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

CarMap 2024

Antimicrobial resistance among medically important bacteria in Aruba

Contents

1 Introduction

This is CarMap 2024, a RIVM/Netherlands Antilles report on the trends in antimicrobial resistance in Aruba in 2023 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 Systen 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 2023, 48 Dutch laboratories were connected to ISIS-AR, all performing antimicrobial susceptibility testing (AST) according to EUCAST guidelines. Of these 48 Dutch laboratories, 37 provided complete data on the last five years (2019 to 2023). Only data from these 37 laboratories were selected to avoid bias in time trends due to incomplete data.

All data provided to ISIS-AR are carefully validated[1]. 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 2024 report, available on the website of the RIVM.

References

[1] Altorf-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 2023 is presented in table 3.0.0.1. The resistance levels in 2023 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 2023 for *Staphylococcus aureus* isolates from wound or pus samples, for β-haemolytic *Streptococcus* spp. group A isolates from wound/pus, respiratory, or genital samples, and for β-haemolytic *Streptococcus* spp. group B isolates from urine or genital samples are presented in their respective subchapters.

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 A and group 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 Enterobacterales or *P. aeruginosa* or wound infections or pus caused by *S. aureus* or β-haemolytic *Streptococcus* spp. groep A presenting at the GP. 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 takes as part of routine diagnostics.

Because of the potential bias in results for Enterobacterales, *P. aeruginosa*, *S. aureus*, and β-haemolytic *Streptococcus* spp. groep A, 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 sampels from selected general practitioners' patients, ISIS-CAR 2023

	Urine		Wound or pus	Respiratory tract	Genital
	Age≤12	Age>12			
Pathogen	N	N	N	N	N
E. coli	13	373	8	0	24
K. pneumoniae	0	89	10	2	6
P. mirabilis	3	58	9	0	9
Other Enterobacterales[1]	1	37	18	1	2
P. aeruginosa	1	7	26	2	0
Other non-fermenters[2]	1	5	4	1	1
Other Gram-negatives[3]	0	0	1	2	9
S. aureus	0	8	70	5	7
ß-haemolytische *Streptococcus* spp. group A	0	1	5	0	6
ß-haemolytische *Streptococcus* spp. group B	0	72	7	0	115
Other Gram-positives[4]	1	41	50	2	24

[1] *In order of frequency: Morganella spp., E. cloacae complex, P. gergoviae, Citrobacter spp., Klebsiella spp. (non-pneumoniae), Proteus spp. (non-mirabilis), Serratia spp.*
[2] *In order of frequency: Pseudomonas spp. (non-aeruginosa), Acinetobacter spp.*
[3] *In order of frequency: H. influenzae, H. parainfluenzae.*
[4] *In order of frequency: Staphylococcus spp. (non-aureus), Enterococcus spp., S. pneumoniae, ß-haemolytic Streptococcus spp. groups C and G, 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-CAR 2023

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
amoxicillin/ampicillin	13	8	62 (34 - 83)	9442	33 (32 - 34)
co-amoxiclav ocuti	13	8	62 (34 - 83)	10009	24 (24 - 25)
cefuroxime	13	0	0 (NA - NA)	8108	5 (5 - 6)
cefotaxime/ceftriaxone non-men	13	0	0 (NA - NA)	9775	3 (3 - 4)
ceftazidime	13	0	0 (NA - NA)	9796	3 (3 - 3)
ciprofloxacin non-men	13	1	8 (1 - 39)	10016	5 (5 - 6)
gentamicin	13	0	0 (NA - NA)	9569	4 (3 - 4)
tobramycin	13	0	0 (NA - NA)	9280	4 (3 - 4)
fosfomycin[1]	13	0	0 (NA - NA)	9780	1 (1 - 2)
co-trimoxazole	13	3	23 (8 - 52)	10012	18 (17 - 18)
nitrofurantoin	13	0	0 (NA - NA)	10015	0 (0 - 0)
MDOT ocuti	13	0	0 (NA - NA)	10005	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.
NA = not applicable.
ocuti = According to breakpoint for oral administration in infections originating from the urinary tract.
non-men = According to breakpoint for indications other than meningitis.
MDOT = multidrug resistance to oral therapy, defined as resistance to all of the following oral agents: co-amoxiclav (according to the breakpoint for indications other than uncomplicated urinary tract infections), ciprofloxacin, and co-trimoxazole.
[1] *Resistance percentage calculated using an mic cut-off of 16mg/L and a diameter cut-off of 24mm (see section 4.1.1 'calculation of resistance levels' of the Nethmap 2024 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-CAR 2023

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
amoxicillin/ampicillin	373	180	48 (43 - 53)	116944	34 (34 - 35)
co-amoxiclav ocuti	373	145	39 (34 - 44)	123177	25 (25 - 26)
cefuroxime	373	37	10 (7 - 13)	99096	7 (7 - 8)
cefotaxime/ceftriaxone non-men	371	19	5 (3 - 8)	120564	4 (4 - 4)
ceftazidime	372	12	3 (2 - 6)	120901	3 (3 - 3)
ciprofloxacin non-men	373	103	28 (23 - 32)	123217	9 (9 - 10)
gentamicin	373	40	11 (8 - 14)	118282	4 (4 - 4)
tobramycin	373	43	12 (9 - 15)	115179	4 (4 - 4)
fosfomycin[1]	373	3	1 (0 - 2)	122524	2 (2 - 2)
co-trimoxazole	372	111	30 (25 - 35)	123139	18 (18 - 18)
nitrofurantoin	373	6	2 (1 - 4)	123201	2 (1 - 2)
MDOT ocuti	372	27	7 (5 - 10)	123044	3 (3 - 3)

ocuti = According to breakpoint for oral administration in infections originating from the urinary tract.
non-men = According to breakpoint for indications other than meningitis.
MDOT = multidrug resistance to oral therapy, defined as resistance to all of the following oral agents: co-amoxiclav (according to the breakpoint for indications other than uncomplicated urinary tract infections), ciprofloxacin, and co-trimoxazole.
[1] *Resistance percentage calculated using an mic cut-off of 16mg/L and a diameter cut-off of 24mm (see section 4.1.1 'calculation of resistance levels' of the Nethmap 2024 report for more detailed information).*

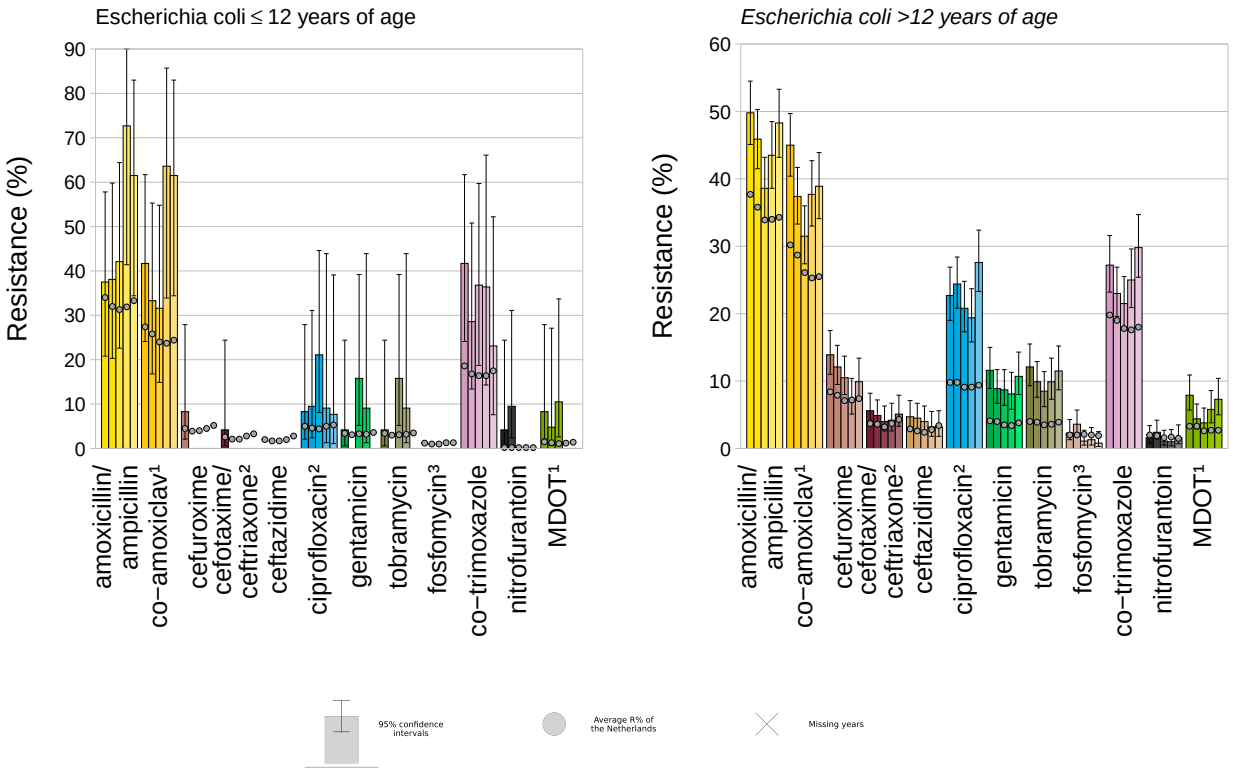

Figure 3.1.0.1 Trends in antibiotic resistance (from left to right 2019 to 2023) among diagnostic urine isolates of *E. coli* from selected general practitioners' patients in ISIS-CAR, by age category*,**

* *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.
MDOT = multidrug resistance to oral therapy, defined as resistance to all of the following oral agents: co-amoxiclav (according to the breakpoint for indications other than uncomplicated urinary tract infections), ciprofloxacin, and co-trimoxazole.
[1] *ocuti = According to breakpoint for oral administration in infections originating from the urinary tract.*
[2] *non-men = According to breakpoint for indications other than meningitis.*
[3] *Resistance percentage calculated using an mic cut-off of 16mg/L and a diameter cut-off of 24mm (see section 4.1.1 'calculation of resistance levels' of the Nethmap 2024 report for more detailed information).*

3.2 *Klebsiella pneumoniae*

The resistance levels among diagnostic urine isolates of *K. pneumoniae* from selected practitioners' patients aged ≤ 12 years could not be shown since no isolates were found in 2023.

Table 3.2.0.1 Resistance levels among diagnostic urine isolates of *K. pneumoniae* from selected general practitioners' patients aged>12, ISIS-CAR 2023

	Aruba			the Netherlands	
Antibiotic	N	R	R% (95%-CI)	N	R% (95%-CI)
co-amoxiclav ocuti	89	17	19 (12 - 29)	18071	16 (15 - 16)
cefuroxime	89	12	13 (8 - 22)	14474	11 (11 - 12)
cefotaxime/ceftriaxone non-men	89	7	8 (4 - 16)	17707	5 (4 - 5)
ceftazidime	89	7	8 (4 - 16)	17743	4 (4 - 5)
ciprofloxacin non-men	89	13	15 (9 - 24)	18079	11 (10 - 11)
gentamicin	89	5	6 (2 - 13)	17384	2 (2 - 2)
tobramycin	89	6	7 (3 - 14)	16949	3 (2 - 3)
co-trimoxazole	89	14	16 (10 - 25)	18075	8 (7 - 8)
MDOT ocuti	89	4	4 (2 - 11)	18062	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.
ocuti = According to breakpoint for oral administration in infections originating from the urinary tract.
non-men = According to breakpoint for indications other than meningitis.
MDOT = multidrug resistance to oral therapy, defined as resistance to all of the following oral agents: co-amoxiclav (according to the breakpoint for indications other than uncomplicated urinary tract infections), ciprofloxacin, and co-trimoxazole.

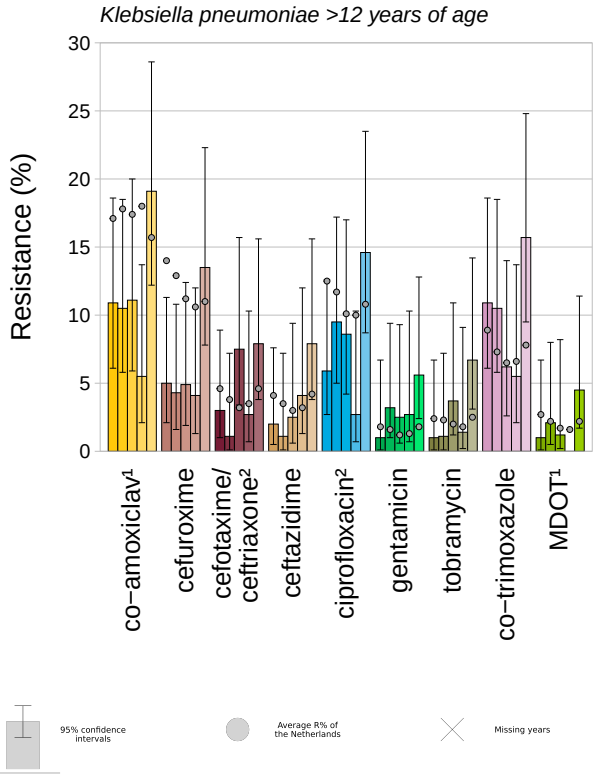

Figure 3.2.0.1 Trends in antibiotic resistance (from left to right 2019 to 2023) among diagnostic urine isolates of *K. pneumoniae* from selected general practitioners' patients in ISIS-CAR, by age category*

* *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.
MDOT = multidrug resistance to oral therapy, defined as resistance to all of the following oral agents: co-amoxiclav (according to the breakpoint for indications other than uncomplicated urinary tract infections), ciprofloxacin, and co-trimoxazole.
[1] *ocuti = According to breakpoint for oral administration in infections originating from the urinary tract.*
[2] *non-men = According to breakpoint for indications other than meningitis.*
[1] *ocuti = According to breakpoint for oral administration in infections originating from the urinary tract.*

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-CAR 2023

	Aruba			the Netherlands	
Antibiotic	N	R	R% (95%-CI)	N	R% (95%-CI)
amoxicillin/ampicillin	3	0	0 (NA - NA)	608	14 (12 - 17)
co-amoxiclav ocuti	3	0	0 (NA - NA)	729	4 (3 - 6)
cefuroxime	3	0	0 (NA - NA)	572	1 (0 - 2)
cefotaxime/ceftriaxone non-men	3	0	0 (NA - NA)	643	1 (0 - 2)
ceftazidime	3	0	0 (NA - NA)	709	0 (0 - 1)
ciprofloxacin non-men	3	0	0 (NA - NA)	729	4 (3 - 6)
gentamicin	3	0	0 (NA - NA)	583	2 (1 - 4)
tobramycin	3	0	0 (NA - NA)	581	1 (1 - 3)
co-trimoxazole	3	0	0 (NA - NA)	729	15 (13 - 18)
MDOT ocuti	3	0	0 (NA - NA)	729	1 (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.
ocuti = According to breakpoint for oral administration in infections originating from the urinary tract.
non-men = According to breakpoint for indications other than meningitis.
MDOT = multidrug resistance to oral therapy, defined as resistance to all of the following oral agents: co-amoxiclav (according to the breakpoint for indications other than uncomplicated urinary tract infections), ciprofloxacin, and co-trimoxazole.

Table 3.3.0.2 Resistance levels among diagnostic urine isolates of *P. mirabilis* from selected general practitioners' patients aged>12, ISIS-CAR 2023

	Aruba			the Netherlands	
Antibiotic	N	R	R% (95%-CI)	N	R% (95%-CI)
amoxicillin/ampicillin	58	4	7 (3 - 17)	10607	17 (17 - 18)
co-amoxiclav ocuti	58	1	2 (0 - 11)	11113	5 (4 - 5)
cefuroxime	58	0	0 (NA - NA)	9045	1 (1 - 1)
cefotaxime/ceftriaxone non-men	55	0	0 (NA - NA)	10815	0 (0 - 1)
ceftazidime	58	0	0 (NA - NA)	10871	0 (0 - 0)
ciprofloxacin non-men	58	3	5 (2 - 15)	11115	9 (9 - 10)
gentamicin	58	2	3 (1 - 13)	9293	5 (5 - 5)
tobramycin	58	1	2 (0 - 11)	9283	4 (3 - 4)
co-trimoxazole	58	3	5 (2 - 15)	11106	21 (20 - 22)
MDOT ocuti	58	0	0 (NA - NA)	11103	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.
ocuti = According to breakpoint for oral administration in infections originating from the urinary tract.
non-men = According to breakpoint for indications other than meningitis.
MDOT = multidrug resistance to oral therapy, defined as resistance to all of the following oral agents: co-amoxiclav (according to the breakpoint for indications other than uncomplicated urinary tract infections), ciprofloxacin, and co-trimoxazole.

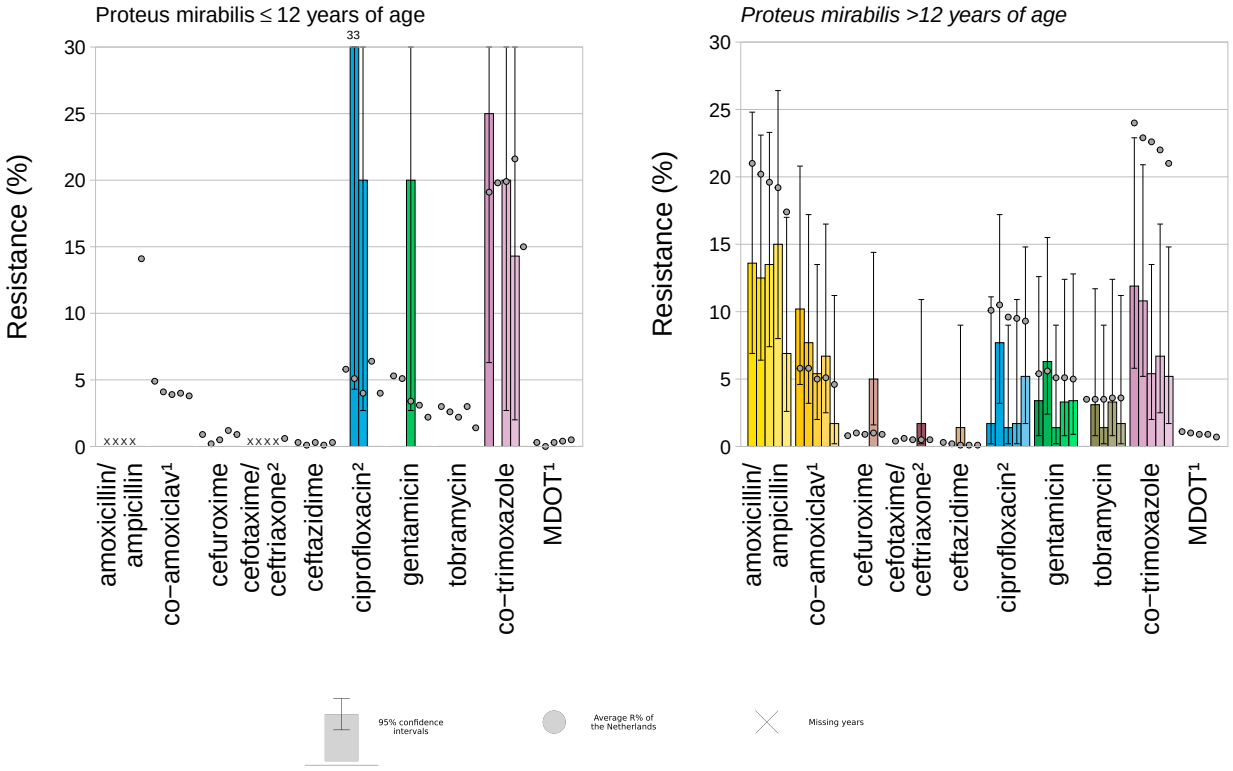

Figure 3.3.0.1 Trends in antibiotic resistance (from left to right 2019 to 2023) among diagnostic urine isolates of *P. mirabilis* from selected general practitioners' patients in ISIS-CAR, by age category*,**

* *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.
MDOT = multidrug resistance to oral therapy, defined as resistance to all of the following oral agents: co-amoxiclav (according to the breakpoint for indications other than uncomplicated urinary tract infections), ciprofloxacin, and co-trimoxazole.
[1] *ocuti = According to breakpoint for oral administration in infections originating from the urinary tract.*
[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-CAR 2023

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
piperacillin-tazobactam	1	0	0 (NA - NA)	190	1 (0 - 4)
ceftazidime	1	0	0 (NA - NA)	202	0 (0 - 3)
imipenem	1	0	0 (NA - NA)	167	1 (0 - 5)
meropenem non-men	1	0	0 (NA - NA)	194	1 (0 - 4)
ciprofloxacin	1	0	0 (NA - NA)	207	1 (0 - 4)
tobramycin	1	0	0 (NA - NA)	195	0 (0 - 100)

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.

Table 3.4.0.2 Resistance levels among diagnostic urine isolates of *P. aeruginosa* from selected general practitioners' patients aged>12, ISIS-CAR 2023

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
piperacillin-tazobactam	7	0	0 (NA - NA)	5059	3 (3 - 4)
ceftazidime	7	0	0 (NA - NA)	5230	1 (1 - 2)
imipenem	4	0	0 (NA - NA)	4474	4 (4 - 5)
meropenem non-men	7	0	0 (NA - NA)	5110	1 (0 - 1)
ciprofloxacin	7	0	0 (NA - NA)	5345	8 (8 - 9)
tobramycin	7	0	0 (NA - NA)	4977	1 (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.
non-men = According to breakpoint for indications other than meningitis.

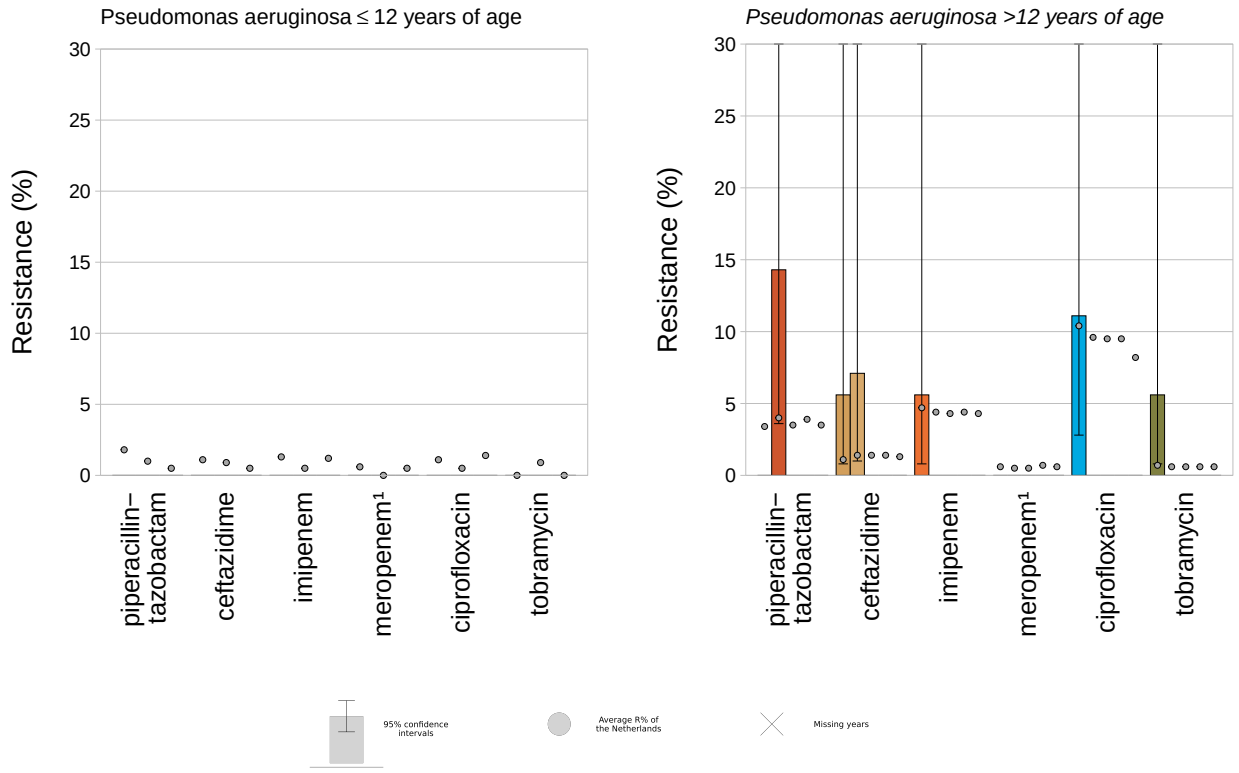

Figure 3.4.0.1 Trends in antibiotic resistance (from left to right 2019 to 2023) among diagnostic urine isolates of *P. aeruginosa* from selected general practitioners' patients in ISIS-CAR, by age category*,**

* *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.
[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-CAR 2023

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
levofloxacin	70	2	3 (1 - 11)	6385	2 (2 - 3)
clindamycin incl. inducible resistance[1]	70	9	13 (7 - 23)	14617	13 (13 - 14)
doxycycline/tetracycline	70	5	7 (3 - 16)	14325	4 (3 - 4)
co-trimoxazole	70	1	1 (0 - 9)	14614	2 (2 - 3)
MRSA	70	14	20 (12 - 31)	14623	4 (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.
MRSA = Methicillin resistance Staphylococcus aureus. For estimation method of MRSA see section 4.1.1 'calculation of resistance levels' of the Nethmap 2024 report for more detailed information.
[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 2024 report for more detailed information).*

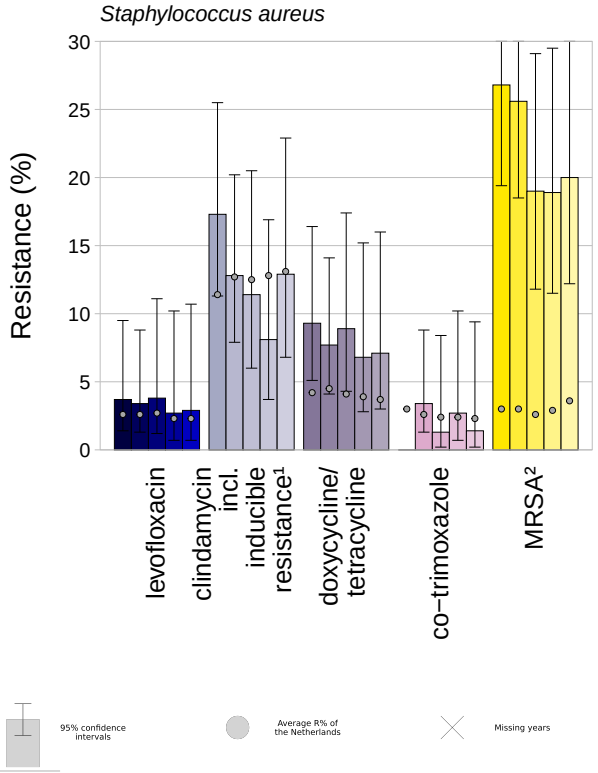

Figure 3.5.0.1 Trends in antibiotic resistance (from left to right 2019 to 2023) among diagnostic wound or pus isolates of *S. aureus* from selected general practitioners' patients in ISIS-CAR*

* *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] *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 2024 report for more detailed information).*
[2] *MRSA = Methicillin resistance Staphylococcus aureus. For estimation method of MRSA see section 4.1.1 'calculation of resistance levels' of the Nethmap 2024 report for more detailed information.*

3.6 β-haemolytic *Streptococcus* spp. group A and group B

Table 3.6.0.1 Resistance levels among diagnostic wound/pus, respiratory or genital isolates β-haemolytic *Streptococcus* spp. group A from selected general practitioners' patients, ISIS-CAR 2023

	Aruba			the Netherlands	
Antibiotic	N	R	R% (95%-CI)	N	R% (95%-CI)
erythromycin	11	0	0 (NA - NA)	2994	9 (8 - 10)
clindamycin incl. inducible resistance[1]	11	0	0 (NA - NA)	3007	7 (7 - 8)
doxycycline/tetracycline	11	0	0 (NA - NA)	2333	28 (27 - 30)
co-trimoxazole	11	0	0 (NA - NA)	2428	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.
[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 2024 report for more detailed information).*

Table 3.6.0.2 Resistance levels among diagnostic urine or genital isolates of β-haemolytic *Streptococcus* spp. group B from selected general practitioners' patients, ISIS-CAR 2023

	Aruba			the Netherlands	
Antibiotic	N	R	R% (95%-CI)	N	R% (95%-CI)
erythromycin	108	36	33 (25 - 43)	6779	22 (21 - 23)
doxycycline/tetracycline	183	144	79 (72 - 84)	3934	76 (75 - 78)
co-trimoxazole	108	0	0 (NA - NA)	9147	1 (1 - 1)

NA = not applicable.

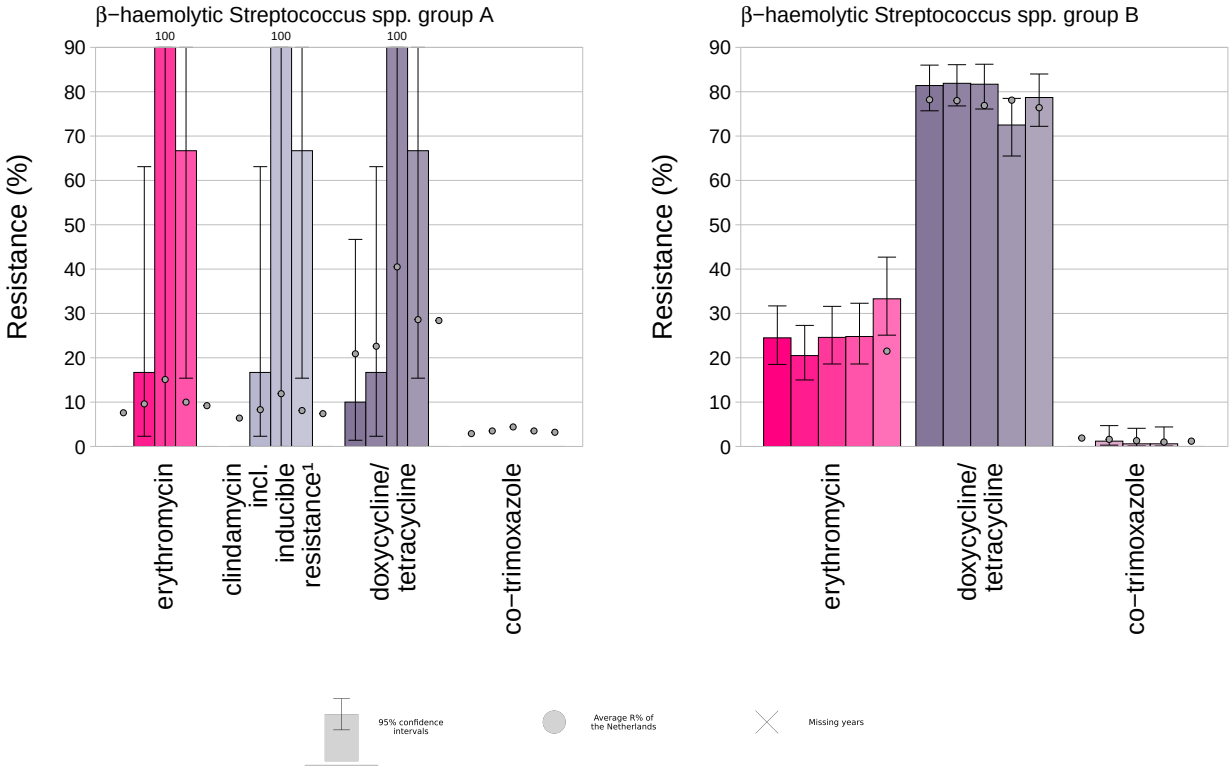

Figure 3.6.0.1 Trends in antibiotic resistance (from left to right 2019 to 2023) among diagnostic wound/pus, respiratory or genital isolates of β-haemolytic *Streptococcus* spp. group A and diagnostic urine or genital isolates of β-haemolytic *Streptococcus* spp. group B from selected general practitioners' patients in ISIS-CAR*,**

* *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 2024 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 2023 is presented in table 4.1.0.1. The resistance levels for a selection of pathogens isolated from these patients in 2023 for *Escherichia coli*, *Klebsiella pneumoniae*, *Proteus mirabilis*, *Pseudomonas aeruginosa* and *Staphylococcus 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-CAR 2023

	Lower respiratory tract	Urine	Wound or pus
Pathogen	N	N	N
E. coli	1	204	22
K. pneumoniae	6	67	34
P. mirabilis	2	44	43
Other Enterobacterales[1]	2	53	104
P. aeruginosa	5	21	69
Other non-fermenters[2]	1	14	12
Other Gram-negatives[3]	9	0	4
S. aureus	4	10	110
Other Gram-positives[4]	7	56	127

[1] *In order of frequency: Morganella spp., Enterobacter species n.n.g., P. gergoviae, E. cloacae complex, Citrobacter spp., Klebsiella spp. (non-pneumoniae), Serratia spp., Providencia spp., Proteus spp. (non-mirabilis).*
[2] *In order of frequency: Acinetobacter spp., S. maltophilia, Pseudomonas spp. (non-aeruginosa).*
[3] *In order of frequency: H. parainfluenzae, H. influenzae, B. fragilis complex.*
[4] *In order of frequency: S. mitis/S. oralis, ß-haemolytic Streptococcus spp. groups C and G, ß-haemolytic Streptococcus spp. group B, S. pneumoniae, S. dysgalactiae subsp. equisimilis, S. anginosus, ß-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-CAR 2023

	Aruba			the Netherlands	
Antibiotic	N	R	R% (95%-CI)	N	R% (95%-CI)
amoxicillin/ampicillin	227	122	54 (47 - 60)	24715	40 (39 - 41)
co-amoxiclav ocuti	227	98	43 (37 - 50)	24981	30 (29 - 31)
piperacillin-tazobactam	224	18	8 (5 - 12)	24345	4 (4 - 4)
cefuroxime	227	45	20 (15 - 26)	23792	11 (10 - 11)
cefotaxime/ceftriaxone non-men	223	29	13 (9 - 18)	24648	6 (6 - 7)
ceftazidime	226	23	10 (7 - 15)	24744	5 (5 - 5)
meropenem/imipenem non-men	227	0	0 (NA - NA)	24764	0 (0 - 0)
ciprofloxacin non-men	227	86	38 (32 - 44)	25001	15 (15 - 16)
gentamicin	227	36	16 (12 - 21)	24977	5 (5 - 5)
tobramycin	227	41	18 (14 - 24)	23771	5 (5 - 5)
fosfomycin[1]	227	4	2 (1 - 5)	24463	3 (2 - 3)
co-trimoxazole	227	83	37 (31 - 43)	24679	22 (22 - 23)
nitrofurantoin	227	3	1 (0 - 4)	24720	2 (2 - 3)
MDOT ocuti	227	28	12 (9 - 17)	24654	5 (5 - 5)
co-amoxiclav + ciprofloxacin - ocuti	227	47	21 (16 - 26)	24976	9 (8 - 9)
	227	34	15 (11 - 20)		
cefuroxime + ciprofloxacin	227	36	16 (12 - 21)		
cefuroxime + gentamicin	227	15	7 (4 - 11)	23260	2 (1 - 2)
cefotaxime/ceftriaxone + ciprofloxacin - non-men	223	26	12 (8 - 17)	24643	4 (4 - 4)
cefotaxime/ceftriaxone + gentamicin - non-men	223	11	5 (3 - 9)	24620	1 (1 - 1)

NA = not applicable.
ocuti = According to breakpoint for oral administration in infections originating from the urinary tract.
non-men = According to breakpoint for indications other than meningitis.
MDOT = multidrug resistance to oral therapy, defined as resistance to all of the following oral agents: co-amoxiclav (according to the breakpoint for indications other than uncomplicated urinary tract infections), ciprofloxacin, and co-trimoxazole.

[1] *Resistance percentage calculated using an mic cut-off of 16mg/L and a diameter cut-off of 24mm (see section 4.1.1 'calculation of resistance levels' of the Nethmap 2024 report for more detailed information).*

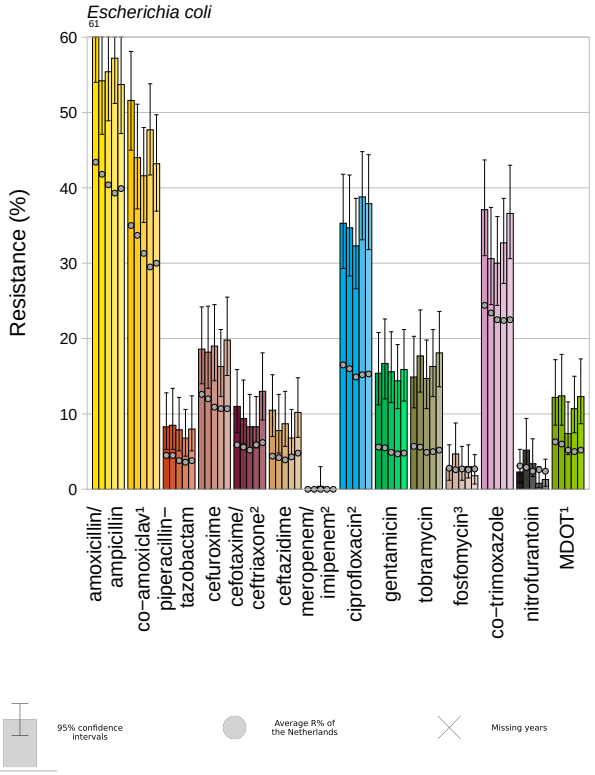

Figure 4.1.1.1 Trends in antibiotic resistance (from left to right 2019 to 2023) among diagnostic isolates of *E. coli* patients attending outpatient departments in ISIS-CAR*,**

* *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.*
MDOT = multidrug resistance to oral therapy, defined as resistance to all of the following oral agents: co-amoxiclav (according to the breakpoint for indications other than uncomplicated urinary tract infections), ciprofloxacin, and co-trimoxazole.
[1] *ocuti = According to breakpoint for oral administration in infections originating from the urinary tract.*
[2] *non-men = According to breakpoint for indications other than meningitis.*
[3] *Resistance percentage calculated using an mic cut-off of 16mg/L and a diameter cut-off of 24mm (see section 4.1.1 'calculation of resistance levels' of the Nethmap 2024 report for more detailed information).*

4.1.2 *Klebsiella pneumoniae*

Table 4.1.2.1 Resistance levels among diagnostic isolates of *K. pneumoniae* from patients attending outpatient departments, ISIS-CAR 2023

	Aruba			the Netherlands	
Antibiotic	N	R	R% (95%-CI)	N	R% (95%-CI)
co-amoxiclav ocuti	107	18	17 (11 - 25)	5503	18 (17 - 19)
piperacillin-tazobactam	107	13	12 (7 - 20)	5285	12 (11 - 13)
cefuroxime	106	13	12 (7 - 20)	5296	13 (12 - 14)
cefotaxime/ceftriaxone non-men	107	7	7 (3 - 13)	5435	9 (8 - 9)
ceftazidime	107	6	6 (3 - 12)	5441	7 (7 - 8)
meropenem/imipenem non-men	107	0	0 (NA - NA)	5246	0 (0 - 0)
ciprofloxacin non-men	107	16	15 (9 - 23)	5511	13 (12 - 14)
gentamicin	107	4	4 (1 - 10)	5504	3 (3 - 4)
tobramycin	107	4	4 (1 - 10)	5314	4 (4 - 5)
co-trimoxazole	107	18	17 (11 - 25)	5442	12 (11 - 13)
MDOT ocuti	107	5	5 (2 - 11)	5434	4 (4 - 5)
co-amoxiclav + ciprofloxacin - ocuti	107	7	7 (3 - 13)	5502	6 (5 - 6)
	107	4	4 (1 - 10)		
cefuroxime + ciprofloxacin	106	8	8 (4 - 14)		
cefuroxime + gentamicin	106	4	4 (1 - 10)	5162	3 (2 - 3)
cefotaxime/ceftriaxone + ciprofloxacin - non-men	107	6	6 (3 - 12)	5434	6 (5 - 6)
cefotaxime/ceftriaxone + gentamicin - non-men	107	4	4 (1 - 10)	5428	3 (3 - 3)

NA = not applicable.
ocuti = According to breakpoint for oral administration in infections originating from the urinary tract.
non-men = According to breakpoint for indications other than meningitis.
MDOT = multidrug resistance to oral therapy, defined as resistance to all of the following oral agents: co-amoxiclav (according to the breakpoint for indications other than uncomplicated urinary tract infections), ciprofloxacin, and co-trimoxazole.

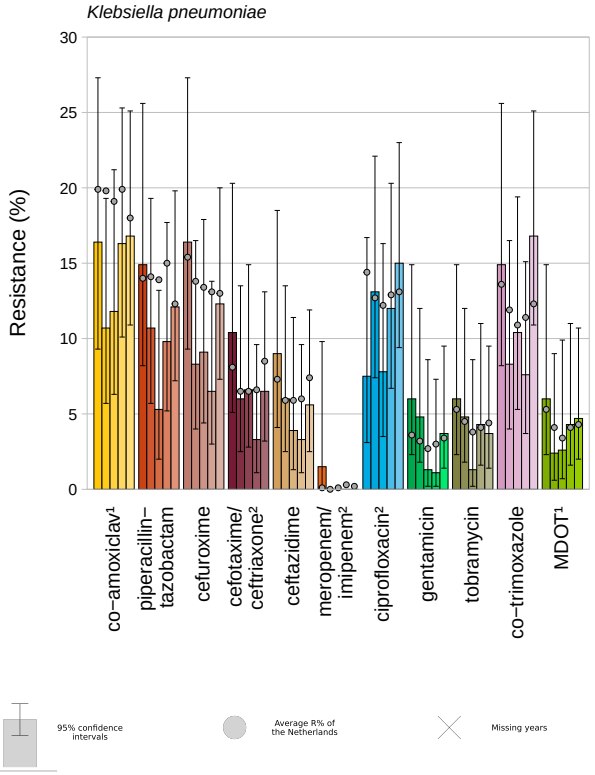

Figure 4.1.2.1 Trends in antibiotic resistance (from left to right 2019 to 2023) among diagnostic isolates of *K. pneumoniae* patients attending outpatient departments in ISIS-CAR*

* *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.
MDOT = multidrug resistance to oral therapy, defined as resistance to all of the following oral agents: co-amoxiclav (according to the breakpoint for indications other than uncomplicated urinary tract infections), ciprofloxacin, and co-trimoxazole.
[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-CAR 2023

	Aruba			the Netherlands	
Antibiotic	N	R	R% (95%-CI)	N	R% (95%-CI)
amoxicillin/ampicillin	89	7	8 (4 - 16)	3764	21 (20 - 22)
co-amoxiclav ocuti	89	1	1 (0 - 8)	3859	6 (5 - 7)
piperacillin-tazobactam	89	0	0 (NA - NA)	3775	0 (0 - 1)
cefuroxime	89	2	2 (1 - 9)	3680	1 (1 - 2)
cefotaxime/ceftriaxone non-men	89	2	2 (1 - 9)	3800	1 (0 - 1)
ceftazidime	89	0	0 (NA - NA)	3829	0 (0 - 1)
meropenem non-men	89	0	0 (NA - NA)	3819	0 (0 - 0)
ciprofloxacin non-men	89	6	7 (3 - 14)	3861	12 (11 - 14)
gentamicin	89	2	2 (1 - 9)	3342	7 (6 - 8)
tobramycin	89	3	3 (1 - 10)	3348	5 (4 - 6)
co-trimoxazole	89	7	8 (4 - 16)	3477	24 (23 - 26)
MDOT ocuti	89	1	1 (0 - 8)	3472	2 (1 - 2)
co-amoxiclav + ciprofloxacin - ocuti	89	1	1 (0 - 8)	3857	2 (2 - 3)
	89	0	0 (NA - NA)		
cefuroxime + ciprofloxacin	89	2	2 (1 - 9)		
cefuroxime + gentamicin	89	1	1 (0 - 8)	3159	0 (0 - 1)
cefotaxime/ceftriaxone + ciprofloxacin - non-men	89	2	2 (1 - 9)	3798	0 (0 - 1)
cefotaxime/ceftriaxone + gentamicin - non-men	89	1	1 (0 - 8)	3280	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.
ocuti = According to breakpoint for oral administration in infections originating from the urinary tract.
non-men = According to breakpoint for indications other than meningitis.
MDOT = multidrug resistance to oral therapy, defined as resistance to all of the following oral agents: co-amoxiclav (according to the breakpoint for indications other than uncomplicated urinary tract infections), ciprofloxacin, and co-trimoxazole.

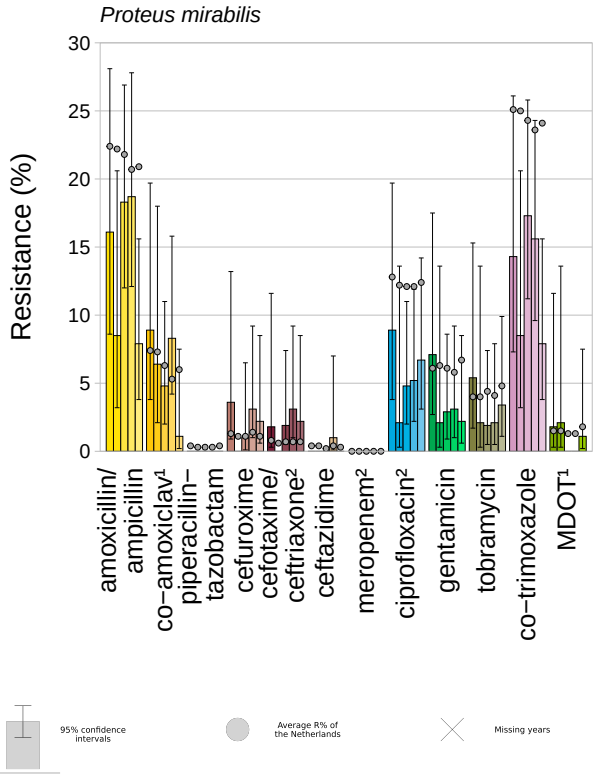

Figure 4.1.3.1 Trends in antibiotic resistance (from left to right 2019 to 2023) among diagnostic isolates of *P. mirabilis* patients attending outpatient departments in ISIS-CAR*

* *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.
MDOT = multidrug resistance to oral therapy, defined as resistance to all of the following oral agents: co-amoxiclav (according to the breakpoint for indications other than uncomplicated urinary tract infections), ciprofloxacin, and co-trimoxazole.
[1] *ocuti = According to breakpoint for oral administration in infections originating from the urinary tract.*
[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-CAR 2023

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
piperacillin-tazobactam	92	12	13 (8 - 22)	6382	5 (5 - 6)
ceftazidime	94	1	1 (0 - 7)	6854	3 (2 - 3)
imipenem	81	2	2 (1 - 9)	5887	5 (4 - 5)
meropenem non-men	95	1	1 (0 - 7)	6807	1 (1 - 2)
ciprofloxacin	95	8	8 (4 - 16)	6872	11 (10 - 12)
tobramycin	95	4	4 (2 - 11)	6803	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.

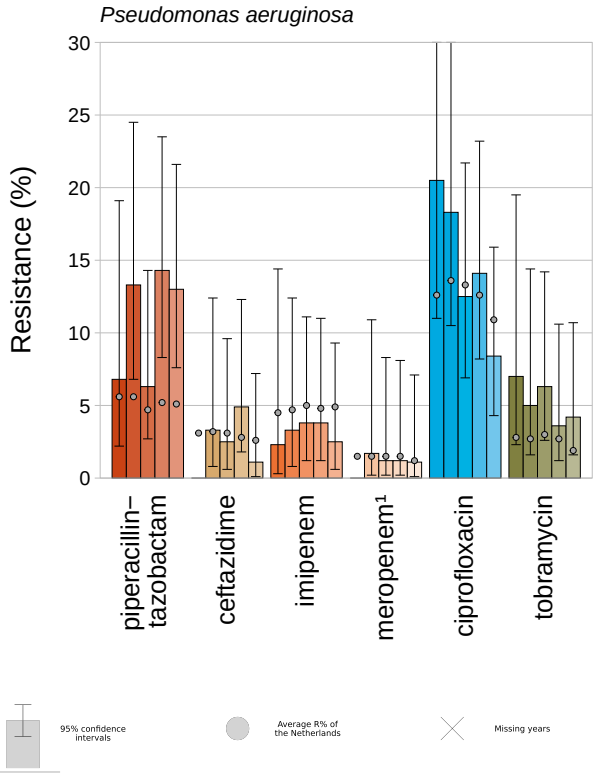

Figure 4.1.4.1 Trends in antibiotic resistance (from left to right 2019 to 2023) among diagnostic isolates of *P. aeruginosa* patients attending outpatient departments in ISIS-CAR*

* *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] *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-CAR 2023

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
levofloxacin	124	27	22 (15 - 30)	8654	3 (3 - 3)
clindamycin incl. inducible resistance[1]	124	17	14 (9 - 21)	20079	17 (17 - 18)
doxycycline/tetracycline	124	19	15 (10 - 23)	19459	4 (4 - 5)
linezolid	124	0	0 (NA - NA)	19323	0 (0 - 0)
co-trimoxazole	124	23	19 (13 - 26)	20199	2 (2 - 2)
MRSA	123	13	11 (6 - 17)	20330	2 (2 - 3)

NA = not applicable.
MRSA = Methicillin resistance Staphylococcus aureus. For estimation method of MRSA see section 4.1.1 'calculation of resistance levels' of the Nethmap 2024 report for more detailed information.
[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 2024 report for more detailed information).*

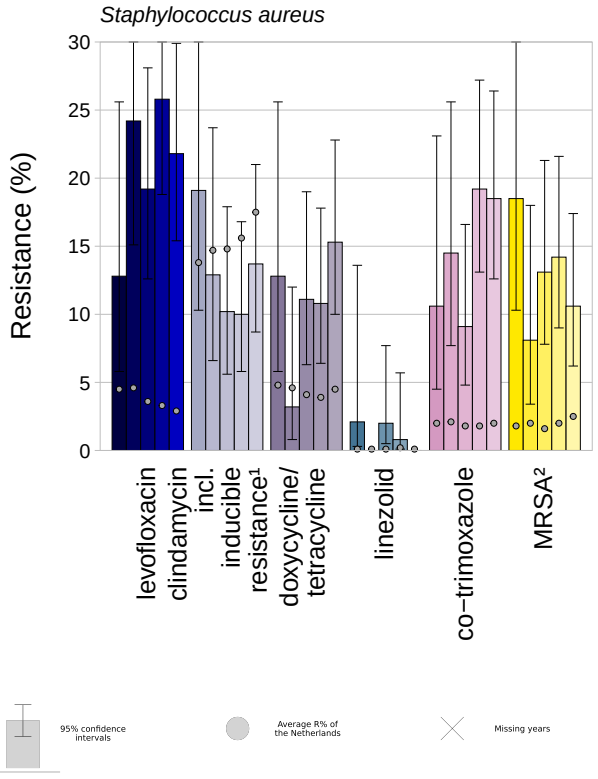

Figure 4.1.5.1 Trends in antibiotic resistance (from left to right 2019 to 2023) among diagnostic isolates of *S. aureus* patients attending outpatient departments in ISIS-CAR*

* *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] *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 2024 report for more detailed information).*
[2] *MRSA = Methicillin resistance Staphylococcus aureus. For estimation method of MRSA see section 4.1.1 'calculation of resistance levels' of the Nethmap 2024 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 2023 is presented in table 4.2.0.1.

The resistance levels for a selection of pathogens isolated from these patients in 2023 for *Escherichia coli*, *Klebsiella pneumoniae*, *Proteus mirabilis*, *Pseudomonas aeruginosa*, *Enterobacter cloacae* complex, *Acinetobacter* spp., *Enterococcus faecalis*, *Enterococcus faecium*, *Staphylococcus aureus*, β-haemolytic *Streptococcus* spp. group A, β-haemolytic *Streptococcus* spp. group B, β-haemolytic *Streptococcus* spp. group C/ group G, and *Streptococcus anginosus* 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*), figure 4.2.9.1 (β-haemolytic *Streptococcus* spp. group A and B), figure 4.2.10.1 (β-haemolytic *Streptococcus* spp. group C/ group G), and figure 4.2.11.1 (*S. anginosus*).

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-CAR 2023

Pathogen	Blood or cerebrospinal fluid	Lower respiratory tract	Urine	Wound or pus
	N	N	N	N
E. coli	88	6	396	94
K. pneumoniae	23	12	119	43
P. mirabilis	11	4	71	57
E. cloaecae complex	10	2	18	31
Other Enterobacterales[1]	30	7	69	88
P. aeruginosa	12	14	38	61
Acinetobacter spp.	4	5	9	8
Other non-fermenters[2]	3	6	1	5
Other Gram-negatives[3]	6	5	0	4
E. faecalis	9	4	37	55
E. faecium	3	0	5	7
S. aureus	52	17	15	183
ß-haemolytische *Streptococcus* spp. group A	17	0	1	14
ß-haemolytische *Streptococcus* spp. group B	12	0	27	52
ß-haemolytic Streptococcus spp. groups C and G	0	0	0	3
S. anginosus	3	3	1	19
S. mitis/ S. oralis	12	2	5	6
Other Gram-positives[4]	371	4	33	83

[1] *In order of frequency: Morganella spp., Citrobacter spp., Klebsiella spp. (non-pneumoniae), Providencia spp., Serratia spp., Proteus spp. (non-mirabilis), P. gergoviae, Salmonella spp., Enterobacter species n.n.g., Pantoea spp., Escherichia spp. (non-coli).*

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

[3] *In order of frequency: H. parainfluenzae, B. fragilis complex, H. influenzae, N. meningitidis.*

[4] *In order of frequency: Staphylococcus spp. (non-aureus), Enterococcus spp. (non-faecalis, non-faecium), S. dysgalactiae subsp. equisimilis, S. pneumoniae, A. urinae, C. perfringens, L. monocytogenes.*

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-CAR 2023

	Aruba			the Netherlands	
Antibiotic	N	R	R% (95%-CI)	N	R% (95%-CI)
amoxicillin/ampicillin	774	407	53 (49 - 56)	55179	39 (39 - 39)
co-amoxiclav ocuti	774	324	42 (38 - 45)	55782	29 (29 - 30)
piperacillin-tazobactam	769	43	6 (4 - 7)	54443	4 (4 - 4)
cefuroxime	774	130	17 (14 - 20)	53763	11 (11 - 11)
cefotaxime/ceftriaxone non-men	767	88	11 (9 - 14)	55017	6 (6 - 6)
ceftazidime	772	76	10 (8 - 12)	55255	5 (5 - 5)
meropenem/imipenem non-men	774	1	0 (0 - 1)	55290	0 (0 - 0)
ciprofloxacin non-men	774	214	28 (25 - 31)	55842	13 (13 - 13)
gentamicin	774	82	11 (9 - 13)	55782	4 (4 - 5)
tobramycin	774	92	12 (10 - 14)	52697	5 (4 - 5)
fosfomycin[1]	774	15	2 (1 - 3)	53861	2 (2 - 3)
co-trimoxazole	774	250	32 (29 - 36)	50124	20 (20 - 20)
nitrofurantoin	773	8	1 (1 - 2)	54466	2 (2 - 2)
MDOT ocuti	774	79	10 (8 - 13)	50057	4 (4 - 4)
co-amoxiclav + ciprofloxacin - ocuti	774	115	15 (13 - 18)	55771	7 (7 - 8)
	774	72	9 (7 - 12)		
cefuroxime + ciprofloxacin	774	89	11 (9 - 14)		
cefuroxime + gentamicin	774	30	4 (3 - 5)	52617	2 (1 - 2)
cefotaxime/ceftriaxone + ciprofloxacin - non-men	767	65	8 (7 - 11)	55007	4 (4 - 4)
cefotaxime/ceftriaxone + gentamicin - non-men	767	24	3 (2 - 5)	54948	1 (1 - 1)

ocuti = According to breakpoint for oral administration in infections originating from the urinary tract.
non-men = According to breakpoint for indications other than meningitis.
MDOT = multidrug resistance to oral therapy, defined as resistance to all of the following oral agents: co-amoxiclav (according to the breakpoint for indications other than uncomplicated urinary tract infections), ciprofloxacin, and co-trimoxazole.

[1] *Resistance percentage calculated using an mic cut-off of 16mg/L and a diameter cut-off of 24mm (see section 4.1.1 'calculation of resistance levels' of the Nethmap 2024 report for more detailed information).*

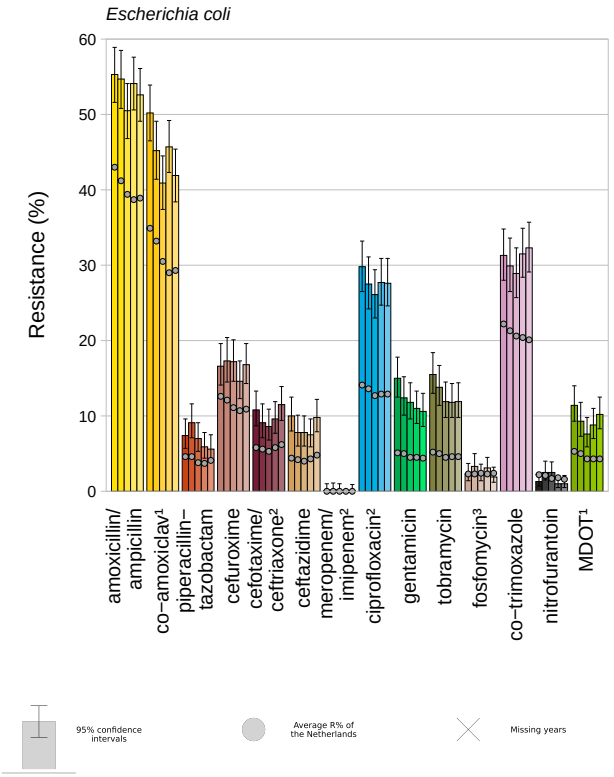

Figure 4.2.1.1 Trends in antibiotic resistance (from left to right 2019 to 2023) among diagnostic isolates of *E. coli* from patients admitted to inpatient departments (excl. intensive care units) in ISIS-CAR*,**

* *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.*
MDOT = multidrug resistance to oral therapy, defined as resistance to all of the following oral agents: co-amoxiclav (according to the breakpoint for indications other than uncomplicated urinary tract infections), ciprofloxacin, and co-trimoxazole.
[1] *ocuti = According to breakpoint for oral administration in infections originating from the urinary tract.*
[2] *non-men = According to breakpoint for indications other than meningitis.*
[3] *Resistance percentage calculated using an mic cut-off of 16mg/L and a diameter cut-off of 24mm (see section 4.1.1 'calculation of resistance levels' of the Nethmap 2024 report for more detailed information).*

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-CAR 2023

	Aruba			the Netherlands	
Antibiotic	N	R	R% (95%-CI)	N	R% (95%-CI)
co-amoxiclav ocuti	282	40	14 (11 - 19)	11683	18 (18 - 19)
piperacillin-tazobactam	282	28	10 (7 - 14)	10986	13 (13 - 14)
cefuroxime	281	28	10 (7 - 14)	11295	13 (12 - 14)
cefotaxime/ceftriaxone non-men	282	17	6 (4 - 9)	11524	8 (8 - 9)
ceftazidime	282	16	6 (4 - 9)	11547	7 (7 - 8)
meropenem/imipenem non-men	282	0	0 (NA - NA)	11199	0 (0 - 1)
ciprofloxacin non-men	282	36	13 (9 - 17)	11690	12 (11 - 12)
gentamicin	282	6	2 (1 - 5)	11681	3 (3 - 4)
tobramycin	282	11	4 (2 - 7)	11294	5 (4 - 5)
co-trimoxazole	282	37	13 (10 - 18)	10327	11 (10 - 12)
MDOT ocuti	282	8	3 (1 - 6)	10316	4 (4 - 5)
co-amoxiclav + ciprofloxacin - ocuti	282	15	5 (3 - 9)	11679	6 (6 - 6)
	282	6	2 (1 - 5)		
cefuroxime + ciprofloxacin	281	14	5 (3 - 8)		
cefuroxime + gentamicin	281	6	2 (1 - 5)	11023	3 (2 - 3)
cefotaxime/ceftriaxone + ciprofloxacin - non-men	282	12	4 (2 - 7)	11521	6 (5 - 6)
cefotaxime/ceftriaxone + gentamicin - non-men	282	6	2 (1 - 5)	11514	3 (2 - 3)

NA = not applicable.
ocuti = According to breakpoint for oral administration in infections originating from the urinary tract.
non-men = According to breakpoint for indications other than meningitis.
MDOT = multidrug resistance to oral therapy, defined as resistance to all of the following oral agents: co-amoxiclav (according to the breakpoint for indications other than uncomplicated urinary tract infections), ciprofloxacin, and co-trimoxazole.

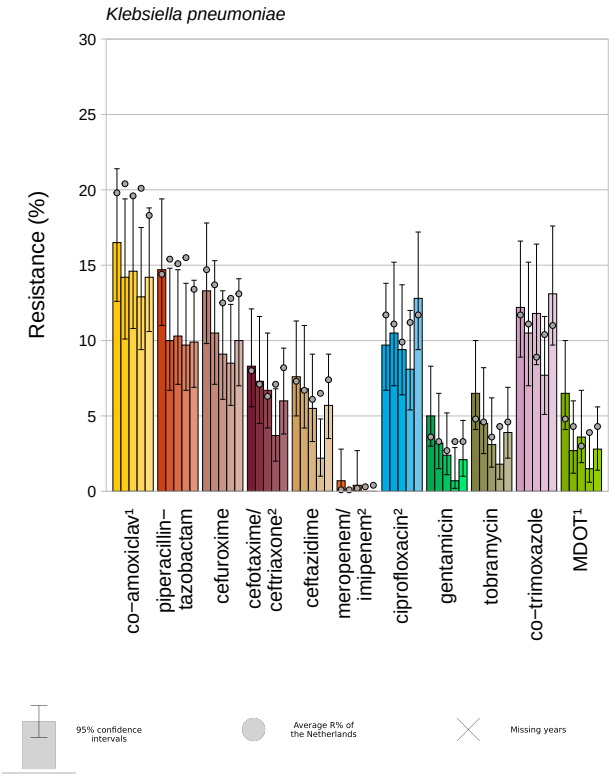

Figure 4.2.2.1 Trends in antibiotic resistance (from left to right 2019 to 2023) among diagnostic isolates of *K. pneumoniae* from patients admitted to inpatient departments (excl. intensive care units) in ISIS-CAR*

* *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.*
MDOT = multidrug resistance to oral therapy, defined as resistance to all of the following oral agents: co-amoxiclav (according to the breakpoint for indications other than uncomplicated urinary tract infections), ciprofloxacin, and co-trimoxazole.
[1] *ocuti = According to breakpoint for oral administration in infections originating from the urinary tract.*
[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-CAR 2023

	Aruba			the Netherlands	
Antibiotic	N	R	R% (95%-CI)	N	R% (95%-CI)
amoxicillin/ampicillin	216	33	15 (11 - 21)	7845	20 (19 - 21)
co-amoxiclav ocuti	216	7	3 (2 - 7)	8058	6 (5 - 6)
piperacillin-tazobactam	215	0	0 (NA - NA)	7879	0 (0 - 0)
cefuroxime	216	3	1 (0 - 4)	7766	1 (1 - 2)
cefotaxime/ceftriaxone non-men	215	3	1 (0 - 4)	7924	1 (1 - 1)
ceftazidime	216	0	0 (NA - NA)	7980	0 (0 - 1)
meropenem non-men	216	0	0 (NA - NA)	7969	0 (0 - 0)
ciprofloxacin non-men	216	13	6 (4 - 10)	8064	11 (10 - 11)
gentamicin	216	8	4 (2 - 7)	6876	6 (6 - 7)
tobramycin	216	9	4 (2 - 8)	6880	4 (4 - 5)
co-trimoxazole	216	24	11 (8 - 16)	6972	23 (22 - 24)
MDOT ocuti	216	2	1 (0 - 4)	6965	1 (1 - 2)
co-amoxiclav + ciprofloxacin - ocuti	216	2	1 (0 - 4)	8056	2 (1 - 2)
	216	2	1 (0 - 4)		
cefuroxime + ciprofloxacin	216	3	1 (0 - 4)		
cefuroxime + gentamicin	216	1	0 (0 - 3)	6579	0 (0 - 1)
cefotaxime/ceftriaxone + ciprofloxacin - non-men	215	3	1 (0 - 4)	7922	0 (0 - 1)
cefotaxime/ceftriaxone + gentamicin - non-men	215	1	0 (0 - 3)	6735	0 (0 - 1)

NA = not applicable.
ocuti = According to breakpoint for oral administration in infections originating from the urinary tract.
non-men = According to breakpoint for indications other than meningitis.
MDOT = multidrug resistance to oral therapy, defined as resistance to all of the following oral agents: co-amoxiclav (according to the breakpoint for indications other than uncomplicated urinary tract infections), ciprofloxacin, and co-trimoxazole.

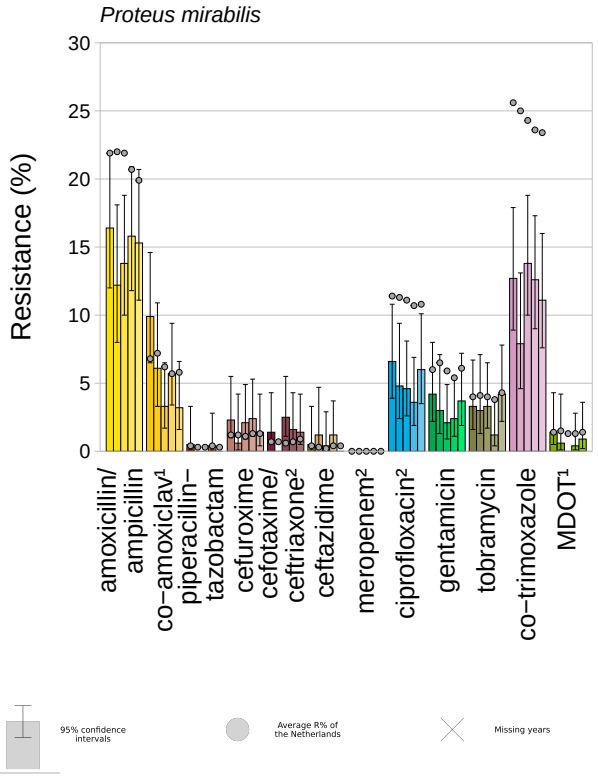

Figure 4.2.3.1 Trends in antibiotic resistance (from left to right 2019 to 2023) among diagnostic isolates of *P. mirabilis* from patients admitted to inpatient departments (excl. intensive care units) in ISIS-CAR*

* *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.*
MDOT = multidrug resistance to oral therapy, defined as resistance to all of the following oral agents: co-amoxiclav (according to the breakpoint for indications other than uncomplicated urinary tract infections), ciprofloxacin, and co-trimoxazole.
[1] *ocuti = According to breakpoint for oral administration in infections originating from the urinary tract.*
[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-CAR 2023

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
piperacillin-tazobactam	203	22	11 (7 - 16)	11690	6 (5 - 6)
ceftazidime	201	7	3 (2 - 7)	12685	3 (3 - 3)
imipenem	182	4	2 (1 - 6)	11458	5 (4 - 5)
meropenem non-men	204	3	1 (0 - 4)	12582	1 (1 - 1)
ciprofloxacin	205	13	6 (4 - 11)	12721	9 (9 - 10)
tobramycin	206	5	2 (1 - 6)	12506	1 (1 - 2)
ciprofloxacin + tobramycin	205	2	1 (0 - 4)	11337	1 (1 - 1)

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

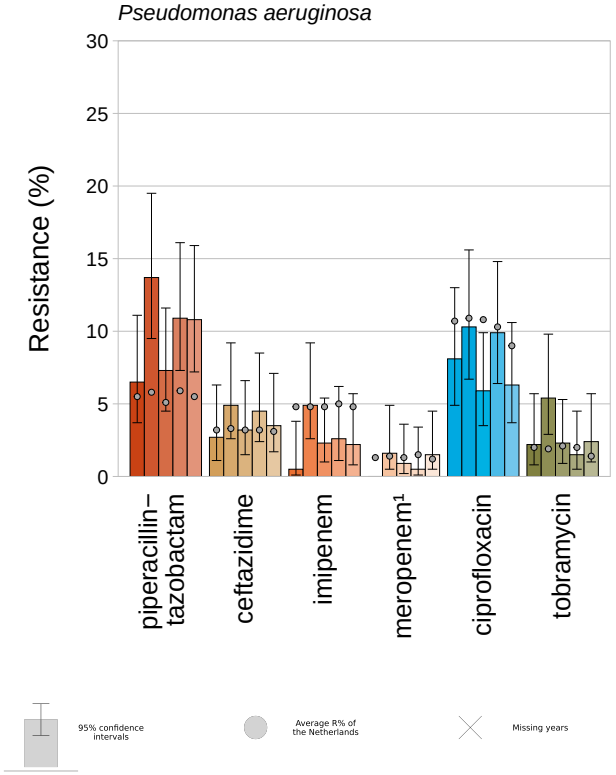

Figure 4.2.4.1 Trends in antibiotic resistance (from left to right 2019 to 2023) among diagnostic isolates of *P. aeruginosa* from patients admitted to inpatient departments (excl. intensive care units) in ISIS-CAR*

* *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.*
[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-CAR 2023

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
meropenem/imipenem non-men	90	0	0 (NA - NA)	6574	0 (0 - 0)
ciprofloxacin non-men	90	6	7 (3 - 14)	6658	4 (3 - 4)
gentamicin	90	1	1 (0 - 7)	6629	2 (2 - 3)
tobramycin	90	2	2 (1 - 8)	6461	3 (2 - 3)
co-trimoxazole	90	7	8 (4 - 15)	5657	6 (5 - 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.

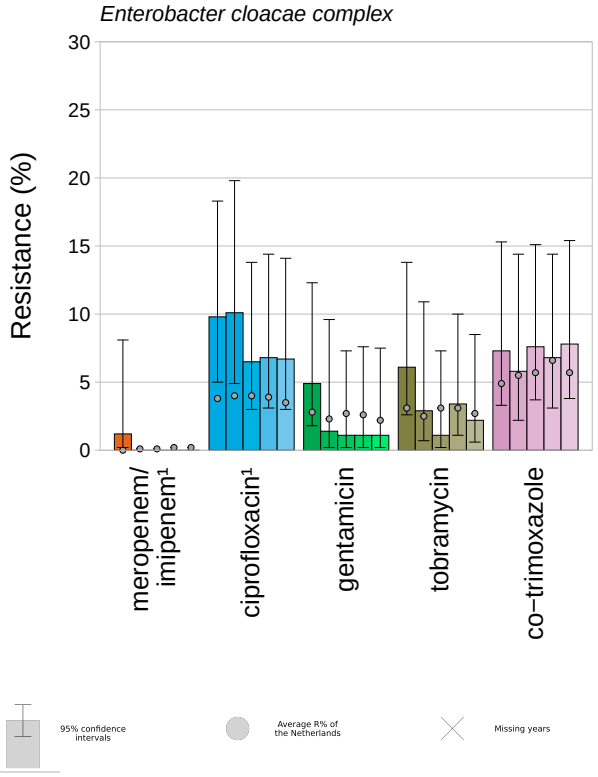

Figure 4.2.5.1 Trends in antibiotic resistance (from left to right 2019 to 2023) among diagnostic isolates of *E. cloacae* complex from patients admitted to inpatient departments (excl. intensive care units) in ISIS-CAR*

* *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] *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-CAR 2023

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
meropenem/imipenem non-men	44	0	0 (NA - NA)	1696	2 (1 - 2)
gentamicin	44	2	5 (1 - 16)	1726	3 (2 - 4)
tobramycin	43	1	2 (0 - 15)	1563	3 (2 - 4)
co-trimoxazole	43	2	5 (1 - 17)	1765	4 (3 - 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.
NA = not applicable.
non-men = According to breakpoint for indications other than meningitis.

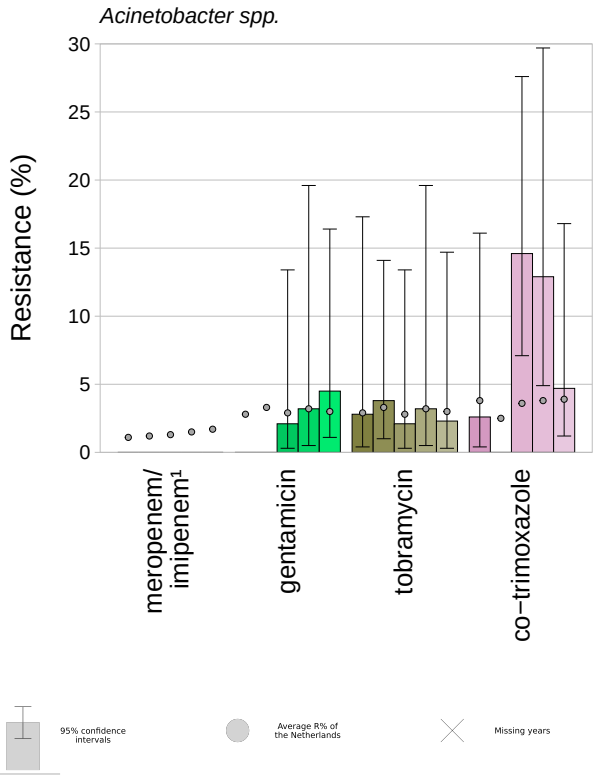

Figure 4.2.6.1 Trends in antibiotic resistance (from left to right 2019 to 2023) among diagnostic isolates of *Acinetobacter* spp. from patients admitted to inpatient departments (excl. intensive care units) in ISIS-CAR*

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

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-CAR 2023

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
vancomycin	142	1	1 (0 - 5)	11791	0 (0 - 0)
nitrofurantoin	140	1	1 (0 - 5)	12405	1 (1 - 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-CAR 2023

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
amoxicillin/ampicillin	15	1	7 (1 - 35)	3629	84 (83 - 85)
vancomycin	15	0	0 (NA - NA)	4314	0 (0 - 1)
linezolid	15	0	0 (NA - NA)	3245	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.

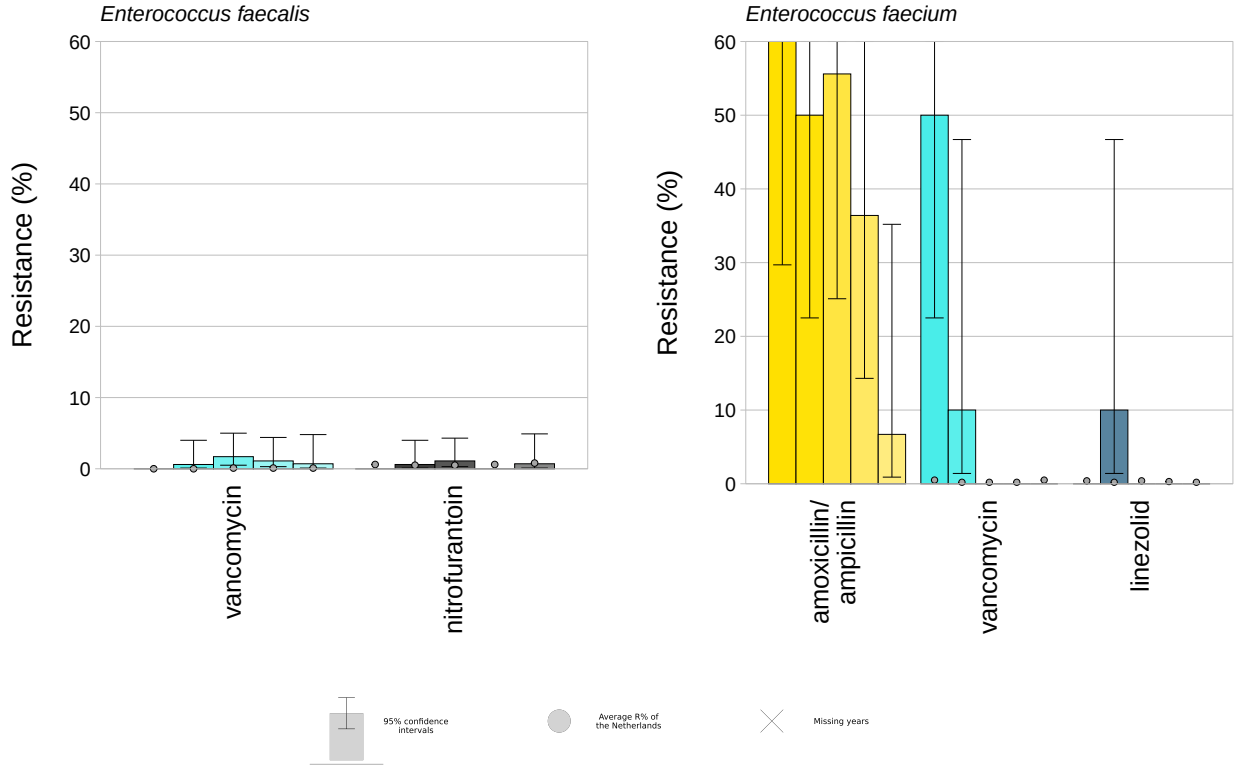

Figure 4.2.7.1 Trends in antibiotic resistance (from left to right 2019 to 2023) among diagnostic isolates of *E. faecalis* and *E. faecium* from patients admitted to inpatient departments (excl. intensive care units) in ISIS-CAR*,**

* *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*

Table 4.2.8.1 Resistance levels among diagnostic isolates of *S. aureus* from patients admitted to inpatient departments (excl. intensive care units), ISIS-CAR 2023

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
levofloxacin	374	39	10 (8 - 14)	14413	3 (3 - 3)
clindamycin incl. inducible resistance[1]	374	54	14 (11 - 18)	34137	17 (16 - 17)
doxycycline/tetracycline	374	35	9 (7 - 13)	33027	4 (4 - 4)
linezolid	374	0	0 (NA - NA)	32926	0 (0 - 0)
co-trimoxazole	374	33	9 (6 - 12)	34321	2 (2 - 2)
MRSA	374	54	14 (11 - 18)	34514	3 (2 - 3)

NA = not applicable.
MRSA = Methicillin resistance Staphylococcus aureus. For estimation method of MRSA see section 4.1.1 'calculation of resistance levels' of the Nethmap 2024 report for more detailed information.
[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 2024 report for more detailed information).*

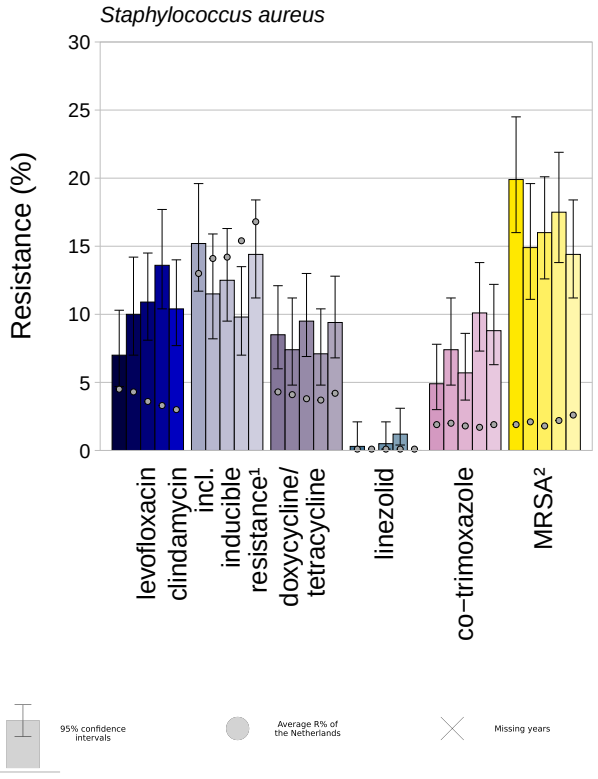

Figure 4.2.8.1 Trends in antibiotic resistance (from left to right 2019 to 2023) among diagnostic isolates of *S. aureus* from patients admitted to inpatient departments (excl. intensive care units) in ISIS-CAR*,**

* *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 2024 report for more detailed information).*
[2] *MRSA = Methicillin resistance Staphylococcus aureus. For estimation method of MRSA see section 4.1.1 'calculation of resistance levels' of the Nethmap 2024 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-CAR 2023

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
erythromycin	33	3	9 (3 - 25)	3043	8 (7 - 9)
clindamycin incl. inducible resistance[1]	33	2	6 (2 - 21)	3052	6 (5 - 6)
doxycycline/tetracycline	34	4	12 (4 - 27)	1932	24 (22 - 26)
co-trimoxazole	34	0	0 (NA - NA)	1684	3 (2 - 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.

[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 2024 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-CAR 2023

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
erythromycin	83	21	25 (17 - 36)	4138	22 (21 - 24)
doxycycline/tetracycline	153	115	75 (68 - 81)	3018	74 (73 - 76)
co-trimoxazole	85	0	0 (NA - NA)	3502	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.

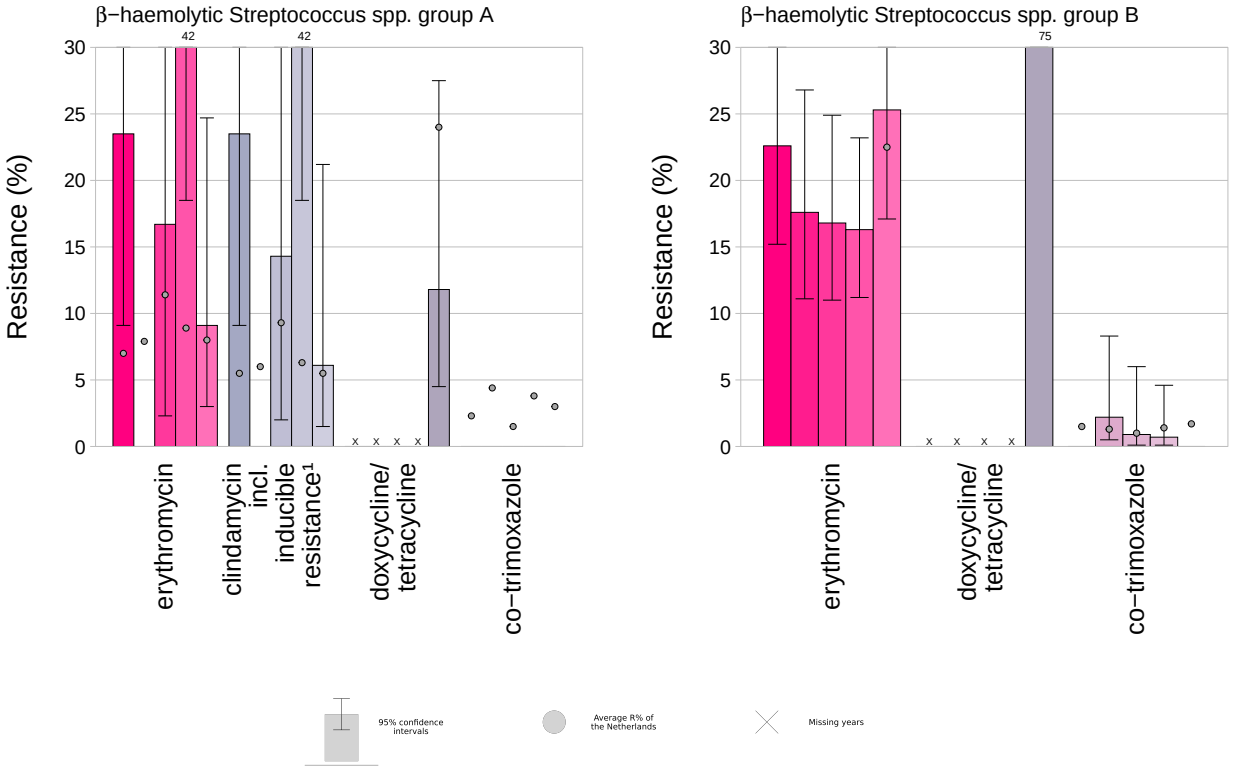

Figure 4.2.9.1 Trends in antibiotic resistance (from left to right 2019 to 2023) among diagnostic isolates of β-haemolytic *Streptococcus* spp. group A and group B from patients admitted to inpatient departments (excl. intensive care units) in ISIS-CAR*,**

* *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] *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 2024 report for more detailed information).*

4.2.10 β-haemolytic *Streptococcus* spp. group C and group G

Table 4.2.10.1 Resistance levels among diagnostic isolates of β-haemolytic *Streptococcus* spp. group C and G from patients admitted to inpatient departments (excl. intensive care units), ISIS-CAR 2023

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
erythromycin	6	2	33 (8 - 73)	1035	16 (14 - 18)
clindamycin incl. inducible resistance[1]	6	2	33 (8 - 73)	1067	15 (13 - 18)
doxycycline/tetracycline	6	2	33 (8 - 73)	756	35 (32 - 39)
co-trimoxazole	6	0	0 (NA - NA)	811	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.
[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 2024 report for more detailed information).*

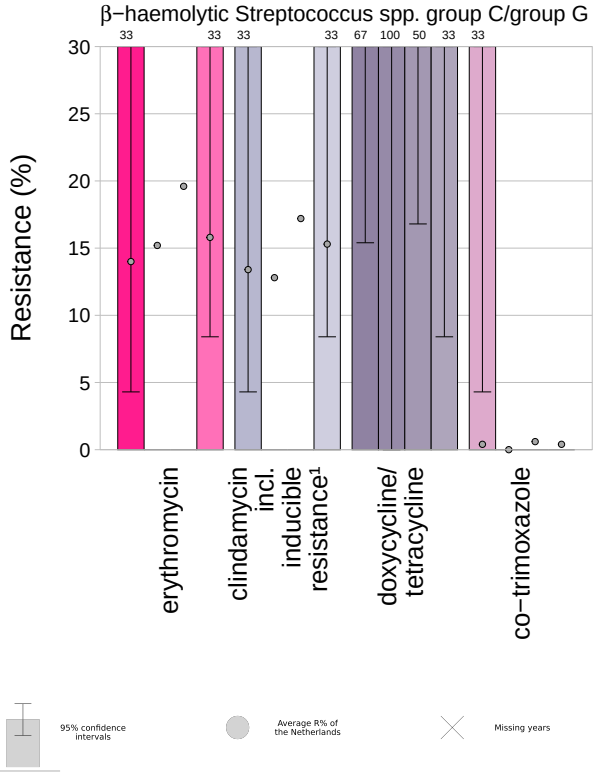

Figure 4.2.10.1 Trends in antibiotic resistance (from left to right 2019 to 2023) among diagnostic isolates of β-haemolytic *Streptococcus* spp. group C and G from patients admitted to inpatient departments (excl. intensive care units) in ISIS-CAR*,**

* *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] *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 2024 report for more detailed information).*

4.2.11 *Streptococcus anginosus*

Table 4.2.11.1 Resistance levels among diagnostic isolates of *Streptococcus anginosus* from patients admitted to inpatient departments (excl. intensive care units), ISIS-CAR 2023

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
clindamycin incl. inducible resistance[1]	28	5	18 (8 - 36)	905	11 (9 - 13)
(benzyl-)penicillin	31	2	6 (2 - 22)	1027	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.

[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 2024 report for more detailed information).*

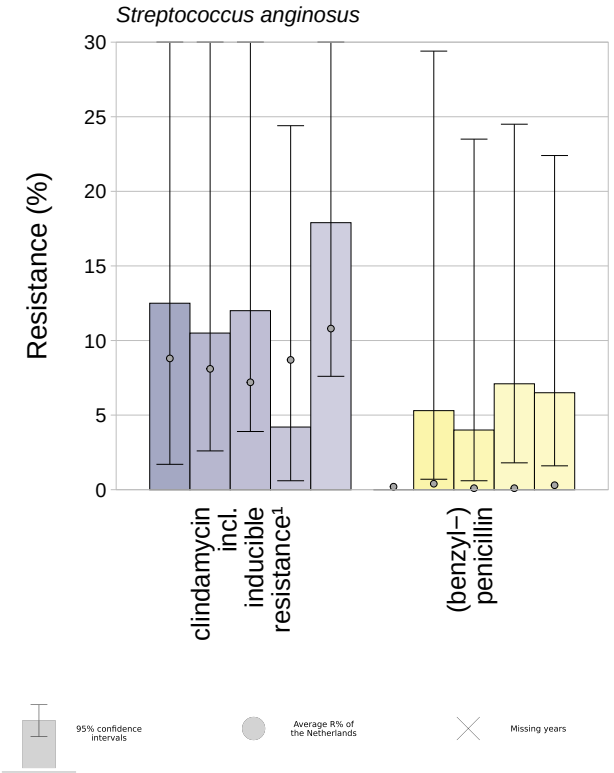

Figure 4.2.11.1 Trends in antibiotic resistance (from left to right 2019 to 2023) among diagnostic isolates of *Streptococcus anginosus* and *S. mitis/ S. oralis* from patients admitted to inpatient departments (excl. intensive care units) in ISIS-CAR*,**

* *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] *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 2024 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 2023 is presented in table 4.3.0.1.

The resistance levels for a selection of pathogens isolated from these patients in 2023 for *Escherichia coli*, *Klebsiella pneumoniae*, *Proteus mirabilis*, *Pseudomonas aeruginosa*, *Enterobacter cloacae* complex, *Acinetobacter* spp., *Enterococcus faecalis*, *Enterococcus faecium*, and *Staphylococcus aureus* 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.), figure 4.3.7.1 (*E. faecalis* and *E. faecium*), and figure 4.3.8.1 (*S. aureus*).

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-CAR 2023

Pathogen	Blood or cerebrospinal fluid	Lower respiratory tract	Urine	Wound or pus
	N	N	N	N
E. coli	13	2	10	15
K. pneumoniae	1	7	5	4
P. mirabilis	1	2	0	3
E. cloaecae complex	1	2	0	3
Other Enterobacterales[1]	5	4	2	10
P. aeruginosa	3	4	1	5
Acinetobacter spp.	0	3	0	3
Other non-fermenters[2]	0	3	0	0
Other Gram-negatives	0	1	0	1
E. faecalis	0	1	2	8
E. faecium	0	0	0	2
S. aureus	3	8	2	8
ß-haemolytische *Streptococcus* spp. group B	1	0	2	0
Other Gram-positives[3]	44	4	2	6

[1] *In order of frequency: Citrobacter spp., Morganella spp., Klebsiella spp. (non-pneumoniae), Serratia spp., Enterobacter species n.n.g., Pantoea spp.*
[2] *In order of frequency: S. maltophilia.*
[3] *In order of frequency: Staphylococcus spp. (non-aureus), S. pneumoniae, S. mitis/S. oralis, ß-haemolytic Streptococcus spp. group A, S. anginosus, Enterococcus spp. (non-faecalis, non-faecium), L. monocytogenes.*

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-CAR 2023

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
amoxicillin/ampicillin	40	23	57 (42 - 72)	1359	41 (39 - 44)
co-amoxiclav ocuti	40	16	40 (26 - 56)	1433	30 (28 - 33)
piperacillin-tazobactam	40	1	3 (0 - 16)	1379	6 (4 - 7)
cefuroxime	40	7	18 (9 - 32)	1383	16 (14 - 18)
cefotaxime/ceftriaxone non-men	40	5	13 (5 - 27)	1360	10 (9 - 12)
ceftazidime	40	4	10 (4 - 24)	1415	8 (7 - 10)
meropenem/imipenem non-men	40	0	0 (NA - NA)	1362	0 (0 - 1)
ciprofloxacin non-men	40	13	32 (20 - 48)	1433	13 (11 - 15)
gentamicin	40	5	13 (5 - 27)	1432	5 (4 - 6)
tobramycin	40	6	15 (7 - 30)	1389	5 (4 - 6)
co-trimoxazole	40	14	35 (22 - 51)	1433	20 (18 - 22)
MDOT ocuti	40	7	18 (9 - 32)	1433	5 (4 - 6)
co-amoxiclav + ciprofloxacin - ocuti	40	8	20 (10 - 35)	1433	8 (7 - 10)
	40	5	13 (5 - 27)		
cefuroxime + ciprofloxacin	40	4	10 (4 - 24)		
cefuroxime + gentamicin	40	2	5 (1 - 18)	1329	3 (2 - 4)
cefotaxime/ceftriaxone + ciprofloxacin - non-men	40	3	7 (2 - 21)	1360	6 (5 - 7)
cefotaxime/ceftriaxone + gentamicin - non-men	40	2	5 (1 - 18)	1359	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.
ocuti = According to breakpoint for oral administration in infections originating from the urinary tract.
non-men = According to breakpoint for indications other than meningitis.
MDOT = multidrug resistance to oral therapy, defined as resistance to all of the following oral agents: co-amoxiclav (according to the breakpoint for indications other than uncomplicated urinary tract infections), ciprofloxacin, and co-trimoxazole.

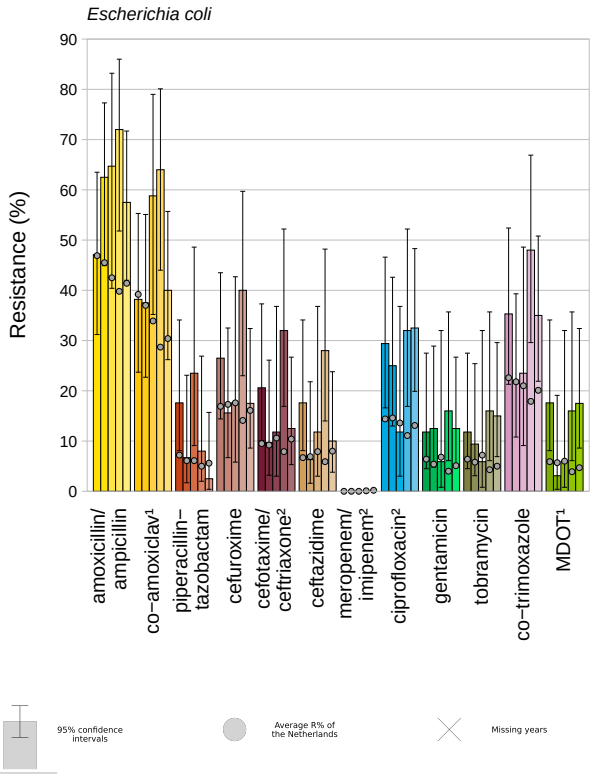

Figure 4.3.1.1 Trends in antibiotic resistance (from left to right 2019 to 2023) among diagnostic isolates of *E. coli* from patients admitted to intensive care units in ISIS-CAR*,**

* *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.
MDOT = multidrug resistance to oral therapy, defined as resistance to all of the following oral agents: co-amoxiclav (according to the breakpoint for indications other than uncomplicated urinary tract infections), ciprofloxacin, and co-trimoxazole.
[1] *ocuti = According to breakpoint for oral administration in infections originating from the urinary tract.*
[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-CAR 2023

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
co-amoxiclav ocuti	17	3	18 (6 - 43)	349	18 (15 - 23)
piperacillin-tazobactam	17	2	12 (3 - 37)	323	15 (11 - 19)
cefuroxime	17	1	6 (1 - 32)	337	18 (14 - 23)
cefotaxime/ceftriaxone non-men	17	0	0 (NA - NA)	337	11 (8 - 15)
ceftazidime	17	0	0 (NA - NA)	346	9 (7 - 13)
meropenem/imipenem non-men	17	0	0 (NA - NA)	334	1 (1 - 4)
ciprofloxacin non-men	17	1	6 (1 - 32)	350	13 (10 - 17)
gentamicin	17	0	0 (NA - NA)	350	6 (4 - 9)
tobramycin	17	0	0 (NA - NA)	342	8 (6 - 12)
co-trimoxazole	17	2	12 (3 - 37)	350	10 (8 - 14)
MDOT ocuti	17	0	0 (NA - NA)	349	5 (3 - 7)
co-amoxiclav + ciprofloxacin - ocuti	17	0	0 (NA - NA)	349	7 (5 - 11)
	17	0	0 (NA - NA)		
cefuroxime + ciprofloxacin	17	0	0 (NA - NA)		
cefuroxime + gentamicin	17	0	0 (NA - NA)	327	6 (3 - 9)
cefotaxime/ceftriaxone + ciprofloxacin - non-men	17	0	0 (NA - NA)	337	8 (6 - 11)
cefotaxime/ceftriaxone + gentamicin - non-men	17	0	0 (NA - NA)	337	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.
ocuti = According to breakpoint for oral administration in infections originating from the urinary tract.
non-men = According to breakpoint for indications other than meningitis.
MDOT = multidrug resistance to oral therapy, defined as resistance to all of the following oral agents: co-amoxiclav (according to the breakpoint for indications other than uncomplicated urinary tract infections), ciprofloxacin, and co-trimoxazole.

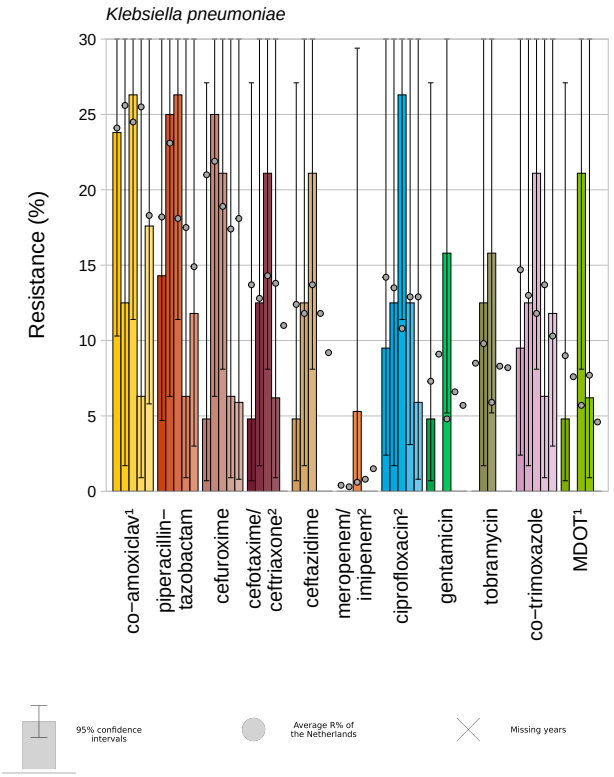

Figure 4.3.2.1 Trends in antibiotic resistance (from left to right 2019 to 2023) among diagnostic isolates of *K. pneumoniae* from patients admitted to intensive care units in ISIS-CAR*

* *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.
MDOT = multidrug resistance to oral therapy, defined as resistance to all of the following oral agents: co-amoxiclav (according to the breakpoint for indications other than uncomplicated urinary tract infections), ciprofloxacin, and co-trimoxazole.
[1] *ocuti = According to breakpoint for oral administration in infections originating from the urinary tract.*
[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-CAR 2023

	Aruba			the Netherlands	
Antibiotic	N	R	R% (95%-CI)	N	R% (95%-CI)
amoxicillin/ampicillin	6	0	0 (NA - NA)	180	21 (15 - 27)
co-amoxiclav ocuti	6	0	0 (NA - NA)	202	7 (5 - 12)
piperacillin-tazobactam	6	0	0 (NA - NA)	196	0 (0 - 100)
cefuroxime	6	0	0 (NA - NA)	195	2 (1 - 5)
cefotaxime/ceftriaxone non-men	6	0	0 (NA - NA)	186	2 (1 - 5)
ceftazidime	6	0	0 (NA - NA)	200	2 (0 - 5)
meropenem non-men	6	0	0 (NA - NA)	199	0 (NA - NA)
ciprofloxacin non-men	6	0	0 (NA - NA)	202	8 (5 - 13)
gentamicin	6	0	0 (NA - NA)	171	7 (4 - 12)
tobramycin	6	0	0 (NA - NA)	172	6 (3 - 10)
co-trimoxazole	6	0	0 (NA - NA)	202	23 (18 - 30)
MDOT ocuti	6	0	0 (NA - NA)	199	2 (0 - 5)
co-amoxiclav + ciprofloxacin - ocuti	6	0	0 (NA - NA)	199	2 (0 - 5)
	6	0	0 (NA - NA)		
cefuroxime + ciprofloxacin	6	0	0 (NA - NA)		
cefuroxime + gentamicin	6	0	0 (NA - NA)	153	2 (1 - 6)
cefotaxime/ceftriaxone + ciprofloxacin - non-men	6	0	0 (NA - NA)	186	1 (0 - 4)
cefotaxime/ceftriaxone + gentamicin - non-men	6	0	0 (NA - NA)	155	2 (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.
ocuti = According to breakpoint for oral administration in infections originating from the urinary tract.
non-men = According to breakpoint for indications other than meningitis.
MDOT = multidrug resistance to oral therapy, defined as resistance to all of the following oral agents: co-amoxiclav (according to the breakpoint for indications other than uncomplicated urinary tract infections), ciprofloxacin, and co-trimoxazole.

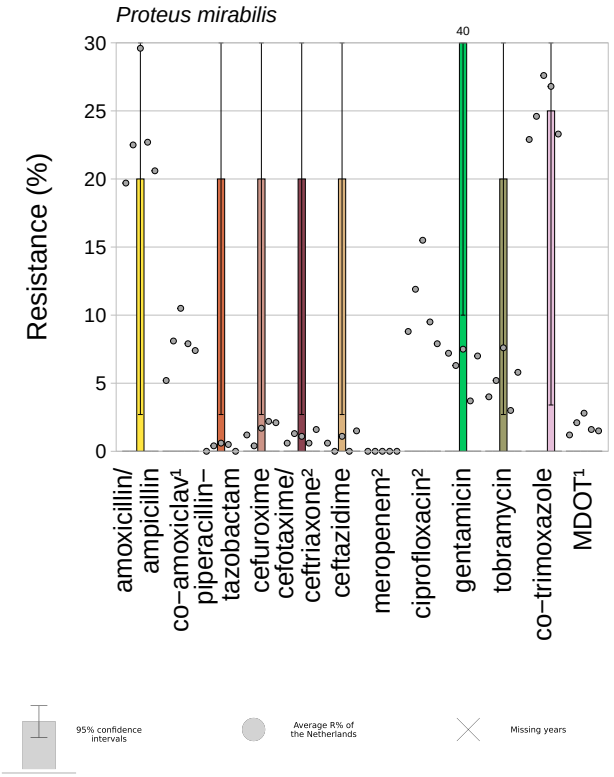

Figure 4.3.3.1 Trends in antibiotic resistance (from left to right 2019 to 2023) among diagnostic isolates of *P. mirabilis* from patients admitted to intensive care units in ISIS-CAR*

* *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.
MDOT = multidrug resistance to oral therapy, defined as resistance to all of the following oral agents: co-amoxiclav (according to the breakpoint for indications other than uncomplicated urinary tract infections), ciprofloxacin, and co-trimoxazole.
[1] *ocuti = According to breakpoint for oral administration in infections originating from the urinary tract.*
[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-CAR 2023

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
piperacillin-tazobactam	13	5	38 (17 - 66)	504	13 (10 - 16)
ceftazidime	13	1	8 (1 - 39)	596	9 (7 - 12)
imipenem	11	1	9 (1 - 44)	573	8 (6 - 11)
meropenem non-men	13	1	8 (1 - 39)	593	3 (2 - 4)
ciprofloxacin	13	2	15 (4 - 45)	596	10 (8 - 13)
tobramycin	13	0	0 (NA - NA)	587	2 (1 - 4)
ciprofloxacin + tobramycin	13	0	0 (NA - NA)	587	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.
non-men = According to breakpoint for indications other than meningitis.

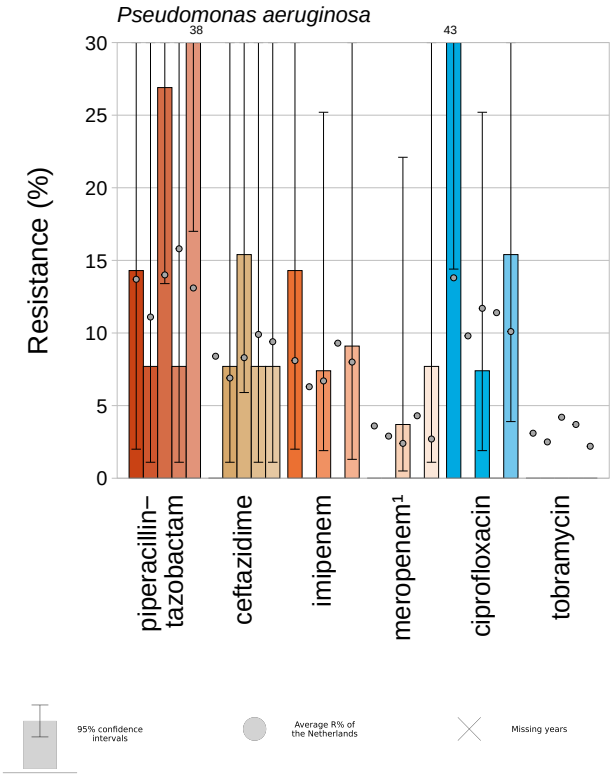

Figure 4.3.4.1 Trends in antibiotic resistance (from left to right 2019 to 2023) among diagnostic isolates of *P. aeruginosa* from patients admitted to intensive care units in ISIS-CAR*

* *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] *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-CAR 2023

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
meropenem/imipenem non-men	6	0	0 (NA - NA)	363	0 (0 - 2)
ciprofloxacin non-men	6	0	0 (NA - NA)	377	4 (2 - 6)
gentamicin	6	0	0 (NA - NA)	376	5 (3 - 8)
tobramycin	6	0	0 (NA - NA)	374	5 (3 - 8)
co-trimoxazole	6	0	0 (NA - NA)	377	5 (3 - 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-men = According to breakpoint for indications other than meningitis.

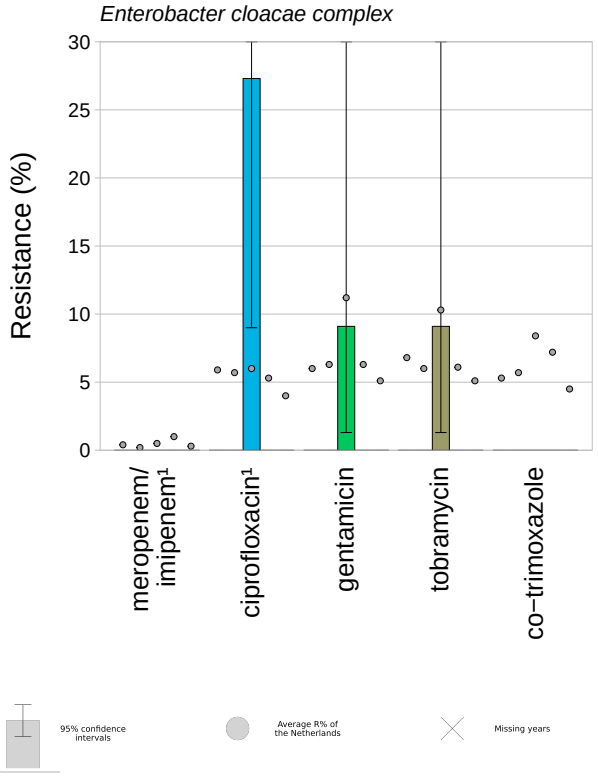

Figure 4.3.5.1 Trends in antibiotic resistance (from left to right 2019 to 2023) among diagnostic isolates of *E. cloacae* complex from patients admitted to intensive care units in ISIS-CAR*

* *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] *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-CAR 2023

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
meropenem/imipenem non-men	6	0	0 (NA - NA)	107	3 (1 - 8)
ciprofloxacin	3	0	0 (NA - NA)	95	6 (3 - 13)
gentamicin	6	0	0 (NA - NA)	109	6 (2 - 12)
tobramycin	6	0	0 (NA - NA)	107	6 (3 - 12)
co-trimoxazole	6	0	0 (NA - NA)	107	5 (2 - 11)

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.

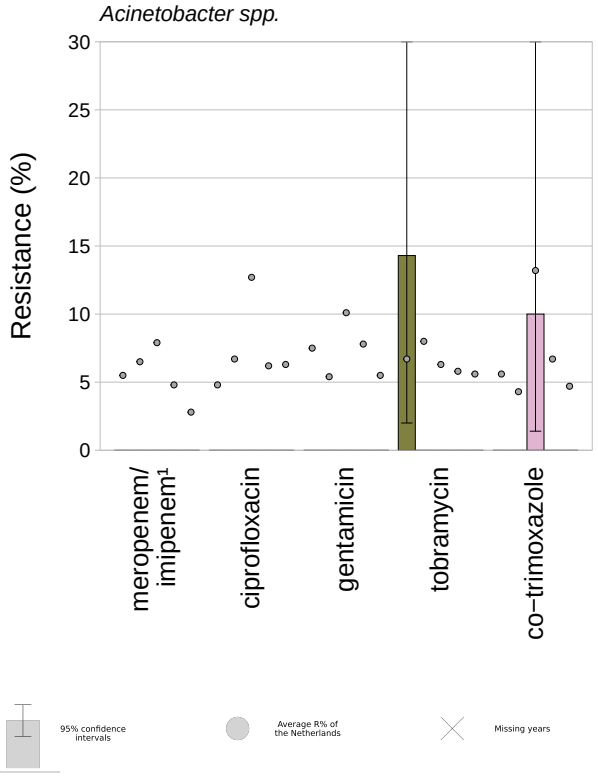

Figure 4.3.6.1 Trends in antibiotic resistance (from left to right 2019 to 2023) among diagnostic isolates of *Acinetobacter* spp. from patients admitted to intensive care units in ISIS-CAR*

* *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] *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-CAR 2023

	Aruba			the Netherlands	
Antibiotic	N	R	R% (95%-CI)	N	R% (95%-CI)
vancomycin	11	0	0 (NA - NA)	486	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-CAR 2023

	Aruba			the Netherlands	
Antibiotic	N	R	R% (95%-CI)	N	R% (95%-CI)
amoxicillin/ampicillin	2	0	0 (NA - NA)	595	88 (85 - 90)
vancomycin	2	0	0 (NA - NA)	678	1 (0 - 2)
linezolid	2	0	0 (NA - NA)	558	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.

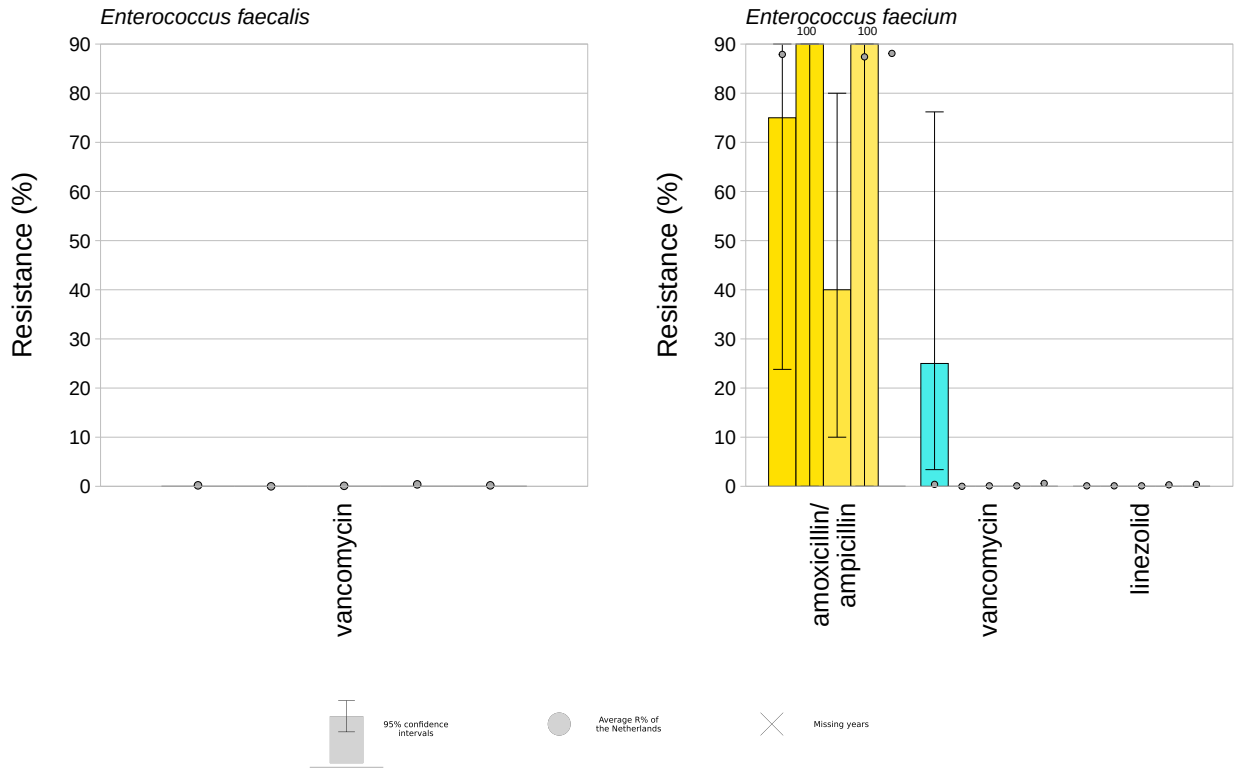

Figure 4.3.7.1 Trends in antibiotic resistance (from left to right 2019 to 2023) among diagnostic isolates of *E. faecalis* and *E. faecium* from patients admitted to intensive care units in ISIS-CAR*,**

* *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*

Table 4.3.8.1 Resistance levels among diagnostic isolates of *S. aureus* from patients admitted to intensive care units, ISIS-CAR 2023

Antibiotic	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
levofloxacin	21	2	10 (2 - 31)	516	2 (1 - 3)
clindamycin incl. inducible resistance[1]	21	3	14 (5 - 36)	1602	15 (14 - 17)
doxycycline/tetracycline	21	2	10 (2 - 31)	1466	4 (3 - 5)
linezolid	21	0	0 (NA - NA)	1530	0 (0 - 1)
co-trimoxazole	21	2	10 (2 - 31)	1603	1 (1 - 2)
MRSA	21	2	10 (2 - 31)	1608	4 (3 - 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.
NA = not applicable.
MRSA = Methicillin resistance Staphylococcus aureus. For estimation method of MRSA see section 4.1.1 'calculation of resistance levels' of the Nethmap 2024 report for more detailed information.
[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 2024 report for more detailed information).*

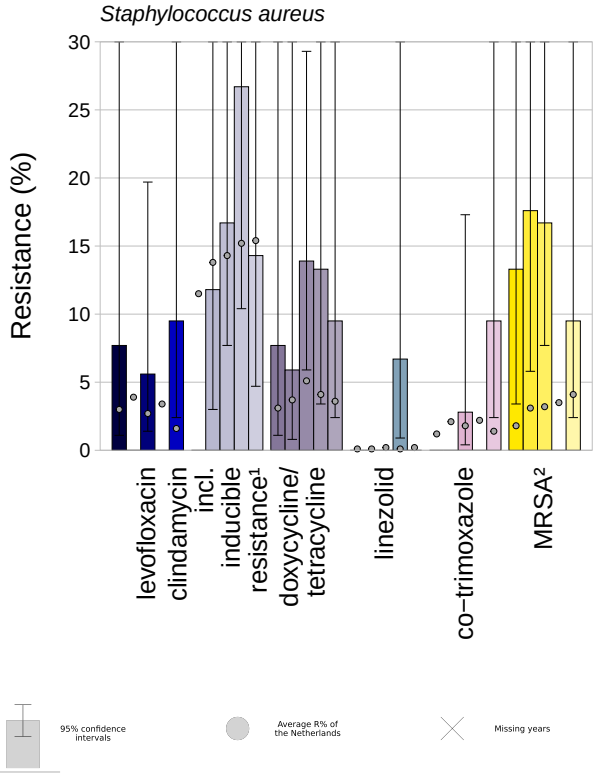

Figure 4.3.8.1 Trends in antibiotic resistance (from left to right 2019 to 2023) among diagnostic isolates of *S. aureus* patients admitted to intensive care units in ISIS-CAR*

* *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] *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 2024 report for more detailed information).*
[2] *MRSA = Methicillin resistance Staphylococcus aureus. For estimation method of MRSA see section 4.1.1 'calculation of resistance levels' of the Nethmap 2024 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), ESBL (section 5.5) and CRAB (section 5.6).

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

The percentages of carbapenem-resistant and carbapenemase-producing *E. coli*, *K. pneumoniae*, *Enterobacter cloacae* complex, and other Enterobacterales 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 2023. 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 2024 report, available on the website of the RIVM.

Table 5.1.0.1 Carbapenem-resistant or carbapenem-producing *E. coli*, ISIS-CAR 2023

	Aruba			the Netherlands	
Type of setting	N	R	R% (95%-CI)	N	R% (95%-CI)
General practitioner	392	0	0 (NA - NA)	126971	0 (0 - 0)
Outpatient departments	227	0	0 (NA - NA)	23897	0 (0 - 0)
Inpatient departments excl. intensive care units	541	1	0 (0 - 1)	31771	0 (0 - 0)
Intensive care units	40	0	0 (NA - NA)	1373	0 (0 - 1)
Total	1200	1	0 (0 - 1)	184012	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 2023.

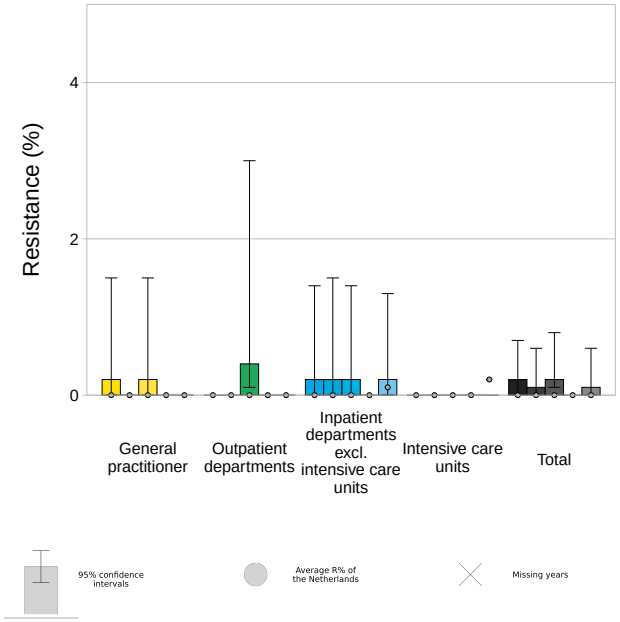

Figure 5.1.0.1 Carbapenem-resistant or carbapenem-producing *E. coli* compared to the total number of *E.coli* isolates in Aruba (from left to right 2019 to 2023), based on ISIS-CAR data*,**

* *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.*
** *Y axis of the figures differs from the standard format.*
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 2023.
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-CAR 2023

Type of setting	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
General practitioner	96	0	0 (NA - NA)	17631	0 (0 - 0)
Outpatient departments	107	0	0 (NA - NA)	5142	0 (0 - 0)
Inpatient departments excl. intensive care units	181	0	0 (NA - NA)	6287	1 (0 - 1)
Intensive care units	17	0	0 (NA - NA)	328	2 (1 - 4)
Total	401	0	0 (NA - NA)	29388	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 2023.

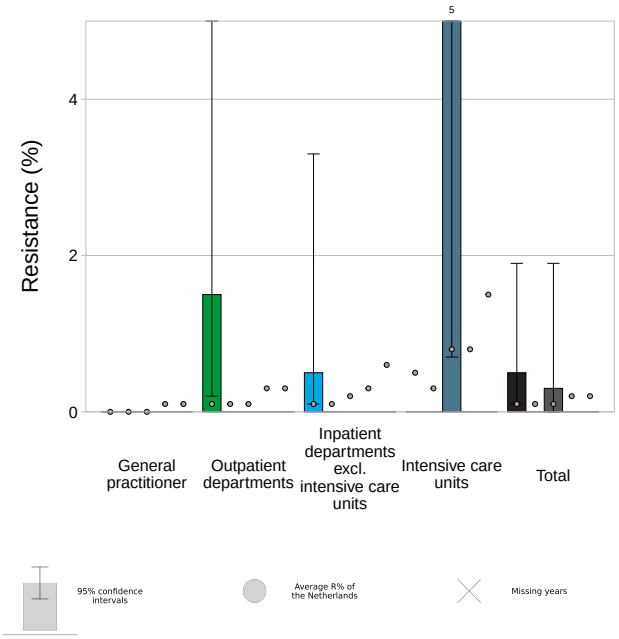

Figure 5.1.0.2 Carbapenem-resistant or carbapenem-producing *K. pneumoniae* compared to the total number of *K. pneumoniae* isolates in Aruba (from left to right 2019 to 2023), based on ISIS-CAR data*,**

* *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.*
** *Y axis of the figures differs from the standard format.*
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 2023.
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 5.1.0.3 Carbapenem-resistant or carbapenem-producing *Enterobacter cloacae* complex, ISIS-CAR 2023

Type of setting	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
General practitioner	12	0	0 (NA - NA)	4172	0 (0 - 0)
Outpatient departments	30	0	0 (NA - NA)	2373	0 (0 - 0)
Inpatient departments excl. intensive care units	55	0	0 (NA - NA)	3312	0 (0 - 0)
Intensive care units	6	0	0 (NA - NA)	350	0 (0 - 100)
Total	103	0	0 (NA - NA)	10207	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 Enterobacter cloacae complex isolates 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 2023.

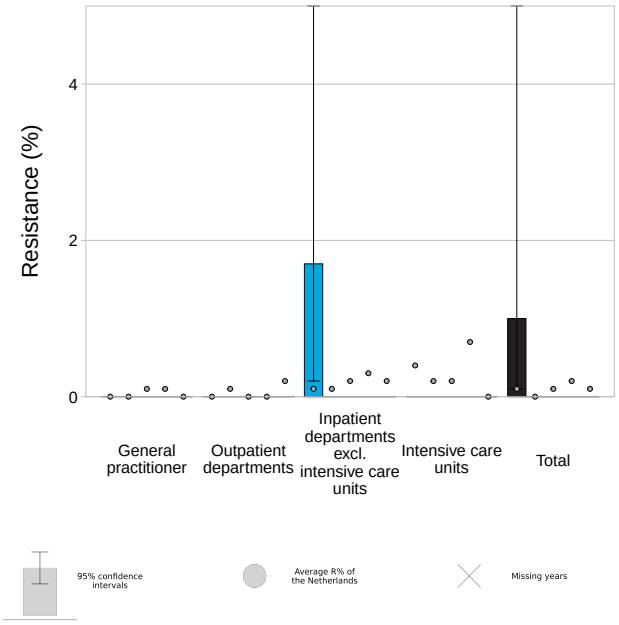

Figure 5.1.0.3 Carbapenem-resistant or carbapenem-producing *Enterobacter cloacae* complex isolates compared to the total number of *Enterobacter cloacae* complex isolates in Aruba (from left to right 2019 to 2023), based on ISIS-CAR data*,**

** 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.*
*** Y axis of the figures differs from the standard format.*
The percentage of carbapenem-resistant or carbapenem-producing Enterobacter cloacae complex isolates 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 2023.
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 5.1.0.4 Other carbapenem-resistant or carbapenem-producing *Enterobacterales*, ISIS-CAR 2023

Type of setting	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
General practitioner	109	0	0 (NA - NA)	32927	0 (0 - 0)
Outpatient departments	214	1	0 (0 - 3)	12303	0 (0 - 0)
Inpatient departments excl. intensive care units	316	0	0 (NA - NA)	15129	0 (0 - 0)
Intensive care units	27	0	0 (NA - NA)	1306	0 (0 - 1)
Total	666	1	0 (0 - 1)	61665	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 other carbapenem-resistant or carbapenem-producing Enterobacterales isolates 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 2023.

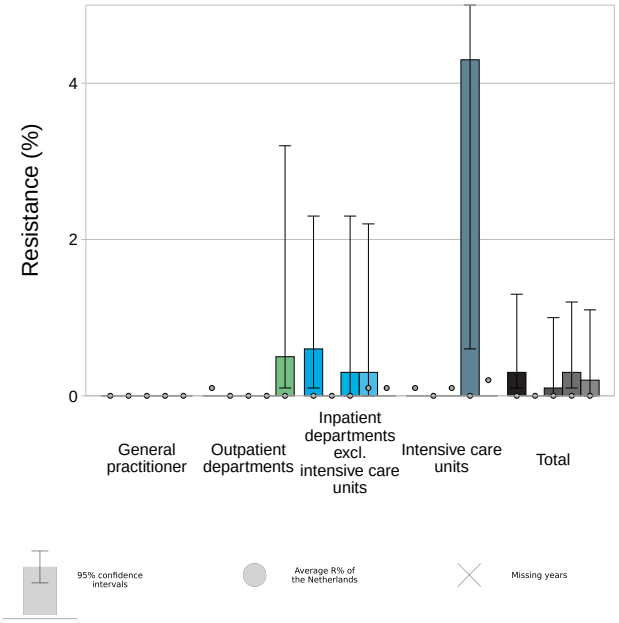

Figure 5.1.0.4 Other carbapenem-resistant or carbapenem-producing Enterobacterales isolates compared to the total number of Enterobacterales isolates in Aruba (from left to right 2019 to 2023), based on ISIS-CAR data*,**

** 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.*
*** Y axis of the figures differs from the standard format.*
The percentage of other carbapenem-resistant or carbapenem-producing Enterobacterales isolates 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 2023.
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 2023, 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-resistent Enterococci' of the Nethmap 2024 report, available on the website of the RIVM.

Table 5.2.0.1 Vancomycin-resistant *E. faecium* in diagnostic isolates, ISIS-CAR 2023

	Aruba			the Netherlands	
Type of setting	N	R	R% (95%-CI)	N	R% (95%-CI)
Inpatient departments excl. intensive care units	13	0	0 (NA - NA)	2611	0 (0 - 1)
Intensive care units	2	0	0 (NA - NA)	546	1 (0 - 2)
Total	15	0	0 (NA - NA)	4199	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.

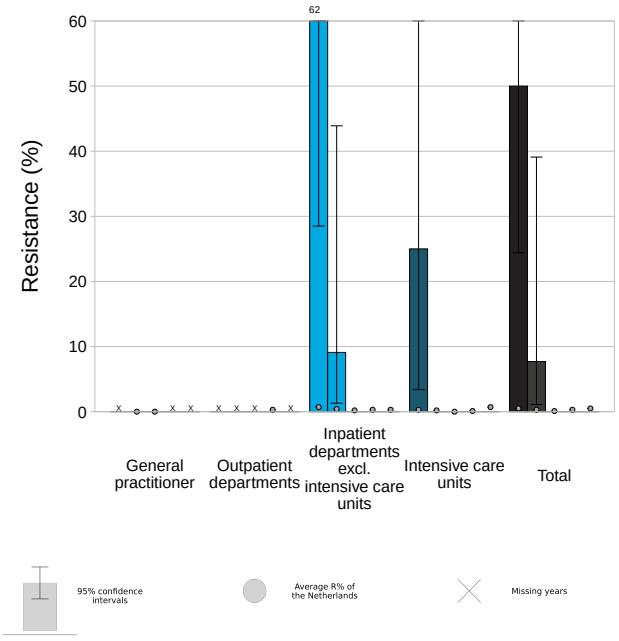

Figure 5.2.0.1 Trends in vancomycin-resistant *E. faecium* in diagnostic isolates in Aruba (from left to right 2019 to 2023), based on ISIS-CAR data*,**

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

5.3 Methicillin-resistant *Staphylococcus aureus* (MRSA)

S. aureus isolates, including MRSA, that were sampled between 2019 and 2023 were identified. The first diagnostic *S. aureus* isolate per patient per year from blood, cerebrosinal 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, *mecC* 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 2024 report, available on the website of the RIVM.

Table 5.3.0.1 Methicillin-resistant *S. aureus* (MRSA), ISIS-CAR 2023

	Aruba			the Netherlands	
Type of setting	N	R	R% (95%-CI)	N	R% (95%-CI)
General practitioner	70	14	20 (12 - 31)	14608	4 (3 - 4)
Outpatient departments	122	13	11 (6 - 17)	20267	2 (2 - 3)
Inpatient departments excl. intensive care units	254	43	17 (13 - 22)	15066	3 (2 - 3)
Intensive care units	21	2	10 (2 - 31)	1608	4 (3 - 5)
Total	467	72	15 (12 - 19)	51549	3 (3 - 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.
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.

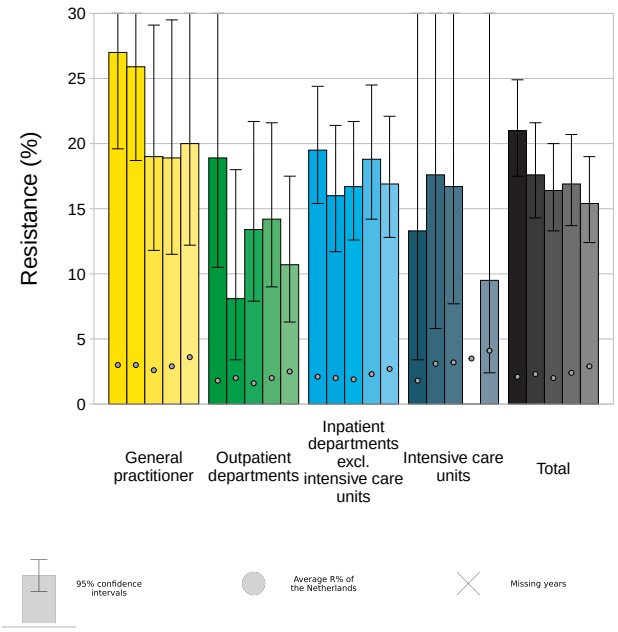

Figure 5.3.0.1 Trends in methicillin-resistant *S. aureus* isolates in Aruba (from left to right 2019 to 2023), based on ISIS-CAR data*

* *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 2024 report, available on the website of the RIVM.

Table 5.4.0.1 Phenotypical carbapenem-resistant *P. aeruginosa* (CRPA), ISIS-CAR 2023

	Aruba			the Netherlands	
Type of setting	N	R	R% (95%-CI)	N	R% (95%-CI)
General practitioner	17	0	0 (NA - NA)	6340	4 (3 - 4)
Outpatient departments	93	2	2 (1 - 8)	5117	6 (5 - 6)
Inpatient departments excl. intensive care units	113	2	2 (0 - 7)	6027	6 (5 - 6)
Intensive care units	13	1	8 (1 - 39)	553	8 (6 - 11)
Total	236	5	2 (1 - 5)	18037	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.
NA = not applicable.
Phenotypical carbapenem resistance was defined as resistance to meropenem and/or imipenem, based on reinterpretation of test-values according to EUCAST 2023.

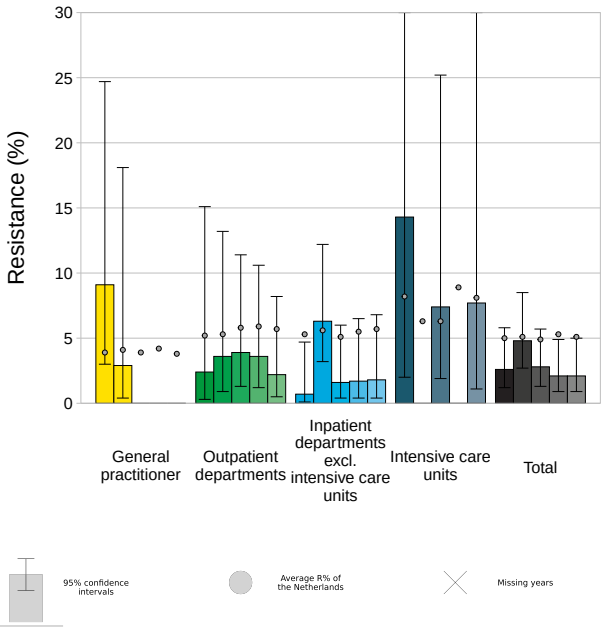

Figure 5.4.0.1 Phenotypical carbapenem-resistant *P. aeruginosa* compared to the total number of *P.aeruginosa* isolates in Aruba (from left to right 2019 to 2023), based on ISIS-CAR data*

* *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 2023.
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-CAR 2023

Type of setting	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
General practitioner	17	0	0 (NA - NA)	6252	1 (0 - 1)
Outpatient departments	90	0	0 (NA - NA)	4838	2 (2 - 3)
Inpatient departments excl. intensive care units	110	0	0 (NA - NA)	5651	2 (2 - 2)
Intensive care units	13	1	8 (1 - 39)	503	3 (2 - 5)
Total	230	1	0 (0 - 3)	17244	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.
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 2023.

Table 5.4.0.3 Carbapenem resistant MDR *P. aeruginosa* (MDR-PA-CRP) compared to the total number of MDR-*P. aeruginosa* isolates, ISIS-CAR 2023

Type of setting	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
Intensive care units	1	1	100 (NA - NA)	17	71 (46 - 87)
Total	1	1	100 (0 - 100)	266	65 (59 - 71)

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.
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 2023 using the meningitis clinical breakpoint.

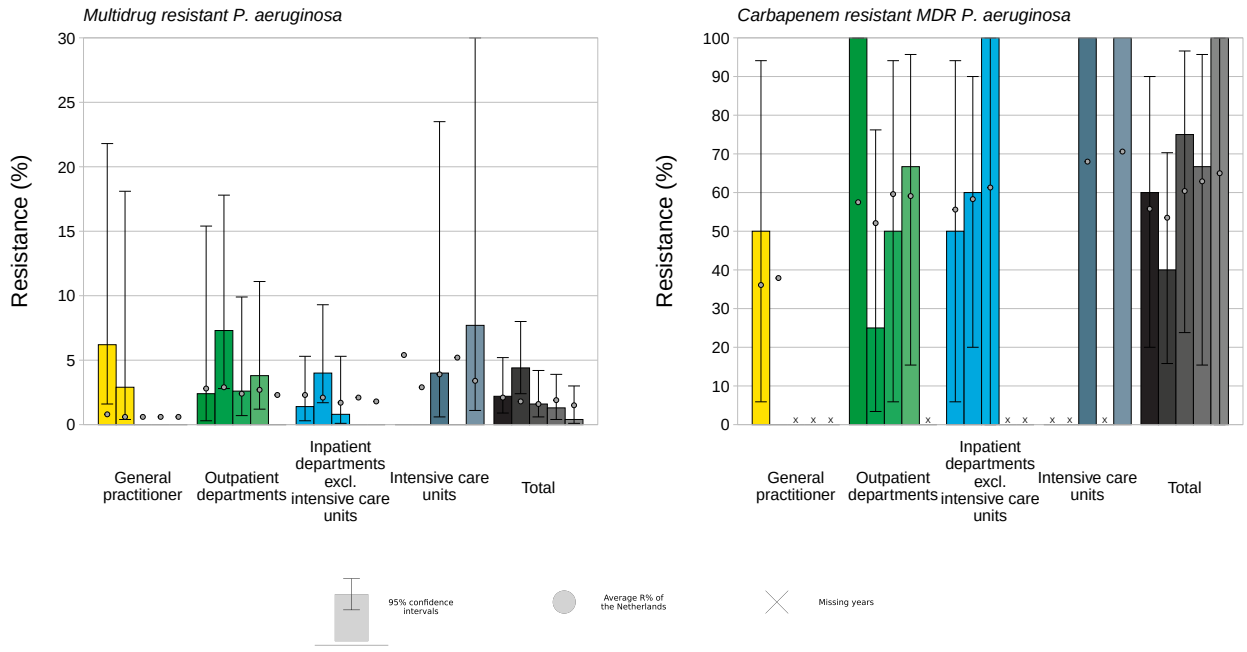

Figure 5.4.0.2 Multidrug resistant *P. aeruginosa* compared to the total number of *P. aeruginosa* isolates (left) and carbapenem resistant MDR-*P. aeruginosa* compared to the total number of MDR-*P. aeruginosa* isolates (right) in Aruba (from left to right 2019 to 2023), based on ISIS-CAR data*,**

* *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.*
** *Y axis of the figures differs from the standard format.*
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 2023.
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 (EBSL)

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 2023 clinical breakpoints. Further information on these methods can be found in Chapter 4.7.5 'Extended spectrum beta-lactamases' of the Nethmap 2024 report, available on the website of the RIVM.

Table 5.5.0.1 Extended spectrum beta-lactamase (ESBL) producing *E. coli*, ISIS-CAR 2023

	Aruba			the Netherlands	
Type of setting	N	R	R% (95%-CI)	N	R% (95%-CI)
General practitioner	390	20	5 (3 - 8)	130821	4 (4 - 4)
Outpatient departments	223	27	12 (8 - 17)	23796	6 (6 - 6)
Inpatient departments excl. intensive care units	538	59	11 (9 - 14)	31633	6 (6 - 7)
Intensive care units	40	5	13 (5 - 27)	1372	9 (8 - 11)
Total	1191	111	9 (8 - 11)	187622	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 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 2023.

Table 5.5.0.2 Extended spectrum beta-lactamase (ESBL) producing *E. coli* resistant to 3rd generation cephalosporins compared to the total number of *E. coli* isolates with a positive or negative confirmation test for ESBL production ISIS-CAR 2023

	Aruba			the Netherlands	
Type of setting	N	R	R% (95%-CI)	N	R% (95%-CI)
General practitioner	18	17	94 (69 - 99)	5335	87 (86 - 88)
Outpatient departments	27	25	93 (75 - 98)	1466	88 (86 - 89)
Inpatient departments excl. intensive care units	66	57	86 (76 - 93)	2049	89 (87 - 90)
Intensive care units	5	5	100 (0 - 100)	124	82 (75 - 88)
Total	116	104	90 (83 - 94)	8974	87 (87 - 88)

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 2023.

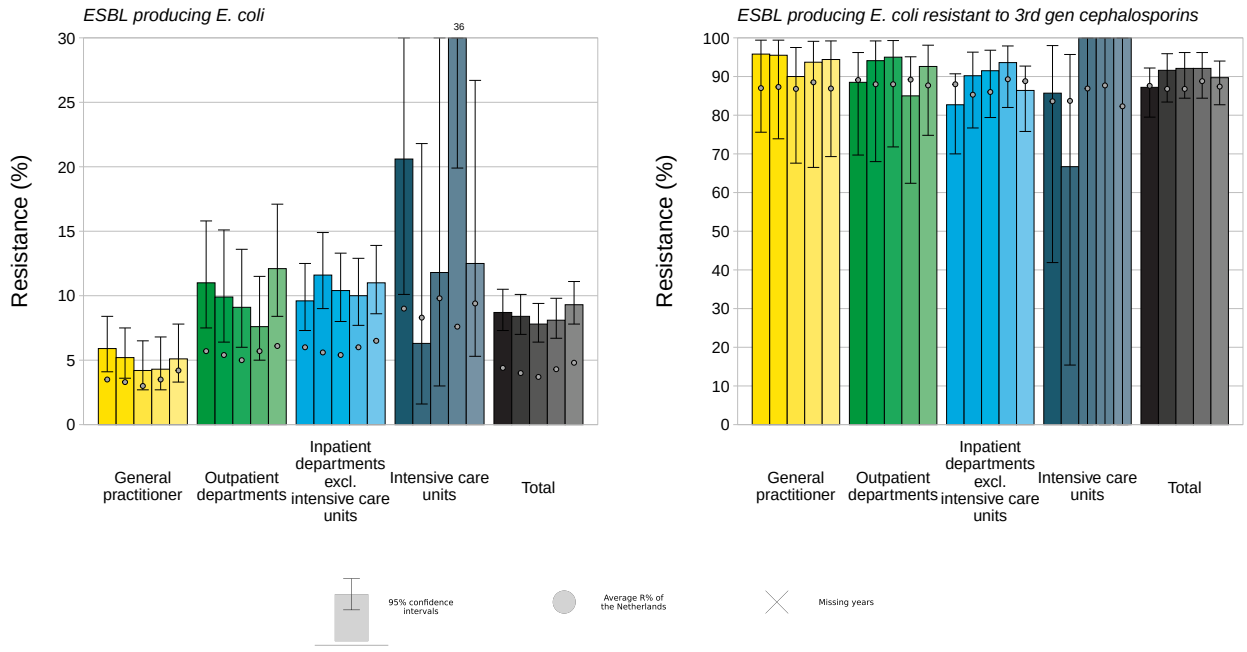

Figure 5.5.0.1 Extended spectrum beta-lactamase producing *E. coli* compared to the total number of *E.coli* isolates (left) and ESBL-producing *E. coli* resistant to 3rd generation cephalosporins compared to the total number of *E. coli* isolates with a positive or negative confirmation test for ESBL production (right) in Aruba (from left to right 2019 to 2023), based on ISIS-CAR 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.*
*** Y axis of the figures differs from the standard format.*
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 2023.
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 5.5.0.3 Extended spectrum beta-lactamase (ESBL) producing *K. pneumoniae*, ISIS-CAR 2023

Type of setting	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
General practitioner	96	7	7 (4 - 15)	18140	5 (4 - 5)
Outpatient departments	107	7	7 (3 - 13)	5193	8 (7 - 9)
Inpatient departments excl. intensive care units	181	13	7 (4 - 12)	6317	9 (8 - 9)
Intensive care units	17	1	6 (1 - 32)	330	11 (8 - 15)
Total	401	28	7 (5 - 10)	29980	6 (6 - 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.

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 testvalues according to EUCAST 2023.

Table 5.5.0.4 Extended spectrum beta-lactamase (ESBL) producing *K. pneumoniae* resistant to 3rd generation cephalosporins compared to the total number of *K. pneumoniae* isolates with a positive or negative confirmation test for ESBL production ISIS-CAR 2023

Type of setting	Aruba			the Netherlands	
	N	R	R% (95%-CI)	N	R% (95%-CI)
General practitioner	7	6	86 (42 - 98)	771	87 (85 - 89)
Outpatient departments	6	6	100 (0 - 100)	395	88 (85 - 91)
Inpatient departments excl. intensive care units	13	11	85 (55 - 96)	502	87 (84 - 90)
Total	26	23	88 (70 - 96)	1700	88 (86 - 89)

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 testvalues according to EUCAST 2023.

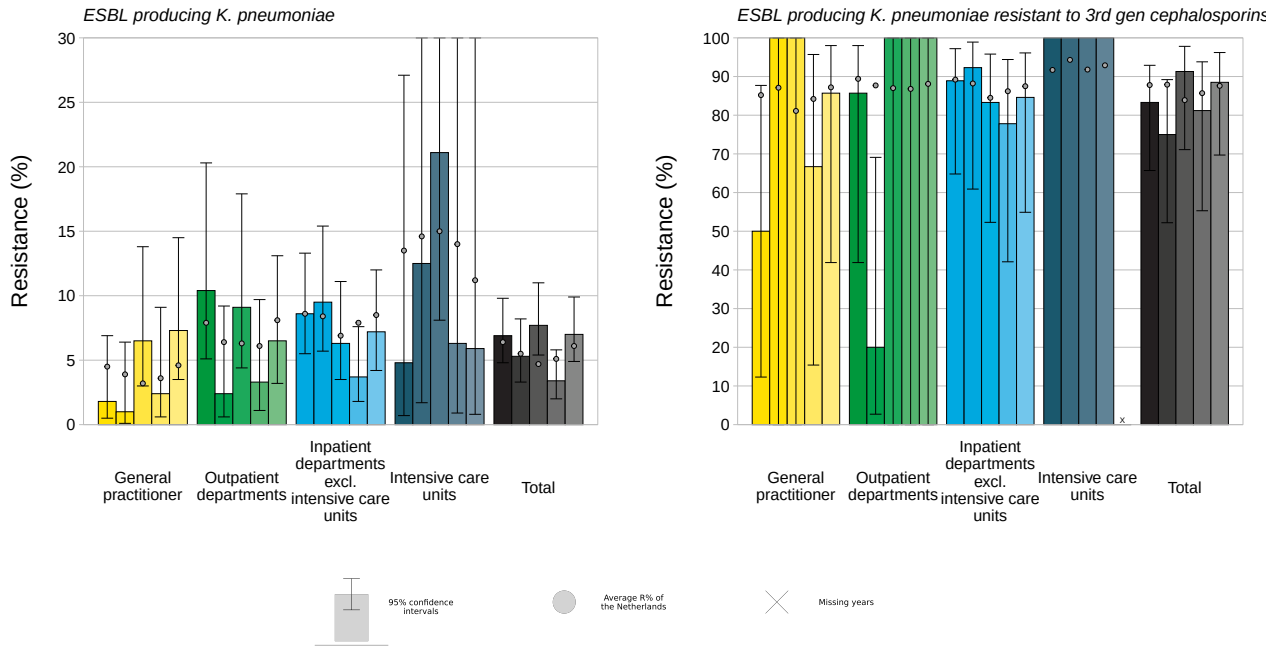

Figure 5.5.0.2 Extended spectrum beta-lactamase producing *K. pneumoniae* compared to the total number of *K. pneumoniae* isolates (left) and ESBL-producing *K. pneumoniae* resistant to 3rd generation cephalosporins compared to the total number of *K. pneumoniae* isolates with a positive or negative confirmation test for ESBL production (right) in Aruba (from left to right 2019 to 2023), based on ISIS-CAR 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.*
*** Y axis of the figures differs from the standard format.*
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 testvalues according to EUCAST 2023.
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.

5.6 Carbapenem-resistant *Acinetobacter baumannii-calcoaceticus* complex (CRAB)

The percentages of carbapenem-resistant *A. baumannii-calcoaceticus* complex 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 2023. 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 *A. baumannii-calcoaceticus* complex' of the Nethmap 2024 report, available on the website of the RIVM.

Table 5.6.0.1 Carbapenem-resistant *A. baumannii – calcoaceticus* complex, ISIS-CAR 2023

	Aruba			the Netherlands	
Type of setting	N	R	R% (95%-CI)	N	R% (95%-CI)
General practitioner	2	0	0 (NA - NA)	592	1 (0 - 2)
Outpatient departments	14	0	0 (NA - NA)	393	1 (0 - 2)
Inpatient departments excl. intensive care units	7	0	0 (NA - NA)	395	5 (3 - 7)
Intensive care units	3	0	0 (NA - NA)	85	5 (2 - 12)
Total	26	0	0 (NA - NA)	1465	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.
The percentage of carbapenem resistant A. baumannii-calcoaceticus complex was estimated based on 1) a positive test for carbapenemase production and/or 2) phenotypic resistance to meropenem and/or imipenem. The phenotypical tests were reinterpreted according to the 2023EUCAST breakpoints for meropenem (applying the cut-off of 8mg/L or 15mm) and/or imipenem (cut-off 4mg/L or 21mm).

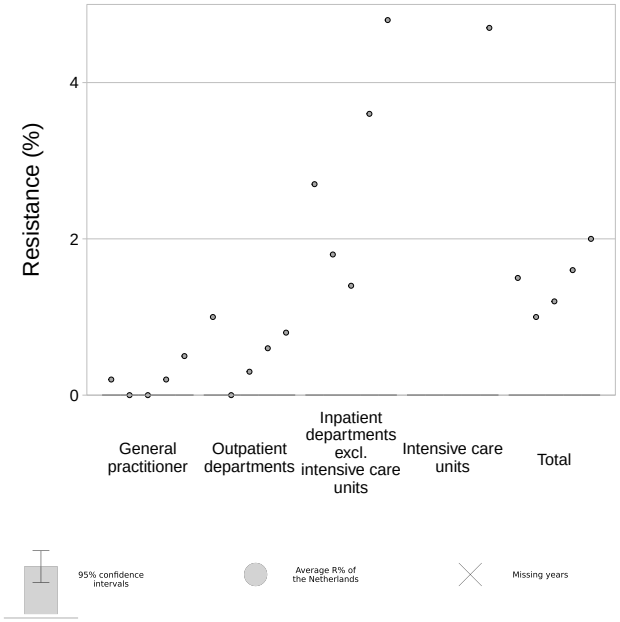

Figure 5.6.0.1 Trends in carbapenem-resistant *A. baumannii – calcoaceticus* complex isolates in Aruba (from left to right 2019 to 2023), based on ISIS-CAR data*

* *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 A. baumannii-calcoaceticus complex was estimated based on 1) a positive test for carbapenemase production and/or 2) phenotypic resistance to meropenem and/or imipenem. The phenotypical tests were reinterpreted according to the 2023EUCAST breakpoints for meropenem (applying the cut-off of 8mg/L or 15mm) and/or imipenem (cut-off 4mg/L or 21mm).
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.