakpoint for indications other than uncomplicated urinary tract infection.

non-men = According to breakpoint for indications other than meningitis.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

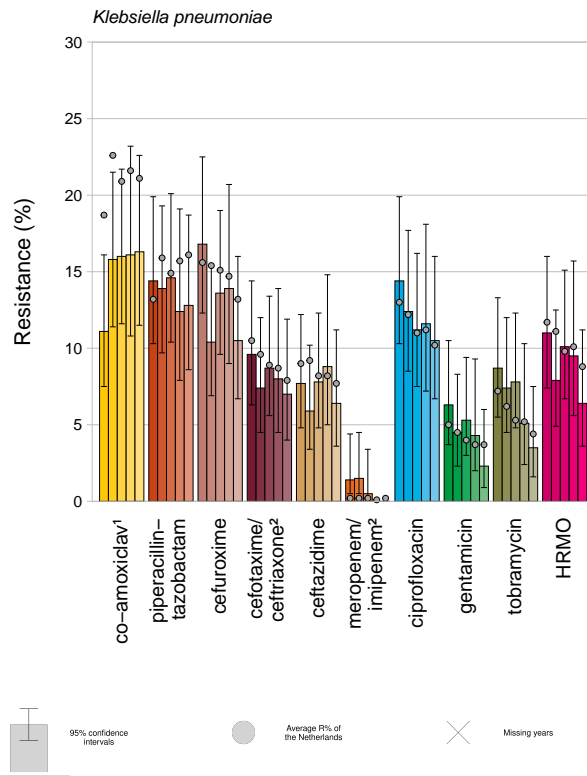


Figure 4.2.2.1 Trends in antibiotic resistance (from left to right 2017 to 2021) among diagnostic isolates of *K. pneumoniae* from patients admitted to inpatient departments (excl. intensive care units) in ISIS-AR*

* A hack took place between the period November 2019 and April 2020 rendering Aruba data from that period unreliable. Data were restored and corrected as much as possible but errors may still be present.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

¹ non-uti = According to breakpoint for indications other than uncomplicated urinary tract infection.

² non-men = According to breakpoint for indications other than meningitis.

4.2.3 *Proteus mirabilis***Table 4.2.3.1** Resistance levels among diagnostic isolates of *P. mirabilis* from patients admitted to inpatient departments (excl. intensive care units), ISIS-AR 2021

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
amoxicillin/ampicillin	145	16	11 (7 - 17)	3955	23 (21 - 24)
co-amoxiclav non-uuti	145	5	3 (1 - 8)	3957	6 (5 - 7)
piperacillin-tazobactam	144	0	0 (NA - NA)	3769	0 (0 - 1)
cefuroxime	145	4	3 (1 - 7)	3885	1 (1 - 1)
cefotaxime/ceftriaxone non-men	144	5	3 (1 - 8)	3942	1 (0 - 1)
ceftazidime	145	1	1 (0 - 5)	3955	0 (0 - 0)
meropenem non-men	145	0	0 (NA - NA)	3949	0 (0 - 0)
ciprofloxacin	145	6	4 (2 - 9)	3958	11 (10 - 12)
gentamicin	145	3	2 (1 - 6)	3266	6 (5 - 7)
tobramycin	145	7	5 (2 - 10)	3194	4 (3 - 5)
gentamicin + co-amoxiclav non-uuti	145	2	1 (0 - 5)	3266	2 (1 - 2)
gentamicin + cefuroxime	145	0	0 (NA - NA)	3195	0 (0 - 1)
gentamicin + cefotaxime/ceftriaxone non-men	144	0	0 (NA - NA)	3251	0 (0 - 1)
ciprofloxacin + co-amoxiclav non-uuti	145	0	0 (NA - NA)	3957	2 (1 - 2)
ciprofloxacin + cefuroxime	145	4	3 (1 - 7)	3885	0 (0 - 1)
ciprofloxacin + cefotaxime/ceftriaxone non-men	144	4	3 (1 - 7)	3942	0 (0 - 1)
HRMO	144	6	4 (2 - 9)	3256	4 (4 - 5)

NA = not applicable.

non-uuti = According to breakpoint for indications other than uncomplicated urinary tract infection.

non-men = According to breakpoint for indications other than meningitis.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

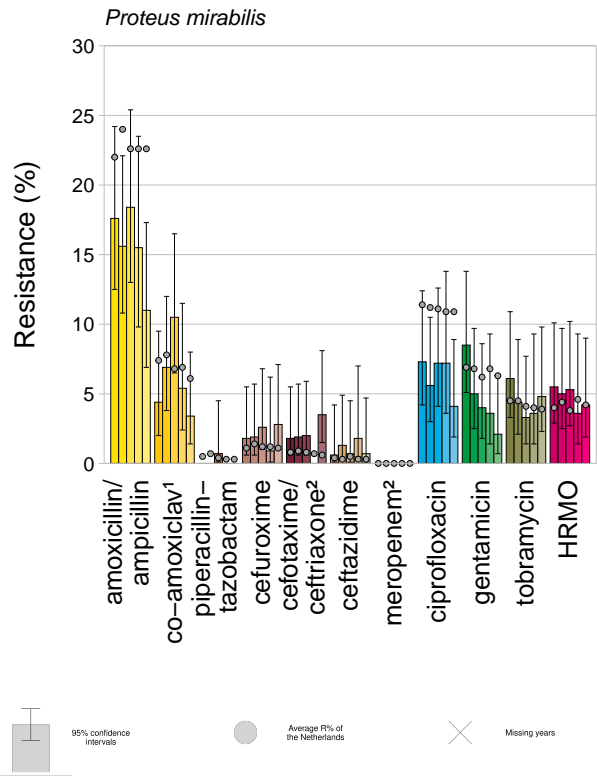


Figure 4.2.3.1 Trends in antibiotic resistance (from left to right 2017 to 2021) among diagnostic isolates of *P. mirabilis* from patients admitted to inpatient departments (excl. intensive care units) in ISIS-AR*

* A hack took place between the period November 2019 and April 2020 rendering Aruba data from that period unreliable. Data were restored and corrected as much as possible but errors may still be present.
 HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

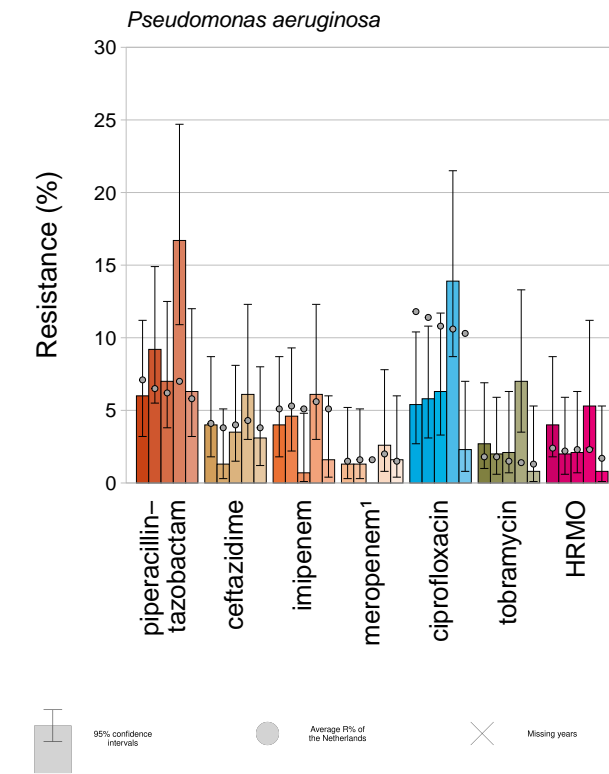
¹ non-uti = According to breakpoint for indications other than uncomplicated urinary tract infection.
² non-men = According to breakpoint for indications other than meningitis.

4.2.4 *Pseudomonas aeruginosa***Table 4.2.4.1** Resistance levels among diagnostic isolates of *P. aeruginosa* from patients admitted to inpatient departments (excl. intensive care units), ISIS-AR 2021

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
piperacillin-tazobactam	128	8	6 (3 - 12)	5012	6 (5 - 7)
ceftazidime	128	4	3 (1 - 8)	5768	4 (3 - 4)
imipenem	128	2	2 (0 - 6)	5467	5 (5 - 6)
meropenem non-men	128	2	2 (0 - 6)	5773	2 (1 - 2)
ciprofloxacin	128	3	2 (1 - 7)	5786	10 (10 - 11)
tobramycin	128	1	1 (0 - 5)	5582	1 (1 - 2)
HRMO	128	1	1 (0 - 5)	4768	2 (1 - 2)

non-men = According to breakpoint for indications other than meningitis.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

**Figure 4.2.4.1** Trends in antibiotic resistance (from left to right 2017 to 2021) among diagnostic isolates of *P. aeruginosa* from patients admitted to inpatient departments (excl. intensive care units) in ISIS-AR*

* A hack took place between the period November 2019 and April 2020 rendering Aruba data from that period unreliable. Data were restored and corrected as much as possible but errors may still be present.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

¹ *non-men* = According to breakpoint for indications other than meningitis.

4.2.5 *Enterobacter cloacae* complex

Table 4.2.5.1 Resistance levels among diagnostic isolates of *E. cloacae* complex from patients admitted to inpatient departments (excl. intensive care units), ISIS-AR 2021

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
meropenem/imipenem non-men	55	0	0 (NA - NA)	3028	0 (0 - 0)
ciprofloxacin	55	3	5 (2 - 16)	3180	4 (3 - 5)
gentamicin	55	0	0 (NA - NA)	3177	3 (2 - 4)
tobramycin	55	0	0 (NA - NA)	2876	3 (3 - 4)
co-trimoxazole	55	6	11 (5 - 22)	2473	6 (5 - 7)
HRMO	55	0	0 (NA - NA)	3172	2 (2 - 3)

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

NA = not applicable.

non-men = According to breakpoint for indications other than meningitis.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

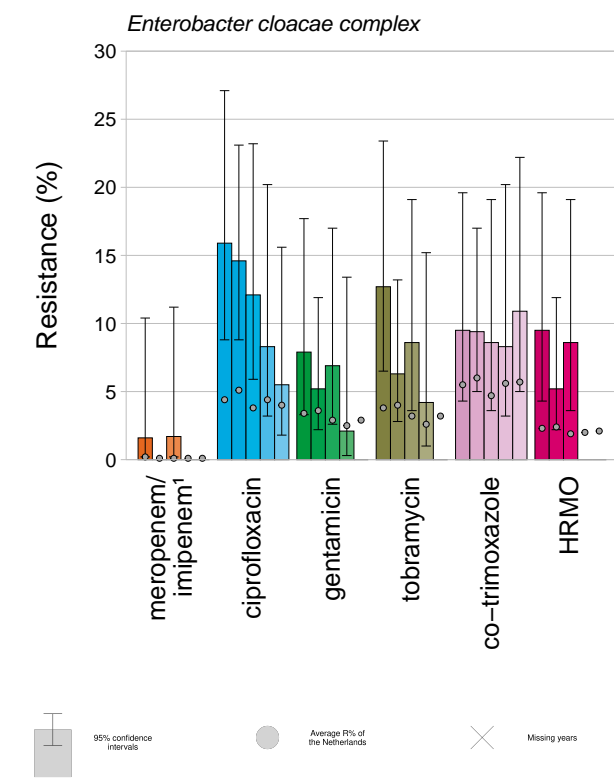


Figure 4.2.5.1 Trends in antibiotic resistance (from left to right 2017 to 2021) among diagnostic isolates of *E. cloacae* complex from patients admitted to inpatient departments (excl. intensive care units) in ISIS-AR*

* A hack took place between the period November 2019 and April 2020 rendering Aruba data from that period unreliable. Data were restored and corrected as much as possible but errors may still be present.

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

¹ non-men = According to breakpoint for indications other than meningitis.

4.2.6 *Acinetobacter* spp.

Table 4.2.6.1 Resistance levels among diagnostic isolates of *Acinetobacter* spp. from patients admitted to inpatient departments (excl. intensive care units), ISIS-AR 2021

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
ciprofloxacin	22	1	5 (1 - 26)	598	4 (3 - 6)
gentamicin	22	0	0 (NA - NA)	630	3 (2 - 4)
tobramycin	22	0	0 (NA - NA)	550	3 (2 - 4)
co-trimoxazole	22	5	23 (10 - 44)	600	3 (2 - 5)
HRMO	22	0	0 (NA - NA)	732	2 (1 - 3)

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

NA = not applicable.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

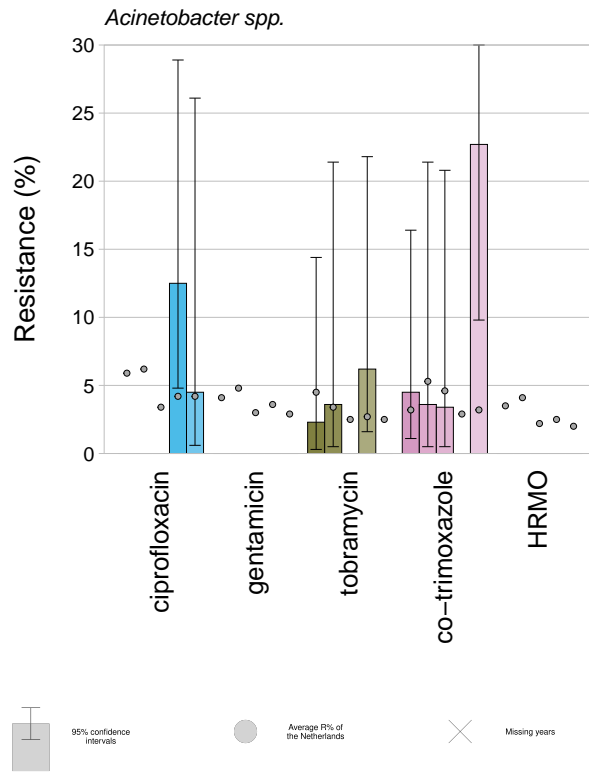


Figure 4.2.6.1 Trends in antibiotic resistance (from left to right 2017 to 2021) among diagnostic isolates of *Acinetobacter* spp. from patients admitted to inpatient departments (excl. intensive care units) in ISIS-AR*

* A hack took place between the period November 2019 and April 2020 rendering Aruba data from that period unreliable. Data were restored and corrected as much as possible but errors may still be present.

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

4.2.7 *Enterococcus faecalis* and *Enterococcus faecium*

Table 4.2.7.1 Resistance levels among diagnostic isolates of *E. faecalis* from patients admitted to inpatient departments (excl. intensive care units), ISIS-AR 2021

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
vancomycin	118	2	2 (0 - 7)	6090	0 (0 - 0)
nitrofurantoin	117	2	2 (0 - 7)	5768	0 (0 - 1)

Table 4.2.7.2 Resistance levels among diagnostic isolates of *E. faecium* from patients admitted to inpatient departments (excl. intensive care units), ISIS-AR 2021

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
amoxicillin/ampicillin	4	3	75 (24 - 97)	2802	87 (86 - 89)
vancomycin	4	0	0 (NA - NA)	2849	0 (0 - 1)
linezolid	4	0	0 (NA - NA)	2743	0 (0 - 1)

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.
NA = not applicable.

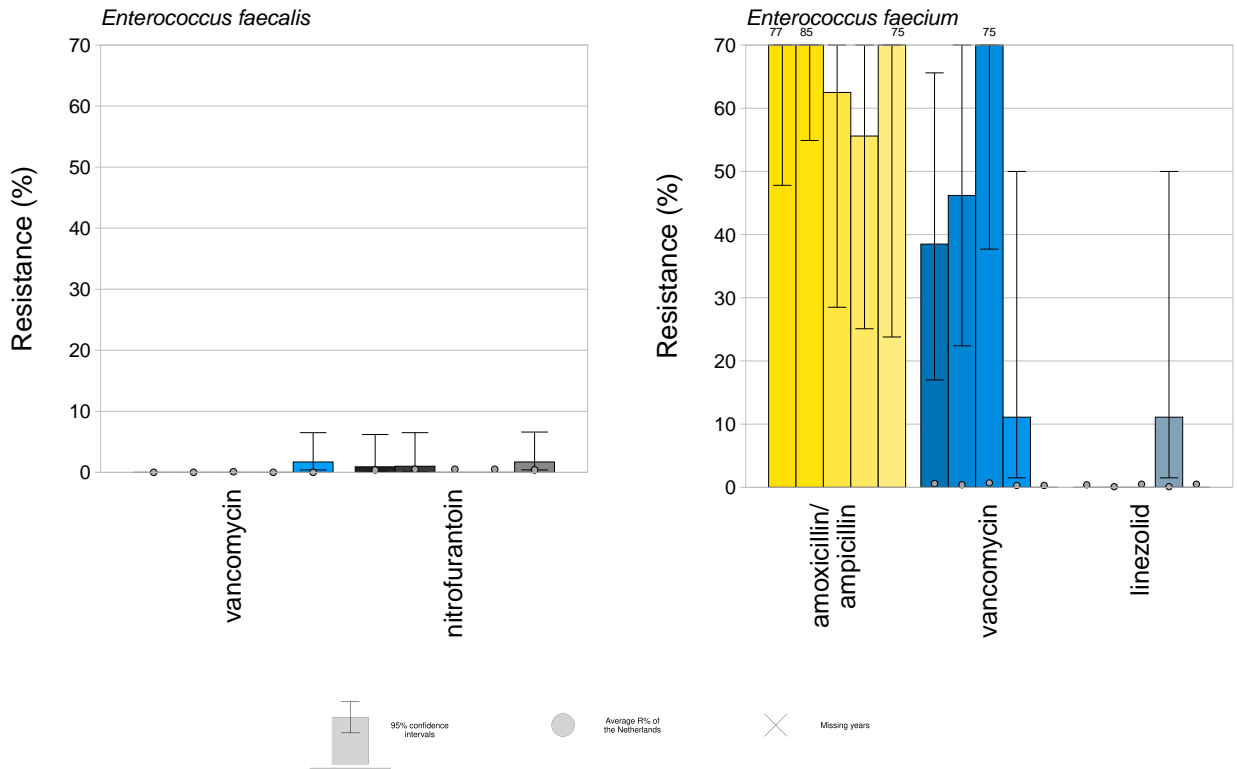


Figure 4.2.7.1 Trends in antibiotic resistance (from left to right 2017 to 2021) among diagnostic isolates of *E. faecalis* and *E. faecium* from patients admitted to inpatient departments (excl. intensive care units) in ISIS-AR^{*,**}

* A hack took place between the period November 2019 and April 2020 rendering Aruba data from that period unreliable. Data were restored and corrected as much as possible but errors may still be present.

** Y axis of the figures differs from the standard format.

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

4.2.8 *Staphylococcus aureus* and coagulase negative *Staphylococcus* spp. (incl. *S. epidermidis*)

Table 4.2.8.1 Resistance levels among diagnostic isolates of *S. aureus* from patients admitted to inpatient departments (excl. intensive care units), ISIS-AR 2021

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
flucloxacillin ¹	254	44	17 (13 - 22)	12602	2 (2 - 2)
ciprofloxacin ²	255	28	11 (8 - 15)	10026	5 (5 - 6)
gentamicin	254	5	2 (1 - 5)	11750	1 (1 - 1)
erythromycin	165	25	15 (10 - 21)	12160	15 (14 - 16)
clindamycin incl. inducible resistance ³	255	7	3 (1 - 6)	12491	13 (13 - 14)
doxycycline/tetracycline	254	21	8 (5 - 12)	11170	3 (3 - 3)
linezolid	254	0	0 (NA - NA)	11748	0 (0 - 0)
co-trimoxazole	255	14	5 (3 - 9)	12231	2 (2 - 2)

NA = not applicable.

¹ Resistance to flucloxacillin was estimated based on laboratory S/R interpretation for cefoxitin, or, if no cefoxitin test was available, for oxacillin/flucloxacillin (see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information).

² Resistance to ciprofloxacin is intended to be a class indicator for resistance to fluorquinolones.

³ To estimate clindamycin resistance including induced resistance, the laboratory S/I/R interpretation was used (see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information).

Table 4.2.8.2 Resistance levels among diagnostic isolates of coagulase-negative *Staphylococcus* spp. (incl. *S. epidermidis*) from patients admitted to inpatient departments (excl. intensive care units), ISIS-AR 2021

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
flucloxacillin ¹	445	146	33 (29 - 37)	12598	40 (39 - 41)
ciprofloxacin ²	444	54	12 (9 - 16)	9939	27 (26 - 28)
gentamicin	442	46	10 (8 - 14)	12262	25 (24 - 26)
erythromycin	331	122	37 (32 - 42)	12353	41 (40 - 42)
clindamycin incl. inducible resistance ³	441	46	10 (8 - 14)	12500	29 (28 - 30)
doxycycline/tetracycline	438	73	17 (13 - 20)	10241	15 (14 - 16)
linezolid	438	5	1 (0 - 3)	12145	0 (0 - 0)
co-trimoxazole	443	40	9 (7 - 12)	12233	15 (14 - 16)

¹ Resistance to flucloxacillin was estimated based on laboratory S/R interpretation for cefoxitin, or, if no cefoxitin test was available, for oxacillin/flucloxacillin (see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information).

² Resistance to ciprofloxacin is intended to be a class indicator for resistance to fluorquinolones.

³ To estimate clindamycin resistance including induced resistance, the laboratory S/I/R interpretation was used (see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information).

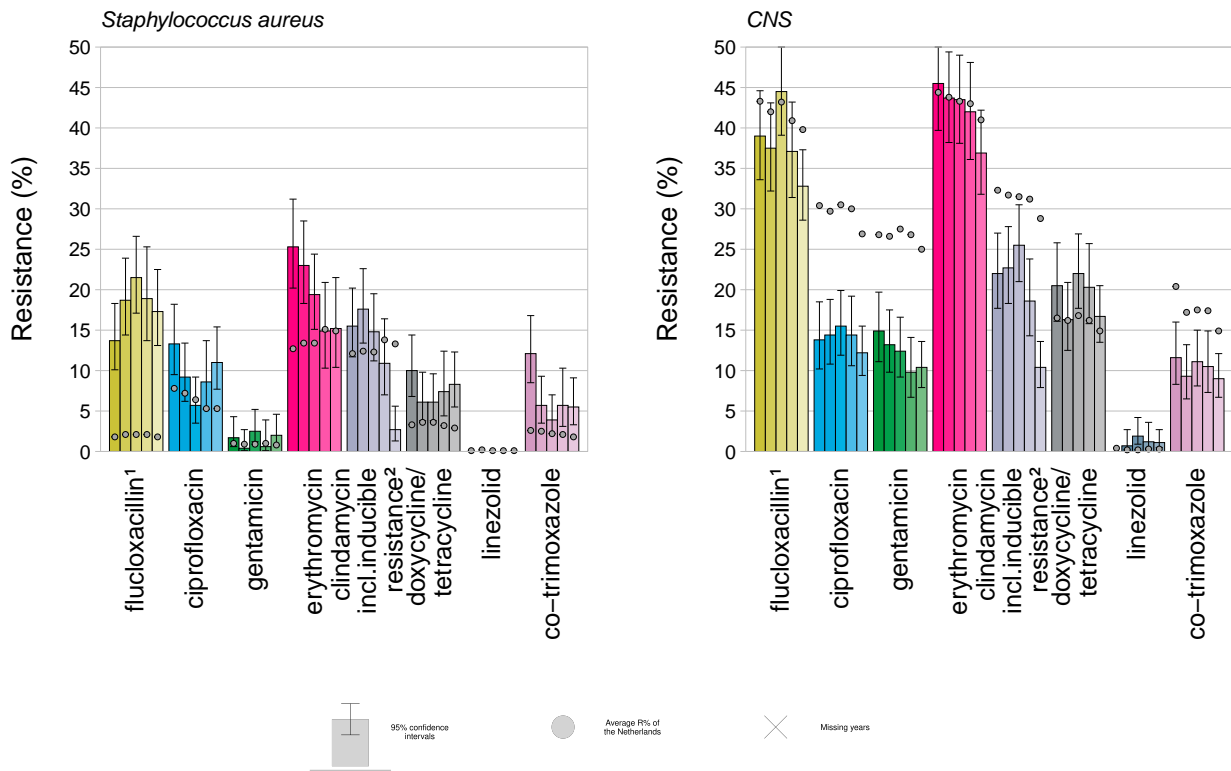


Figure 4.2.8.1 Trends in antibiotic resistance (from left to right 2017 to 2021) among diagnostic isolates of *S. aureus* and coagulase negative *Staphylococcus* spp. (incl. *S. epidermidis*) from patients admitted to inpatient departments (excl. intensive care units) in ISIS-AR^{*,**}

* A hack took place between the period November 2019 and April 2020 rendering Aruba data from that period unreliable. Data were restored and corrected as much as possible but errors may still be present.

** Y axis of the figures differs from the standard format.

¹ Resistance to flucloxacillin was estimated based on laboratory S/R interpretation for cefoxitin, or, if no cefoxitin test was available, for oxacillin/flucloxacillin (see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information).

² To estimate clindamycin resistance including induced resistance, the laboratory S/I/R interpretation was used (see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information).

4.2.9 β -haemolytic *Streptococcus* spp. group A and group B**Table 4.2.9.1** Resistance levels among diagnostic isolates of β -haemolytic *Streptococcus* spp. group A from patients admitted to inpatient departments (excl. intensive care units), ISIS-AR 2021

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
erythromycin	4	0	0 (NA - NA)	249	11 (8 - 16)
clindamycin incl. inducible resistance ¹	5	0	0 (NA - NA)	358	9 (7 - 13)
doxycycline/tetracycline	5	1	20 (3 - 69)	227	31 (26 - 38)
co-trimoxazole	5	0	0 (NA - NA)	235	3 (1 - 6)

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

NA = not applicable.

¹ To estimate clindamycin resistance including induced resistance, the laboratory S/I/R interpretation was used (see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information).

Table 4.2.9.2 Resistance levels among diagnostic isolates of β -haemolytic *Streptococcus* spp. group B from patients admitted to inpatient departments (excl. intensive care units), ISIS-AR 2021

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
erythromycin	67	11	16 (9 - 27)	1436	20 (18 - 22)
clindamycin incl. inducible resistance ¹	93	9	10 (5 - 18)	1590	17 (15 - 19)
doxycycline/tetracycline	94	71	76 (66 - 83)	1097	75 (73 - 78)

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

¹ To estimate clindamycin resistance including induced resistance, the laboratory S/I/R interpretation was used (see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information).

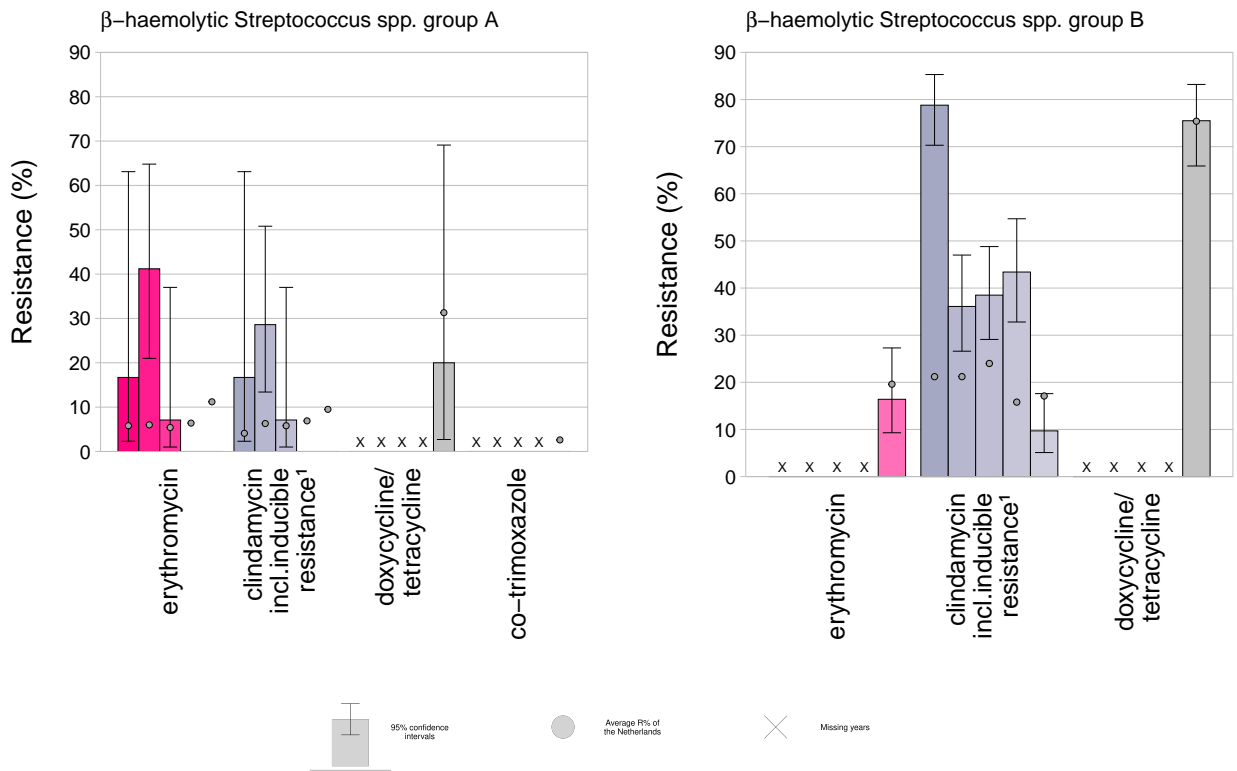


Figure 4.2.9.1 Trends in antibiotic resistance (from left to right 2017 to 2021) among diagnostic isolates of *β*-haemolytic *Streptococcus* spp. group A and B from patients admitted to inpatient departments (excl. intensive care units) in ISIS-AR^{*,**}

* A hack took place between the period November 2019 and April 2020 rendering Aruba data from that period unreliable. Data were restored and corrected as much as possible but errors may still be present.

** Y axis of the figures differs from the standard format.

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

¹ To estimate clindamycin resistance including induced resistance, the laboratory S/I/R interpretation was used (see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information).

4.2.10 *Streptococcus anginosus* and *Streptococcus mitis*/*Streptococcus oralis***Table 4.2.10.1** Resistance levels among diagnostic isolates of *Streptococcus anginosus* from patients admitted to inpatient departments (excl. intensive care units), ISIS-AR 2021

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
clindamycin incl. inducible resistance ¹	21	0	0 (NA - NA)	1054	7 (6 - 9)

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

NA = not applicable.

¹ To estimate clindamycin resistance including induced resistance, the laboratory S/I/R interpretation was used (see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information).

Table 4.2.10.2 Resistance levels among diagnostic isolates of *Streptococcus mitis*/*S. oralis* from patients admitted to inpatient departments (excl. intensive care units), ISIS-AR 2021

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
amoxicillin/ampicillin	18	1	6 (1 - 31)	291	8 (6 - 12)
clindamycin incl. inducible resistance ¹	18	1	6 (1 - 31)	491	7 (5 - 9)

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

¹ To estimate clindamycin resistance including induced resistance, the laboratory S/I/R interpretation was used (see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information).

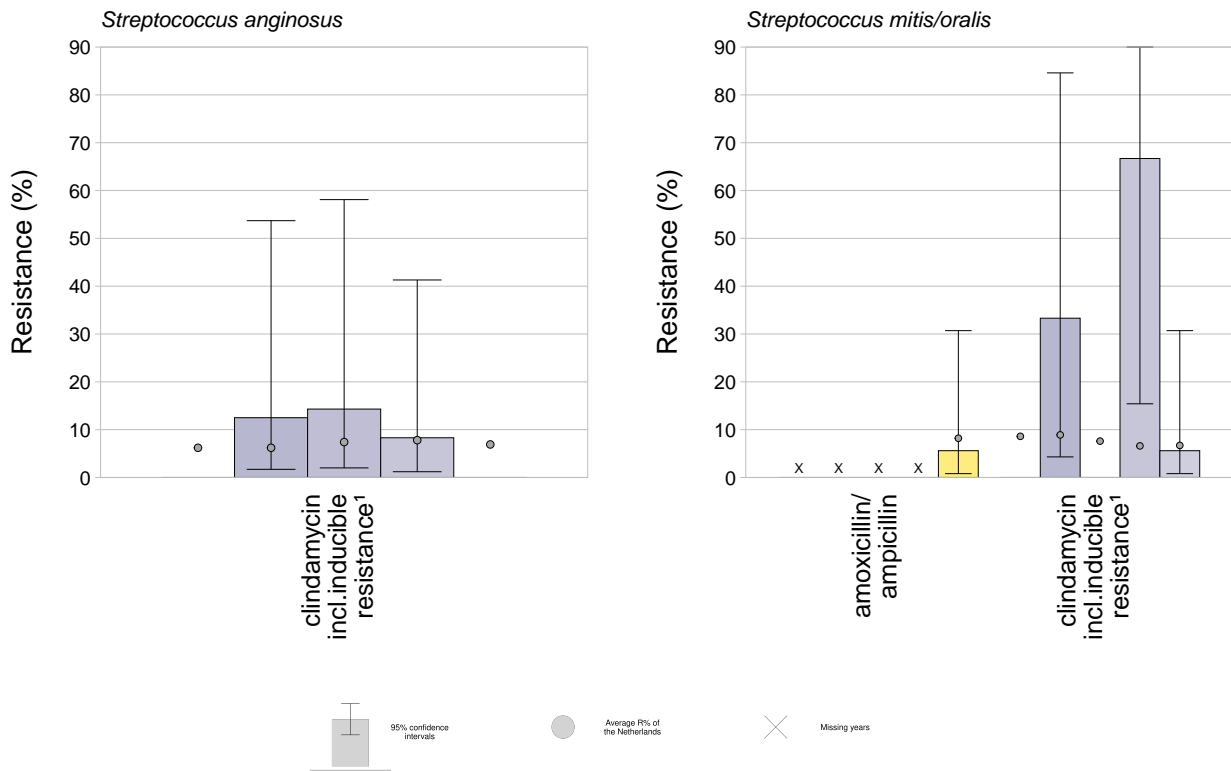


Figure 4.2.10.1 Trends in antibiotic resistance (from left to right 2017 to 2021) among diagnostic isolates of *Streptococcus anginosus* and *S. mitis/ S. oralis* from patients admitted to inpatient departments (excl. intensive care units) in ISIS-AR^{*,**}

* A hack took place between the period November 2019 and April 2020 rendering Aruba data from that period unreliable. Data were restored and corrected as much as possible but errors may still be present.

** Y axis of the figures differs from the standard format.

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

¹ To estimate clindamycin resistance including induced resistance, the laboratory S/I/R interpretation was used (see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information).

4.3 Intensive Care Units

The distribution of pathogens from diagnostic samples (blood or cerebrospinal fluid, lower respiratory tract, urine, and wound or pus) from patients admitted to intensive care units in 2021 is presented in table 4.3.0.1.

The resistance levels for a selection of pathogens isolated from these patients in 2021 for *Escherichia coli*, *Klebsiella pneumoniae*, *Proteus mirabilis*, *Pseudomonas aeruginosa*, *Enterobacter cloacae* complex, *Acinetobacter* spp., *Staphylococcus aureus*, and coagulase-negative *Staphylococcus* spp. (incl. *S. epidermidis*) isolates are presented in their respective subchapters.

Five-year trends in resistance are shown in figure 4.3.1.1 (*E. coli*), figure 4.3.2.1 (*K. pneumoniae*), figure 4.3.3.1 (*P. mirabilis*), figure 4.3.4.1 (*P. aeruginosa*), figure 4.3.5.1 (*E. cloacae* complex), figure 4.3.6.1 (*Acinetobacter* spp.), and figure 4.3.8.1 (*S. aureus* and CNS).

In intensive care units on the Netherlands Antilles, a sample is taken from almost all patients presenting with infections and susceptibility testing is performed as part of routine diagnostics. Bias due to selective sampling of patients is therefore unlikely.

Table 4.3.0.1 Distribution of isolated pathogens in diagnostic samples from patients admitted to intensive care units, ISIS-AR 2021

Pathogen	Blood or cerebrospinal fluid	Lower respiratory tract	Urine	Wound or pus
	N	N	N	N
<i>E. coli</i>	4	4	7	2
<i>K. pneumoniae</i>	3	11	3	3
<i>P. mirabilis</i>	0	1	1	3
<i>E. cloacae</i> complex	1	8	1	1
Other <i>Enterobacterales</i> ¹	4	13	6	6
<i>P. aeruginosa</i>	1	18	1	7
<i>Acinetobacter</i> spp.	2	8	1	0
Other non-fermenters ²	1	6	0	0
<i>E. faecalis</i>	4	4	10	5
<i>E. faecium</i>	3	1	0	1
<i>S. aureus</i>	14	15	1	6
CNS ³	39	4	1	0
Other Gram-positives ⁴	7	2	2	3

¹ In order of frequency: *Klebsiella* spp. (non-pneumoniae), *Citrobacter* spp., *Morganella* spp., *Enterobacter* spp. (non-cloacae complex), *Serratia* spp., *Providencia* spp., *Proteus* spp. (non-mirabilis), *Raoultella* spp., *Salmonella* spp.

² In order of frequency: *S. maltophilia*.

³ Coagulase-negative *Staphylococcus* spp., including *S. epidermidis*.

⁴ In order of frequency: *S. pneumoniae*, *S. mitis*/*S. oralis*, β -haemolytic *Streptococcus* spp. group B, *S. anginosus*, *Staphylococcus* spp. (non-aureus, non-CNS), *A. urinae*, *Enterococcus* spp. (non-faecalis, non-faecium).

4.3.1 *Escherichia coli***Table 4.3.1.1** Resistance levels among diagnostic isolates of *E. coli* from patients admitted to intensive care units, ISIS-AR 2021

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
amoxicillin/ampicillin	17	11	65 (40 - 83)	1333	43 (40 - 45)
co-amoxiclav non-uuti	17	10	59 (35 - 79)	1331	34 (31 - 36)
piperacillin-tazobactam	17	4	24 (9 - 49)	1284	6 (5 - 7)
cefuroxime	17	3	18 (6 - 43)	1331	18 (16 - 20)
cefotaxime/ceftriaxone non-men	17	2	12 (3 - 37)	1328	11 (9 - 12)
ceftazidime	17	2	12 (3 - 37)	1329	8 (6 - 9)
meropenem/imipenem non-men	17	0	0 (NA - NA)	1330	0 (0 - 0)
ciprofloxacin	17	2	12 (3 - 37)	1329	14 (12 - 16)
gentamicin	17	1	6 (1 - 32)	1331	6 (5 - 8)
tobramycin	17	1	6 (1 - 32)	1293	7 (6 - 8)
co-trimoxazole	17	4	24 (9 - 49)	1330	21 (19 - 23)
gentamicin + co-amoxiclav non-uuti	17	1	6 (1 - 32)	1330	5 (4 - 6)
gentamicin + cefuroxime	17	1	6 (1 - 32)	1330	4 (3 - 5)
gentamicin + cefotaxime/ceftriaxone non-men	17	1	6 (1 - 32)	1327	3 (2 - 4)
ciprofloxacin + co-amoxiclav non-uuti	17	2	12 (3 - 37)	1329	9 (8 - 11)
ciprofloxacin + cefuroxime	17	2	12 (3 - 37)	1329	8 (7 - 9)
ciprofloxacin + cefotaxime/ceftriaxone non-men	17	2	12 (3 - 37)	1326	6 (5 - 8)
HRMO	17	2	12 (3 - 37)	1328	11 (10 - 13)
multidrug resistance ¹	17	1	6 (1 - 32)	1329	6 (4 - 7)

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

NA = not applicable.

non-uuti = According to breakpoint for indications other than uncomplicated urinary tract infection.

non-men = According to breakpoint for indications other than meningitis.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

¹ Multidrug resistance is defined as resistance to all of the following oral agents: co-amoxiclav (according to the breakpoint for indications other than uncomplicated urinary tract infection), ciprofloxacin, and co-trimoxazole.

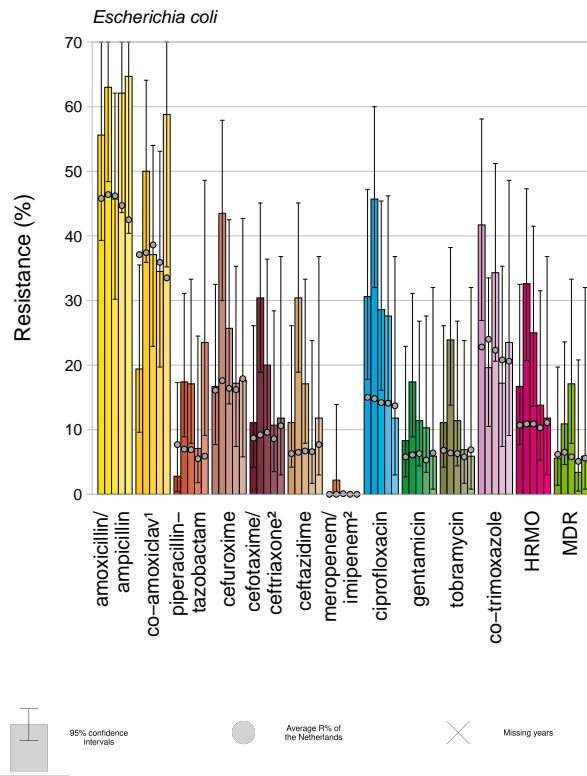


Figure 4.3.1.1 Trends in antibiotic resistance (from left to right 2017 to 2021) among diagnostic isolates of *E. coli* from patients admitted to intensive care units in ISIS-AR^{*,**}

* A hack took place between the period November 2019 and April 2020 rendering Aruba data from that period unreliable. Data were restored and corrected as much as possible but errors may still be present.

** Y axis of the figures differs from the standard format.

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

MDR = multidrug resistance. It is defined as resistance to all of the following oral agents: co-amoxiclav (according to the breakpoint for indications other than uncomplicated urinary tract infection), ciprofloxacin, and co-trimoxazole.

¹ non-wuti = According to breakpoint for indications other than uncomplicated urinary tract infection.

² non-men = According to breakpoint for indications other than meningitis.

4.3.2 *Klebsiella pneumoniae***Table 4.3.2.1** Resistance levels among diagnostic isolates of *K. pneumoniae* from patients admitted to intensive care units, ISIS-AR 2021

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
co-amoxiclav non-uuti	19	5	26 (11 - 50)	442	25 (21 - 29)
piperacillin-tazobactam	19	5	26 (11 - 50)	423	17 (14 - 21)
cefuroxime	19	4	21 (8 - 45)	441	20 (17 - 24)
cefotaxime/ceftriaxone non-men	19	4	21 (8 - 45)	442	16 (13 - 20)
ceftazidime	19	4	21 (8 - 45)	442	15 (12 - 19)
meropenem/imipenem non-men	19	1	5 (1 - 29)	419	1 (0 - 2)
ciprofloxacin	19	5	26 (11 - 50)	441	11 (8 - 14)
gentamicin	19	3	16 (5 - 39)	441	8 (6 - 11)
tobramycin	19	3	16 (5 - 39)	405	9 (6 - 12)
co-trimoxazole	19	4	21 (8 - 45)	442	13 (10 - 17)
gentamicin + co-amoxiclav non-uuti	19	3	16 (5 - 39)	441	7 (5 - 9)
gentamicin + cefuroxime	19	3	16 (5 - 39)	440	8 (6 - 11)
gentamicin + cefotaxime/ceftriaxone non-men	19	3	16 (5 - 39)	441	8 (6 - 11)
ciprofloxacin + co-amoxiclav non-uuti	19	4	21 (8 - 45)	441	7 (5 - 10)
ciprofloxacin + cefuroxime	19	4	21 (8 - 45)	440	9 (7 - 12)
ciprofloxacin + cefotaxime/ceftriaxone non-men	19	4	21 (8 - 45)	441	8 (6 - 11)
HRMO	19	4	21 (8 - 45)	442	17 (14 - 21)
multidrug resistance ¹	19	4	21 (8 - 45)	441	6 (4 - 8)

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

non-uuti = According to breakpoint for indications other than uncomplicated urinary tract infection.

non-men = According to breakpoint for indications other than meningitis.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

¹ Multidrug resistance is defined as resistance to all of the following oral agents: co-amoxiclav (according to the breakpoint for indications other than uncomplicated urinary tract infection), ciprofloxacin, and co-trimoxazole.

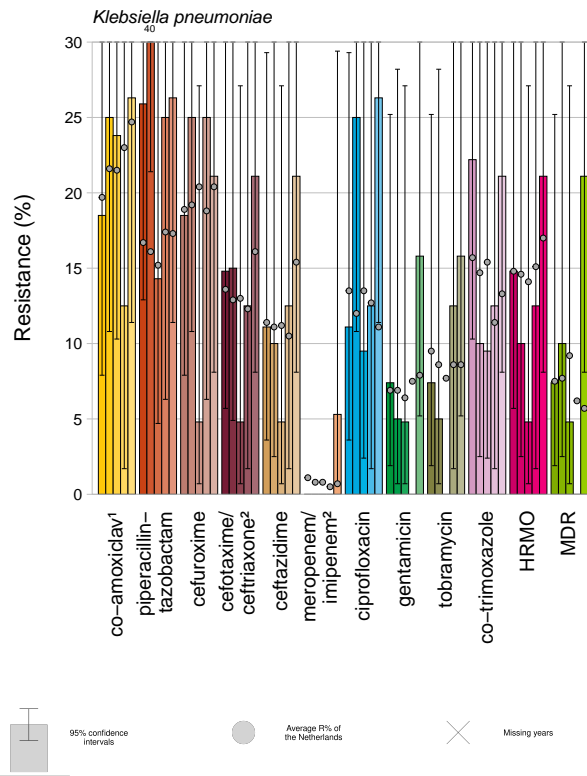


Figure 4.3.2.1 Trends in antibiotic resistance (from left to right 2017 to 2021) among diagnostic isolates of *K. pneumoniae* from patients admitted to intensive care units in ISIS-AR*

* A hack took place between the period November 2019 and April 2020 rendering Aruba data from that period unreliable. Data were restored and corrected as much as possible but errors may still be present.

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

MDR = multidrug resistance. It is defined as resistance to all of the following oral agents: co-amoxiclav (according to the breakpoint for indications other than uncomplicated urinary tract infection), ciprofloxacin, and co-trimoxazole.

¹ non-uti = According to breakpoint for indications other than uncomplicated urinary tract infection.

² non-men = According to breakpoint for indications other than meningitis.

4.3.3 *Proteus mirabilis***Table 4.3.3.1** Resistance levels among diagnostic isolates of *P. mirabilis* from patients admitted to intensive care units, ISIS-AR 2021

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
amoxicillin/ampicillin	5	1	20 (3 - 69)	166	28 (22 - 36)
co-amoxiclav non-uuti	5	0	0 (NA - NA)	170	9 (6 - 15)
piperacillin-tazobactam	5	1	20 (3 - 69)	159	1 (0 - 4)
cefuroxime	5	1	20 (3 - 69)	170	1 (0 - 5)
cefotaxime/ceftriaxone non-men	5	1	20 (3 - 69)	161	1 (0 - 4)
ceftazidime	5	1	20 (3 - 69)	170	1 (0 - 4)
meropenem non-men	5	0	0 (NA - NA)	169	0 (NA - NA)
ciprofloxacin	5	0	0 (NA - NA)	170	15 (11 - 22)
gentamicin	5	2	40 (10 - 80)	148	6 (3 - 11)
tobramycin	5	1	20 (3 - 69)	147	6 (3 - 11)
co-trimoxazole	5	0	0 (NA - NA)	170	28 (22 - 35)
gentamicin + co-amoxiclav non-uuti	5	0	0 (NA - NA)	148	3 (1 - 7)
gentamicin + cefuroxime	5	1	20 (3 - 69)	147	1 (0 - 5)
gentamicin + cefotaxime/ceftriaxone non-men	5	1	20 (3 - 69)	139	1 (0 - 5)
ciprofloxacin + co-amoxiclav non-uuti	5	0	0 (NA - NA)	170	4 (2 - 8)
ciprofloxacin + cefuroxime	5	0	0 (NA - NA)	169	1 (0 - 4)
ciprofloxacin + cefotaxime/ceftriaxone non-men	5	0	0 (NA - NA)	161	1 (0 - 4)
HRMO	5	0	0 (NA - NA)	146	3 (1 - 8)
multidrug resistance ¹	5	0	0 (NA - NA)	170	3 (1 - 7)

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

NA = not applicable.

non-uuti = According to breakpoint for indications other than uncomplicated urinary tract infection.

non-men = According to breakpoint for indications other than meningitis.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

¹ Multidrug resistance is defined as resistance to all of the following oral agents: co-amoxiclav (according to the breakpoint for indications other than uncomplicated urinary tract infection), ciprofloxacin, and co-trimoxazole.

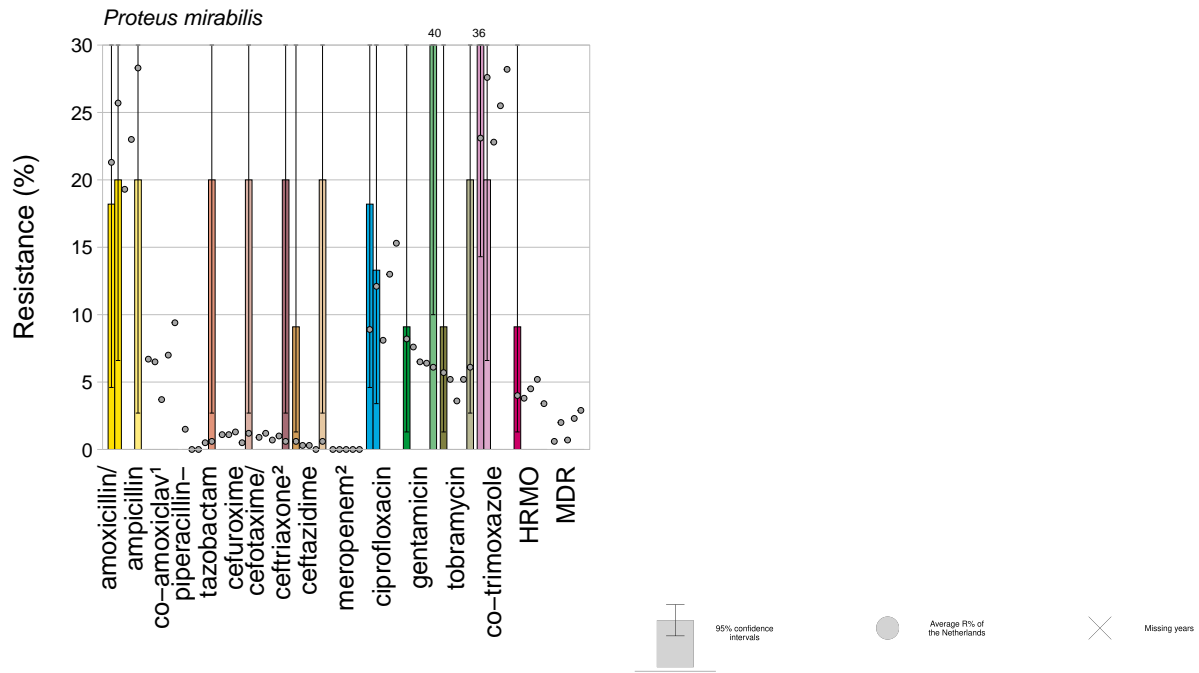


Figure 4.3.3.1 Trends in antibiotic resistance (from left to right 2017 to 2021) among diagnostic isolates of *P. mirabilis* from patients admitted to intensive care units in ISIS-AR*

* A hack took place between the period November 2019 and April 2020 rendering Aruba data from that period unreliable. Data were restored and corrected as much as possible but errors may still be present.

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

MDR = multidrug resistance. It is defined as resistance to all of the following oral agents: co-amoxiclav (according to the breakpoint for indications other than uncomplicated urinary tract infection), ciprofloxacin, and co-trimoxazole.

¹ non-uuti = According to breakpoint for indications other than uncomplicated urinary tract infection.

² non-men = According to breakpoint for indications other than meningitis.

4.3.4 *Pseudomonas aeruginosa***Table 4.3.4.1** Resistance levels among diagnostic isolates of *P. aeruginosa* from patients admitted to intensive care units, ISIS-AR 2021

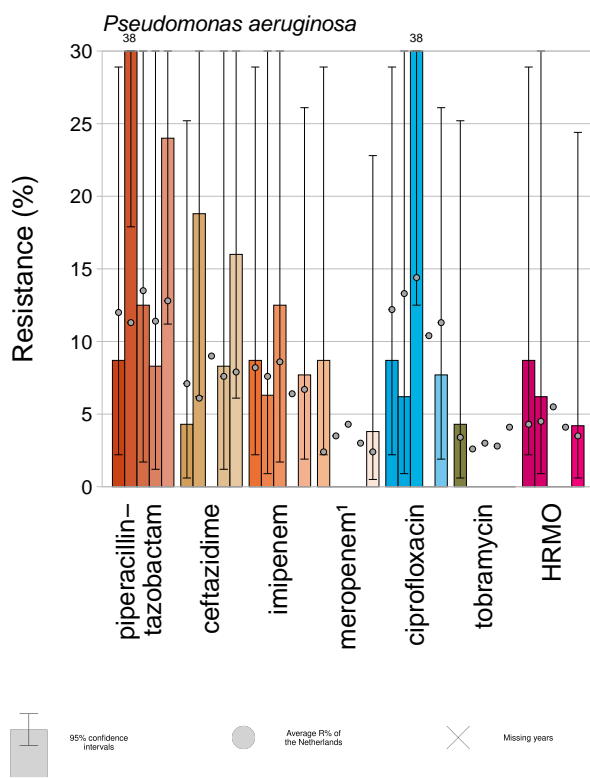
Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
piperacillin-tazobactam	25	6	24 (11 - 44)	517	13 (10 - 16)
ceftazidime	25	4	16 (6 - 36)	617	8 (6 - 10)
imipenem	26	2	8 (2 - 26)	598	7 (5 - 9)
meropenem non-men	26	1	4 (1 - 23)	616	2 (1 - 4)
ciprofloxacin	26	2	8 (2 - 26)	617	11 (9 - 14)
tobramycin	26	0	0 (NA - NA)	612	4 (3 - 6)
HRMO	24	1	4 (1 - 24)	509	4 (2 - 6)

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

NA = not applicable.

non-men = According to breakpoint for indications other than meningitis.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

**Figure 4.3.4.1** Trends in antibiotic resistance (from left to right 2017 to 2021) among diagnostic isolates of *P. aeruginosa* from patients admitted to intensive care units in ISIS-AR*

* A hack took place between the period November 2019 and April 2020 rendering Aruba data from that period unreliable. Data were restored and corrected as much as possible but errors may still be present.

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

¹ non-men = According to breakpoint for indications other than meningitis.

4.3.5 *Enterobacter cloacae* complex

Table 4.3.5.1 Resistance levels among diagnostic isolates of *E. cloacae* complex from patients admitted to intensive care units, ISIS-AR 2021

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
meropenem/imipenem non-men	11	0	0 (NA - NA)	397	1 (0 - 2)
ciprofloxacin	11	3	27 (9 - 59)	398	6 (4 - 9)
gentamicin	11	1	9 (1 - 44)	398	12 (9 - 15)
tobramycin	11	1	9 (1 - 44)	396	11 (8 - 14)
co-trimoxazole	11	0	0 (NA - NA)	397	9 (7 - 12)
HRMO	11	1	9 (1 - 44)	397	5 (3 - 8)

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

NA = not applicable.

non-men = According to breakpoint for indications other than meningitis.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

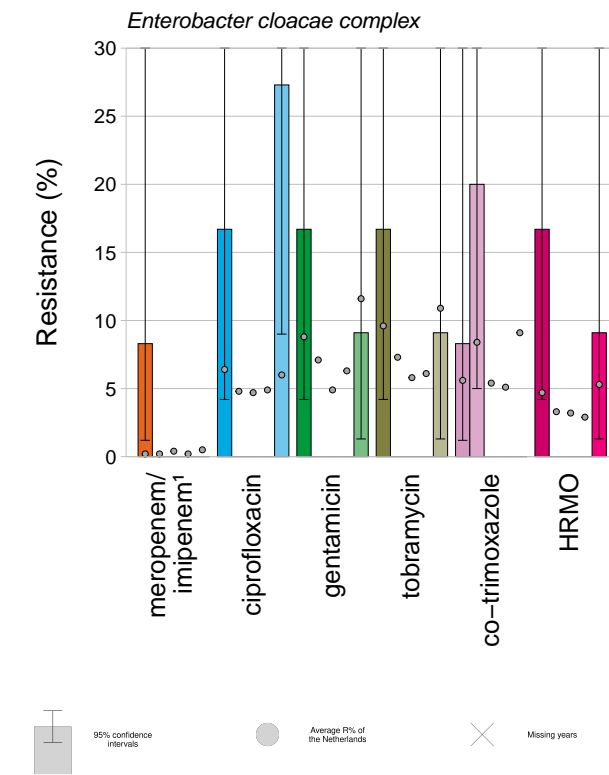


Figure 4.3.5.1 Trends in antibiotic resistance (from left to right 2017 to 2021) among diagnostic isolates of *E. cloacae* complex from patients admitted to intensive care units in ISIS-AR*

* A hack took place between the period November 2019 and April 2020 rendering Aruba data from that period unreliable. Data were restored and corrected as much as possible but errors may still be present.

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

¹ non-men = According to breakpoint for indications other than meningitis.

4.3.6 *Acinetobacter* spp.**Table 4.3.6.1** Resistance levels among diagnostic isolates of *Acinetobacter* spp. from patients admitted to intensive care units, ISIS-AR 2021

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
meropenem/imipenem non-men	10	0	0 (NA - NA)	121	7 (4 - 14)
ciprofloxacin	10	0	0 (NA - NA)	115	11 (7 - 19)
gentamicin	10	0	0 (NA - NA)	128	9 (5 - 15)
tobramycin	10	0	0 (NA - NA)	125	6 (3 - 11)
co-trimoxazole	10	1	10 (1 - 47)	124	12 (7 - 19)
HRMO	10	0	0 (NA - NA)	134	8 (5 - 14)

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

NA = not applicable.

non-men = According to breakpoint for indications other than meningitis.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

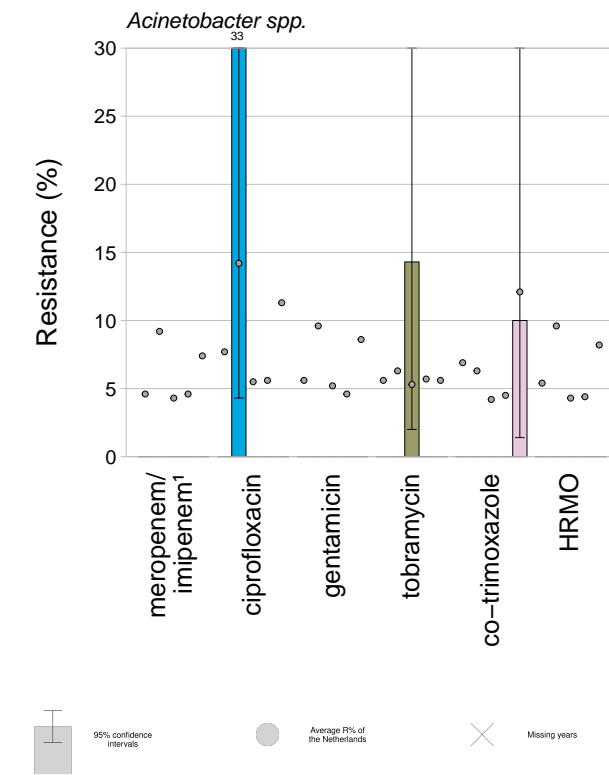


Figure 4.3.6.1 Trends in antibiotic resistance (from left to right 2017 to 2021) among diagnostic isolates of *Acinetobacter* spp. from patients admitted to intensive care units in ISIS-AR*

* A hack took place between the period November 2019 and April 2020 rendering Aruba data from that period unreliable. Data were restored and corrected as much as possible but errors may still be present.

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

HRMO = Highly resistant microorganism. For definition of HRMO per species see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information.

¹ non-men = According to breakpoint for indications other than meningitis.

4.3.7 *Enterococcus faecalis* and *Enterococcus faecium*

Table 4.3.7.1 Resistance levels among diagnostic isolates of *E. faecalis* from patients admitted to inpatient departments (excl. intensive care units), ISIS-AR 2021

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
vancomycin	23	0	0 (NA - NA)	689	0 (0 - 1)

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.
NA = not applicable.

Table 4.3.7.2 Resistance levels among diagnostic isolates of *E. faecium* from patients admitted to inpatient departments (excl. intensive care units), ISIS-AR 2021

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
amoxicillin/ampicillin	5	2	40 (10 - 80)	1068	92 (90 - 94)
vancomycin	5	0	0 (NA - NA)	1069	0 (0 - 1)
linezolid	5	0	0 (NA - NA)	1101	0 (0 - 1)

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.
NA = not applicable.

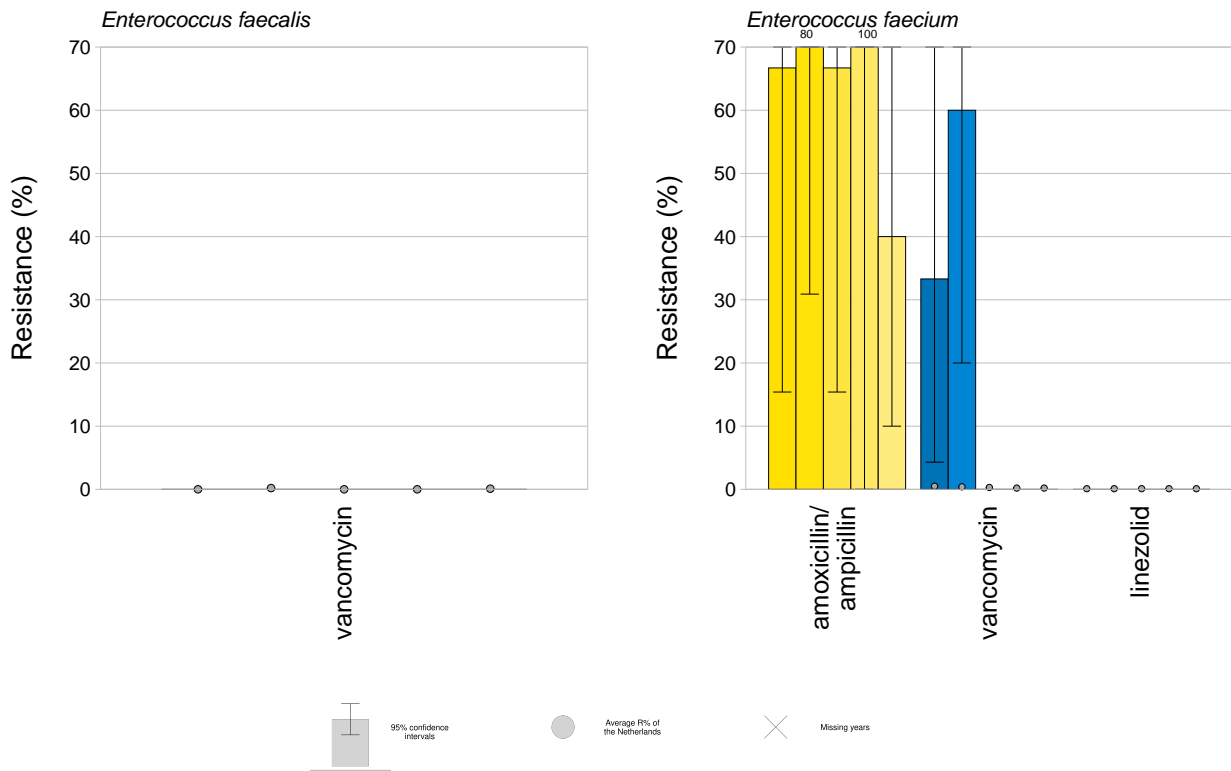


Figure 4.3.7.1 Trends in antibiotic resistance (from left to right 2017 to 2021) among diagnostic isolates of *E. faecalis* and *E. faecium* from patients admitted to intensive care units in ISIS-AR^{*,**}

* A hack took place between the period November 2019 and April 2020 rendering Aruba data from that period unreliable. Data were restored and corrected as much as possible but errors may still be present.

** Y axis of the figures differs from the standard format.

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

4.3.8 *Staphylococcus aureus* and coagulase negative *Staphylococcus* spp. (incl. *S. epidermidis*)

Table 4.3.8.1 Resistance levels among diagnostic isolates of *S. aureus* from patients admitted to intensive care units, ISIS-AR 2021

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
flucloxacillin ¹	36	7	19 (10 - 36)	1916	3 (2 - 4)
ciprofloxacin ²	36	2	6 (1 - 20)	1471	3 (2 - 4)
gentamicin	36	0	0 (NA - NA)	1806	1 (1 - 2)
erythromycin	27	10	37 (21 - 56)	1849	15 (14 - 17)
clindamycin incl. inducible resistance ³	36	1	3 (0 - 17)	1912	14 (12 - 15)
doxycycline/tetracycline	36	5	14 (6 - 29)	1660	5 (4 - 6)
linezolid	36	0	0 (NA - NA)	1797	0 (0 - 1)
co-trimoxazole	36	1	3 (0 - 17)	1847	2 (1 - 2)

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

NA = not applicable.

¹ Resistance to flucloxacillin was estimated based on laboratory S/R interpretation for cefoxitin, or, if no cefoxitin test was available, for oxacillin/flucloxacillin (see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information).

² Resistance to ciprofloxacin is intended to be a class indicator for resistance to fluoroquinolones.

³ To estimate clindamycin resistance including induced resistance, the laboratory S/I/R interpretation was used (see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information).

Table 4.3.8.2 Resistance levels among diagnostic isolates of coagulase-negative *Staphylococcus* spp. (incl. *S. epidermidis*) from patients admitted to intensive care units, ISIS-AR 2021

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
flucloxacillin ¹	44	26	59 (44 - 72)	3697	80 (79 - 82)
ciprofloxacin ²	44	17	39 (26 - 54)	2887	73 (71 - 75)
gentamicin	44	13	30 (18 - 44)	3643	64 (63 - 66)
erythromycin	39	23	59 (43 - 73)	3614	73 (72 - 75)
clindamycin incl. inducible resistance ³	44	15	34 (22 - 49)	3703	65 (63 - 67)
doxycycline/tetracycline	44	4	9 (3 - 22)	2875	29 (27 - 30)
linezolid	44	3	7 (2 - 19)	3665	0 (0 - 0)
co-trimoxazole	44	10	23 (13 - 37)	3634	28 (26 - 29)

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

¹ Resistance to flucloxacillin was estimated based on laboratory S/R interpretation for cefoxitin, or, if no cefoxitin test was available, for oxacillin/flucloxacillin (see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information).

² Resistance to ciprofloxacin is intended to be a class indicator for resistance to fluoroquinolones.

³ To estimate clindamycin resistance including induced resistance, the laboratory S/I/R interpretation was used (see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information).

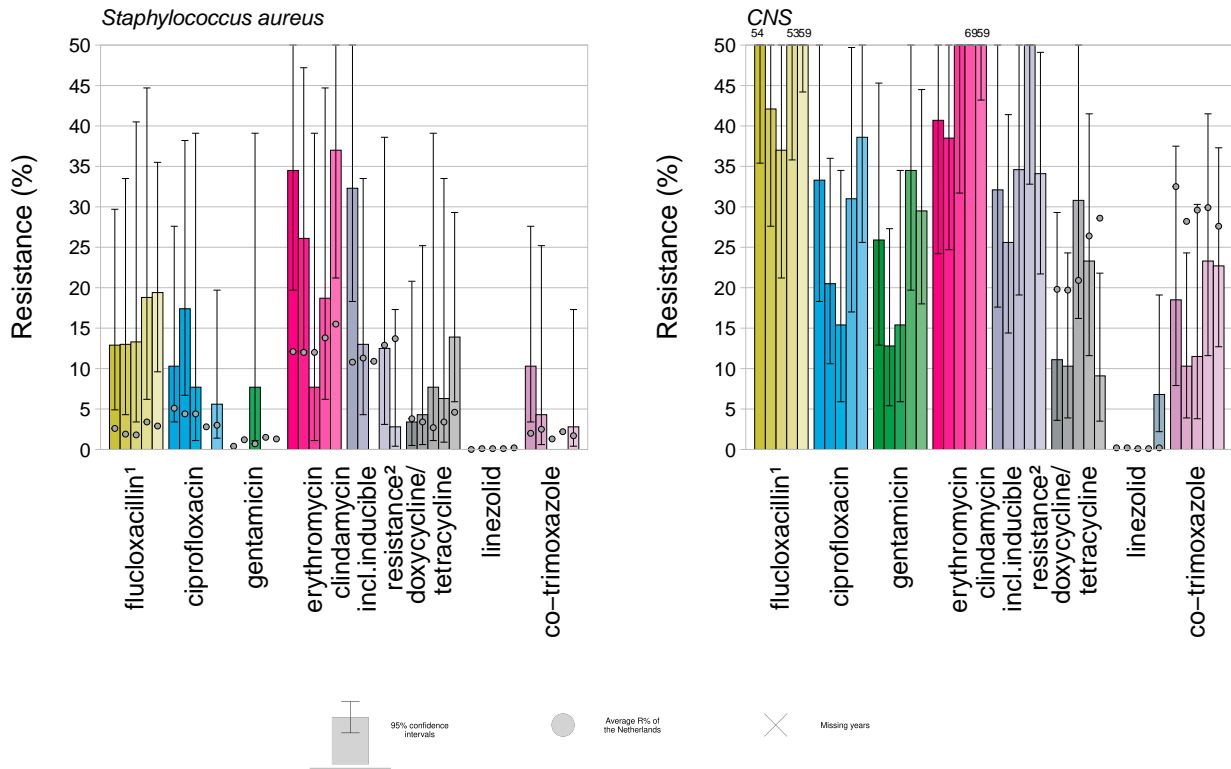


Figure 4.3.8.1 Trends in antibiotic resistance (from left to right 2017 to 2021) among diagnostic isolates of *S. aureus* and coagulase negative *Staphylococcus* spp. (incl. *S. epidermidis*) from patients admitted to intensive care units in ISIS-AR^{*,**}

* A hack took place between the period November 2019 and April 2020 rendering Aruba data from that period unreliable. Data were restored and corrected as much as possible but errors may still be present.

** Y axis of the figures differs from the standard format.

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

¹ Resistance to flucloxacillin was estimated based on laboratory S/R interpretation for ceftazidime, or, if no ceftazidime test was available, for oxacillin/flucloxacillin (see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information).

² To estimate clindamycin resistance including induced resistance, the laboratory S/I/R interpretation was used (see section 4.1.1 'calculation of resistance levels' of the Nethmap 2021 report for more detailed information).

5 Highly resistant microorganisms (HRMO)

In this section, resistance levels for the following HRMOs are presented: CRE/CPE (section 5.1), VRE (section 5.2), MRSA (section 5.3), CRPA/CPPA/MDR-PA (section 5.4) and ESBL (section 5.5).

5.1 Carbapenem-resistant and carbapenemase-producing *Enterobacterales* (CRE/CPE)

The percentages of carbapenem-resistant and carbapenemase-producing *E. coli* and *K. pneumoniae* were estimated based on positivity for confirmation tests, or, if data from these tests were lacking, on re-interpretation of testvalues for meropenem/imipenem according to EUCAST 2021. Only diagnostic isolates (i.e. infection-related and thus non-screening samples) were included. Further information on these methods can be found in Chapter 4.7.1 ‘Carbapenem-resistant and carbapenemase-producing *Enterobacterales*’ of the Nethmap 2021 report, available on the [website of the RIVM](#).

Table 5.1.0.1 Carbapenem-resistant or carbapenem-producing *E. coli*, ISIS-AR 2021

Type of setting	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
General practitioner	460	1	0 (0 - 2)	116801	0 (0 - 0)
Outpatient departments	189	0	0 (NA - NA)	17443	0 (0 - 0)
Inpatient departments excl. intensive care units	467	0	0 (NA - NA)	25635	0 (0 - 0)
Intensive care units	16	0	0 (NA - NA)	1039	0 (0 - 0)
Total	1132	1	0 (0 - 1)	160918	0 (0 - 0)

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

NA = not applicable.

The percentage of carbapenem-resistant or carbapenem-producing *E. coli* was estimated based on positivity of confirmation tests, or, if data from these tests were lacking, resistance for meropenem/imipenem, based on re-interpretation of testvalues according to EUCAST 2021.

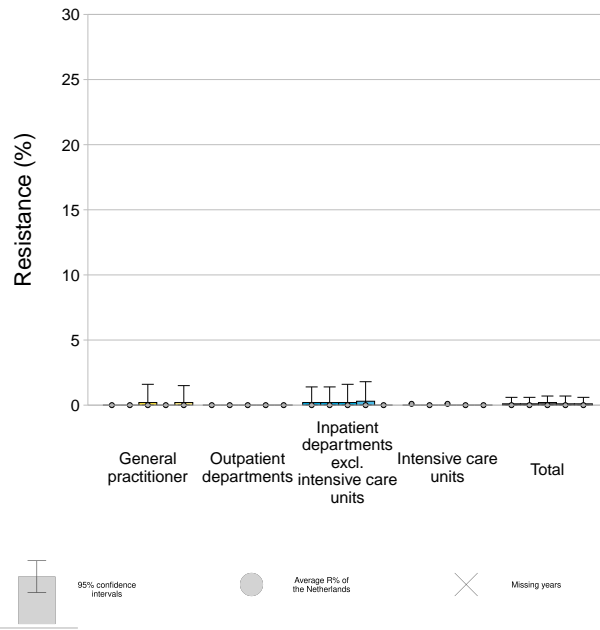


Figure 5.1.0.1 Carbapenem-resistant or carbapenem-producing *E. coli* compared to the total number of *E. coli* isolates in Aruba (from left to right 2017 to 2021), based on ISIS-AR data*

* A hack took place between the period November 2019 and April 2020 rendering Aruba data from that period unreliable. Data were restored and corrected as much as possible but errors may still be present. The percentage of carbapenem-resistant or carbapenem-producing *E. coli* was estimated based on positivity of confirmation tests, or, if data from these tests were lacking, resistance for meropenem/imipenem, based on re-interpretation of test values according to EUCAST 2021.

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

Table 5.1.0.2 Carbapenem-resistant or carbapenem-producing *K. pneumoniae*, ISIS-AR 2021

Type of setting	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
General practitioner	88	0	0 (NA - NA)	15730	0 (0 - 0)
Outpatient departments	67	0	0 (NA - NA)	4012	0 (0 - 0)
Inpatient departments excl. intensive care units	159	0	0 (NA - NA)	5453	0 (0 - 0)
Intensive care units	15	1	7 (1 - 35)	369	1 (0 - 3)
Total	329	1	0 (0 - 2)	25564	0 (0 - 0)

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

NA = not applicable.

The percentage of carbapenem-resistant or carbapenem-producing *K. pneumoniae* was estimated based on positivity of confirmation tests, or, if data from these tests were lacking, resistance for meropenem/imipenem, based on re-interpretation of testvalues according to EUCAST 2021.

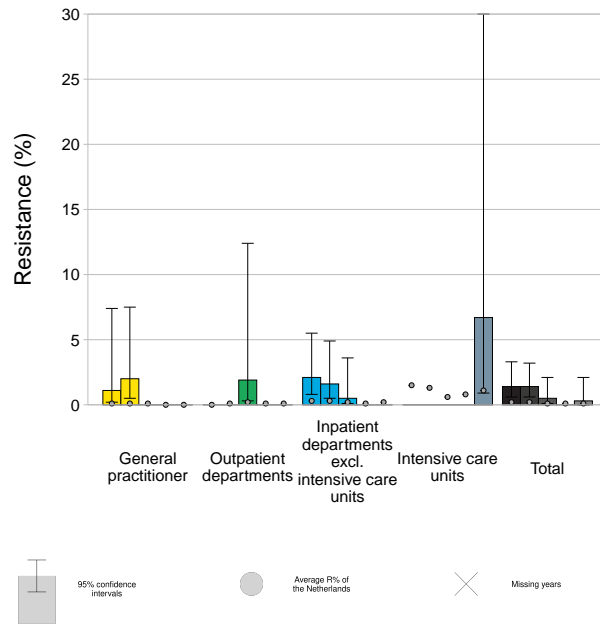


Figure 5.1.0.2 Carbapenem-resistant or carbapenem-producing *K. pneumoniae* compared to the total number of *K. pneumoniae* isolates in Aruba (from left to right 2017 to 2021), based on ISIS-AR data*

* A hack took place between the period November 2019 and April 2020 rendering Aruba data from that period unreliable. Data were restored and corrected as much as possible but errors may still be present.

The percentage of carbapenem-resistant or carbapenem-producing *K. pneumoniae* was estimated based on positivity of confirmation tests, or, if data from these tests were lacking, resistance for meropenem/imipenem, based on re-interpretation of testvalues according to EUCAST 2021.

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

5.2 Vancomycin-resistant Enterococci (VRE)

The prevalence of vancomycin resistance in *E. faecium* isolates was based on positivity of confirmation tests, or, if these tests were lacking, on re-interpretation of testvalues for amoxicillin/ampicillin and vancomycin according to EUCAST 2021, with VRE_{fm} being defined as resistant to amoxicillin/ampicillin and vancomycin. Both diagnostic isolates (i.e. infection-related and thus non-screening samples) and screening isolates were included. The first diagnostic or screening *E. faecium* isolate per patient was selected. Further information on these methods can be found in Chapter 4.7.2 ‘Vancomycin-resistant Enterococci’ of the Nethmap 2021 report, available on the [website of the RIVM](#).

Table 5.2.0.1 Vancomycin-resistant *E. faecium* in diagnostic isolates, ISIS-AR 2021

Type of setting	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
General practitioner	1	0	0 (NA - NA)	482	0 (0 - 0)
Inpatient departments excl. intensive care units	4	0	0 (NA - NA)	2574	0 (0 - 1)
Intensive care units	5	0	0 (NA - NA)	924	0 (0 - 1)
Total	10	0	0 (NA - NA)	4410	0 (0 - 0)

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.
NA = not applicable.

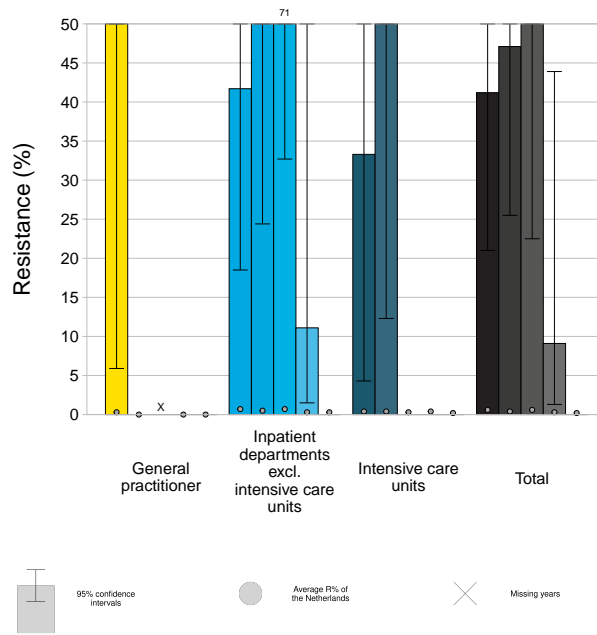


Figure 5.2.0.1 Trends in vancomycin-resistant *E. faecium* in diagnostic isolates in Aruba (from left to right 2017 to 2021), based on ISIS-AR data*

* A hack took place between the period November 2019 and April 2020 rendering Aruba data from that period unreliable. Data were restored and corrected as much as possible but errors may still be present.

5.3 Methicillin-resistant *Staphylococcus aureus* (MRSA)

S. aureus isolates, including MRSA, that were sampled between 2017 and 2021 were identified. The first diagnostic *S. aureus* isolate per patient per year from blood, cerebrospinal fluid, urine, lower respiratory tract, or wound/pus was selected. Prevalence of MRSA was calculated as the percentage of *S. aureus* isolates for which the MRSA confirmation test (presence of *mecA* gene or *pbp2*) was positive, or, if these tests were lacking, laboratory S/R interpretation for cefoxitin was R, or, if no data on cefoxitin test was available, the S/R laboratory interpretation for flucloxacillin/oxacillin was R. Further information on these methods can be found in Chapter 4.7.3 ‘Methicillin-resistant *Staphylococcus aureus* (MRSA)’ of the Nethmap 2021 report, available on the [website of the RIVM](#).

Table 5.3.0.1 Methicillin-resistant *S. aureus* (MRSA), ISIS-AR 2021

Type of setting	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
General practitioner	79	15	19 (12 - 29)	8050	2 (2 - 3)
Outpatient departments	87	13	15 (9 - 24)	10001	2 (1 - 2)
Inpatient departments excl. intensive care units	240	41	17 (13 - 22)	9868	2 (1 - 2)
Intensive care units	30	4	13 (5 - 31)	1673	3 (2 - 4)
Total	436	73	17 (14 - 21)	29592	2 (2 - 2)

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

The prevalence of MRSA isolates was based on positivity of confirmation tests (presence of *mecA* gene or *pbp2*) or if these tests were lacking, on laboratory S/R interpretation for cefoxitin. If no data on a cefoxitin test was available, the prevalence was based on laboratory S/R interpretation of flucloxacillin/oxacillin.

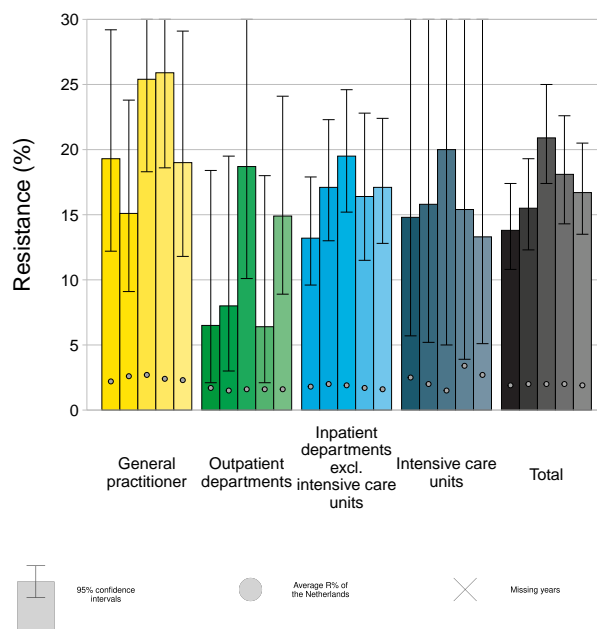


Figure 5.3.0.1 Trends in methicillin-resistant *S. aureus* isolates in Aruba (from left to right 2017 to 2021), based on ISIS-AR data*

* A hack took place between the period November 2019 and April 2020 rendering Aruba data from that period unreliable. Data were restored and corrected as much as possible but errors may still be present.

The prevalence of MRSA isolates was based on positivity of confirmation tests (presence of *mecA* gene or *pbp2*) or if these tests were lacking, on laboratory S/R interpretation for cefoxitin. If no data on a cefoxitin test was available, the prevalence was based on laboratory S/R interpretation of flucloxacillin/oxacillin.

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

5.4 Carbapenem-resistant and carbapenemase-producing *Pseudomonas aeruginosa* (CRPA/CPPA)

For each patient the first *P. aeruginosa* isolate per year was extracted from the database. To avoid overestimation of the percentage CRPA caused by active screening for highly resistant isolates, only data on diagnostic isolates from blood, cerebrospinal fluid, urine, lower respiratory tract, and wound/pus were included in the analysis. Further information on these methods can be found in Chapter 4.7.4 ‘Carbapenem-resistant and carbapenemase-producing *Pseudomonas aeruginosa* (CRPA/CPPA)’ of the Nethmap 2021 report, available on the [website of the RIVM](#).

Table 5.4.0.1 Phenotypical carbapenem-resistant *P. aeruginosa* (CRPA), ISIS-AR 2021

Type of setting	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
General practitioner	19	0	0 (NA - NA)	5818	4 (4 - 5)
Outpatient departments	70	3	4 (1 - 12)	3902	7 (6 - 7)
Inpatient departments excl. intensive care units	119	0	0 (NA - NA)	4781	5 (4 - 6)
Intensive care units	24	2	8 (2 - 28)	510	5 (4 - 8)
Total	232	5	2 (1 - 5)	15011	5 (5 - 5)

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

Phenotypical carbapenem resistance was defined as resistance to meropenem and/or imipenem, based on reinterpretation of test-values according to EUCAST 2021 using the non-meningitis clinical breakpoint.

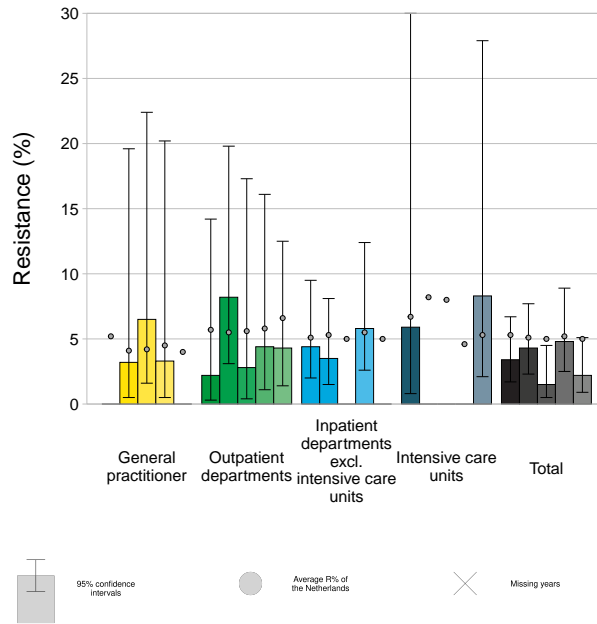


Figure 5.4.0.1 Phenotypical carbapenem-resistant *P. aeruginosa* compared to the total number of *P. aeruginosa* isolates in Aruba (from left to right 2017 to 2021), based on ISIS-AR data*

* A hack took place between the period November 2019 and April 2020 rendering Aruba data from that period unreliable. Data were restored and corrected as much as possible but errors may still be present.

Phenotypical carbapenem resistance was defined as resistance to meropenem and/or imipenem, based on reinterpretation of test-values according to EUCAST 2021 using the non-meningitis clinical breakpoint.

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

Table 5.4.0.2 Multidrug resistant *P. aeruginosa* (MDR-PA), ISIS-AR 2021

Type of setting	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
General practitioner	19	0	0 (NA - NA)	5574	0 (0 - 1)
Outpatient departments	69	2	3 (1 - 11)	3704	3 (2 - 3)
Inpatient departments excl. intensive care units	119	0	0 (NA - NA)	4510	1 (1 - 2)
Intensive care units	22	1	5 (1 - 26)	478	4 (3 - 6)
Total	229	3	1 (0 - 4)	14266	1 (1 - 2)

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

Multidrug resistance was defined as resistant to *geq3* antimicrobial groups among fluoroquinolones, aminoglycosides, carbapenems, ceftazidime, and piperacillin-tazobactam, based on re-interpretation of test-values according to EUCAST 2021 using the non-meningitis clinical breakpoint.

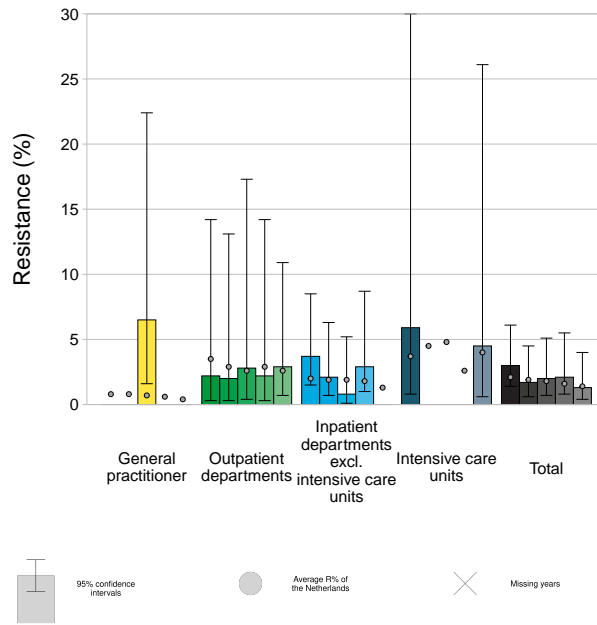


Figure 5.4.0.2 Multidrug resistant *P. aeruginosa* compared to the total number of *P.aeruginosa* isolates in Aruba (from left to right 2017 to 2021), based on ISIS-AR data*

* A hack took place between the period November 2019 and April 2020 rendering Aruba data from that period unreliable. Data were restored and corrected as much as possible but errors may still be present. Multidrug resistance was defined as resistant to ≥ 3 antimicrobial groups among fluoroquinolones, aminoglycosides, carbapenems, ceftazidime, and piperacillin-tazobactam, based on re-interpretation of test-values according to EUCAST 2021 using the non-meningitis clinical breakpoint.

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

5.5 Extended spectrum beta-lactamases (ESBL)

The percentages of ESBL producing *E. coli* and *K. pneumoniae* were estimated based on positivity for confirmation tests, or, if data from these tests were lacking, resistance for third generation cephalosporins (cefotaxime/ceftriaxone/ceftazidime) based on EUCAST 2021 clinical breakpoints. Further information on these methods can be found in Chapter 4.7.5 ‘Extended spectrum beta-lactamases’ of the Nethmap 2021 report, available on the [website of the RIVM](#).

Table 5.5.0.1 Extended spectrum beta-lactamase (ESBL) producing *E. coli*, ISIS-AR 2021

Type of setting	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
General practitioner	460	18	4 (2 - 6)	113787	3 (3 - 3)
Outpatient departments	189	15	8 (5 - 13)	16865	4 (4 - 5)
Inpatient departments excl. intensive care units	468	47	10 (8 - 13)	24794	5 (5 - 5)
Intensive care units	16	2	13 (3 - 39)	1014	9 (7 - 11)
Total	1133	82	7 (6 - 9)	156460	3 (3 - 4)

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

The percentage of ESBL producing *E. coli* was estimated based on positivity of confirmation tests, or, if data from these tests were lacking, resistance for third generation cephalosporins (cefotaxime/ceftriaxone/ceftazidime), based on re-interpretation of testvalues according to EUCAST 2021.

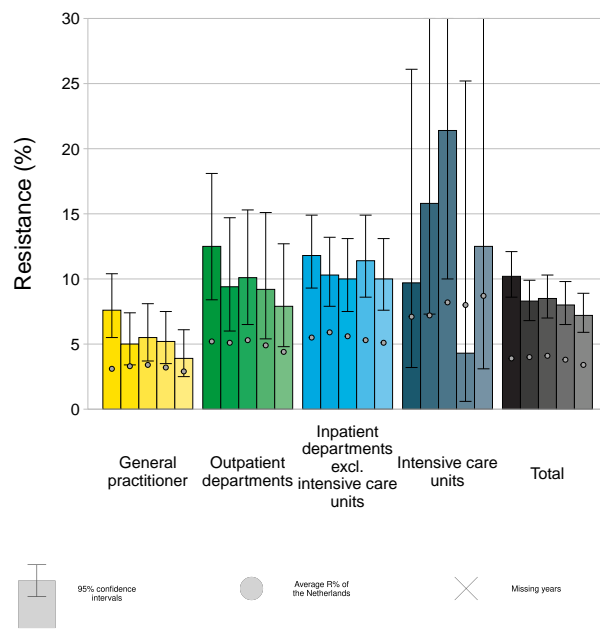


Figure 5.5.0.1 Extended spectrum beta-lactamase producing *E. coli* compared to the total number of *E. coli* isolates in Aruba (from left to right 2017 to 2021), based on ISIS-AR data*

* A hack took place between the period November 2019 and April 2020 rendering Aruba data from that period unreliable. Data were restored and corrected as much as possible but errors may still be present.

The percentage of ESBL producing *E. coli* was estimated based on positivity of confirmation tests, or, if data from these tests were lacking, resistance for third generation cephalosporins (cefotaxime/ceftriaxone/ceftazidime), based on re-interpretation of testvalues according to EUCAST 2021.

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

Table 5.5.0.2 Extended spectrum beta-lactamase (ESBL) producing *K. pneumoniae*, ISIS-AR 2021

Type of setting	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
General practitioner	87	5	6 (2 - 13)	15385	3 (3 - 4)
Outpatient departments	67	6	9 (4 - 19)	3865	6 (5 - 7)
Inpatient departments excl. intensive care units	159	9	6 (3 - 11)	5304	8 (7 - 9)
Intensive care units	15	3	20 (7 - 47)	356	15 (12 - 19)
Total	328	23	7 (5 - 10)	24910	5 (5 - 5)

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.

The percentage of ESBL producing *K. pneumoniae* was estimated based on positivity of confirmation tests, or, if data from these tests were lacking, resistance for third generation cephalosporins (cefotaxime/ceftriaxone/ceftazidime), based on re-interpretation of test values according to EUCAST 2021.

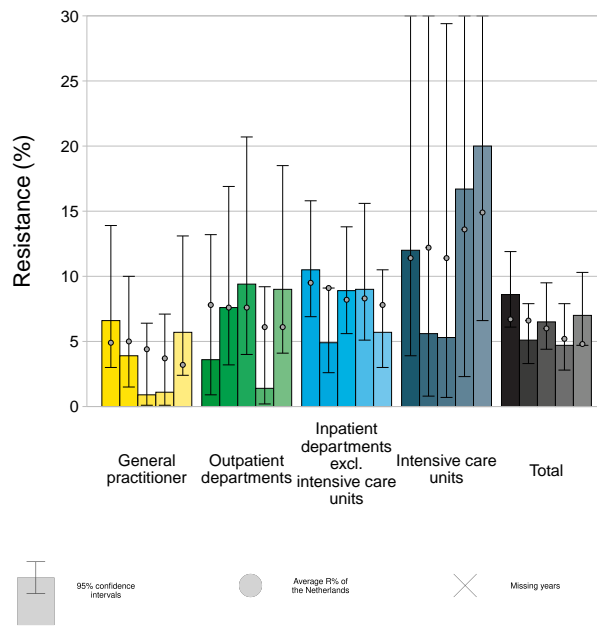


Figure 5.5.0.2 Extended spectrum beta-lactamase producing *K. pneumoniae* compared to the total number of *K. pneumoniae* isolates in Aruba (from left to right 2017 to 2021), based on ISIS-AR data*

* A hack took place between the period November 2019 and April 2020 rendering Aruba data from that period unreliable. Data were restored and corrected as much as possible but errors may still be present.

The percentage of ESBL producing *K. pneumoniae* was estimated based on positivity of confirmation tests, or, if data from these tests were lacking, resistance for third generation cephalosporins (cefotaxime/ceftriaxone/ceftazidime), based on re-interpretation of test values according to EUCAST 2021.

Warning: number of isolates for at least one of the organism-antibiotic-year combinations is lower than 100. Data can be difficult to interpret as is reflected by the wide confidence intervals. Interpret with caution.