

Appendices

Appendix 1: Anatomic therapeutic chemical classification of funded systemic antibiotics

ATC group ¹	Antibiotic agent	AWaRe classification ²
J01A: Tetracyclines	Doxycycline, Minocycline, Tetracycline	Access
J01C: Penicillins		
J01CA: Penicillins with extended spectrum	Amoxicillin	Access
J01CE: β -lactamase-sensitive penicillins	Phenoxymethylpenicillin, Benzylpenicillin, Benzathine penicillin, Procaine penicillin	Access
J01CF: β -lactamase-resistant penicillins	Flucloxacillin	Access
J01CR: Combinations of penicillins with beta-lactamase inhibitors	Amoxicillin and clavulanic acid	Access
J01D: Cephalosporins		
J01DB: First generation cephalosporins	Cefalexin, Cefazolin	Access
J01DC: Second generation cephalosporins	Cefaclor, Cefuroxime	Watch
J01DD: Third generation cephalosporins	Ceftriaxone	Watch
J01E: Sulfonamides and trimethoprim	Trimethoprim, Trimethoprim and sulfamethoxazole	Access
J01F: Macrolides and lincosamides		
J01FA: Macrolides	Azithromycin, Clarithromycin, Erythromycin, Roxithromycin	Watch
J01FF: Lincosamides	Clindamycin	Access
J01M: Quinolones	Ciprofloxacin, Moxifloxacin, Norfloxacin	Watch
J01X: Other antibacterials		
J01XA: Glycopeptides	Vancomycin	Watch
J01XE: Nitrofurantoin derivatives	Metronidazole, Ornidazole	Access
J01XE: Nitrofurantoin derivatives	Nitrofurantoin	Access
J01XX: Other	Colistin, Gentamicin, Methenamine, Sodium fusidate, Tobramycin, Vancomycin	Reserve, Access, Unclassified, Access, Watch, Watch

¹ WHO Collaborating Centre for Drug Statistics Methodology. International language for drug utilization research. Edition., [updated 14/11/2021; cited 10/03/2022. Available from: https://www.whocc.no/atc_ddd_index/

² Geneva: World Health Organization. WHO Access, Watch, Reserve (AWaRe) classification of antibiotics for evaluation and monitoring of use. 2021.

Appendix 2a: Antibiotic dispensings per antibiotic groups, stratified for 2012 to 2021, and 2012 to 2019.

Antibiotic groups—number of dispensings per 1000 inhabitants per year						
Antibiotic group	Number of dispensings per 1,000 inhabitants, year 2012	Number of dispensings per 1,000 inhabitants, year 2021	Delta: 2021 minus 2012 for number dispensings per 1,000 inhabitants	Average annual change between 2012–2021, RR (95% CI)	Delta: 2019 minus 2012 for number dispensings per 1,000 inhabitants	Average annual change in number of dispensings per 1,000 inhabitants between 2012–2019 RR (95% CI)
β-lactamase-sensitive penicillins	38	18	-20	-6.7 (-6.9 to -6.6)	-15	-4.3 (-4.5 to -4)
β-lactamase-resistant penicillins	108	87	-21	-2.5 (-2.6 to -2.4)	-15	-2.4 (-2.5 to -2.3)
Penicillins with extended spectrum	201	139	-62	-4.8 (-4.9 to -4.8)	-31	-2.6 (-2.7 to -2.5)
Combinations of penicillins with betalactamase inhibitors	134	91	-43	-4.5 (-4.6 to -4.4)	-37	-4.7 (-4.8 to -4.6)
Macrolides and lincosamides	124	54	-70	-8.4 (-8.5 to -8.3)	-51	-7.1 (-7.3 to -7)
First generation cephalosporins*	3	38	35	28.1 (27.7 to 28.4)	20	29.4 (28.9 to 30)
Second generation cephalosporins	19	9	-9	-6.2 (-6.4 to -5.9)	-2	-2.7 (-3 to -2.4)
Third generation cephalosporin	0	1	1	14.1 (12.8 to 15.4)	1	21.7 (19.7 to 23.8)
Tetracyclines	65	47	-18	-3.7 (-3.8 to -3.6)	-10	-3 (-3.1 to -2.8)
Quinolones	49	11	-39	-14.6 (-14.8 to -14.5)	-32	-14.5 (-14.8 to -14.3)
Sulfonamides and trimethoprim	76	42	-35	-5.7 (-5.8 to -5.6)	-18	-3.5 (-3.7 to -3.4)
Nitrofurantoin derivatives	19	34	14	6 (5.8 to 6.2)	3	0.9 (0.6 to 1.2)
Imidazole derivatives	28	28	0	-1.2 (-1.4 to -1.1)	0	-0.9 (-1.2 to -0.7)
Other+	0.6	3.1	2.5	21.6 (20.5 to 22.8)	0.3	3.5 (2 to 5.1)

*Increase in first-generation cephalosporins mainly attributable to increases in cefalexin
+ Increase in other antibiotics mainly attributable to increases in methenamine hippurate

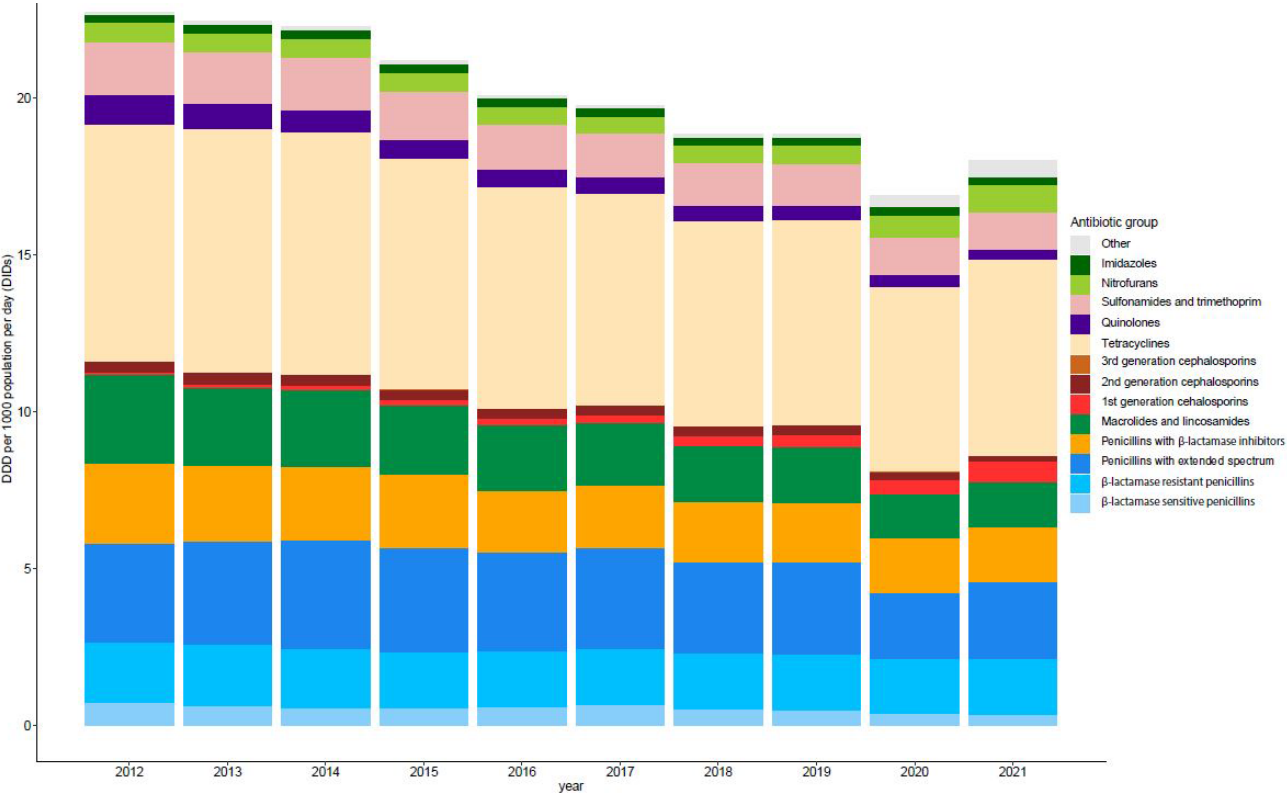
Appendix 2a (continued): Antibiotic dispensings per antibiotic groups, stratified for 2012 to 2021, and 2012 to 2019.

Antibiotic groups—defined daily doses per 1000 inhabitants per day (DIDs)						
Antibiotic group	DIDs, year 2012	DIDs, year 2021	Delta 2021 minus 2012 for DIDs	Average annual change in DIDs between 2012– 2021, Beta (95% CI)	Delta: 2019 minus 2012 for DIDs	Average annual change in DIDs between 2012–2019, Beta (95% CI)
β-lactamase-sensitive penicillins	0.73	0.36	-0.37	-0.03 (-0.05 to -0.02)	-0.24	-0.02 (-0.04 to 0)
β-lactamase-resistant penicillins	1.92	1.76	-0.15	-0.02 (-0.03 to -0.01)	-0.14	-0.03 (-0.04 to -0.02)
Penicillins with extended spectrum	3.15	2.47	-0.69	-0.11 (-0.17 to -0.05)	-0.19	-0.05 (-0.09 to -0.01)
Combinations of penicillins with betalactamase inhibitors	2.58	1.74	-0.84	-0.1 (-0.11 to -0.08)	-0.68	-0.1 (-0.13 to -0.08)
Macrolides and lincosamides	2.83	1.43	-1.40	-0.15 (-0.17 to -0.13)	-1.07	-0.15 (-0.17 to -0.13)
First generation cephalosporins*	0.07	0.67	0.60	0.06 (0.05 - 0.07)	0.33	0.04 (0.04 to 0.05)
Second generation cephalosporins	0.33	0.17	-0.16	-0.02 (-0.02 to -0.01)	-0.02	-0.01 (-0.01 to 0)
Third generation cephalosporin	0.00	0.01	0.00	0 (0 to 0)	0.00	0 (0 to 0)
Tetracyclines	7.58	6.27	-1.31	-0.2 (-0.25 to -0.16)	-1.05	-0.2 (-0.25 to -0.14)
Quinolones	0.93	0.32	-0.61	-0.06 (-0.07 to -0.05)	-0.49	-0.07 (-0.08 to -0.05)
Sulfonamides and trimethoprim	1.69	1.19	-0.50	-0.06 (-0.07 to -0.05)	-0.34	-0.05 (-0.07 to -0.04)
Nitrofurantoin derivatives	0.61	0.85	0.24	0.01 (0 to 0.03)	-0.04	-0.01 (-0.02 to 0)
Imidazole derivatives	0.24	0.26	0.02	0 (0 to 0)	0.01	0 (-0.01 to 0)
Other+	0.09	0.53	0.44	0.04 (0.01 to 0.06)	0.04	0 (0 to 0.01)

* Increase in first-generation cephalosporins mainly attributable to increases in cefalexin.

+ Increase in other antibiotics mainly attributable to increases in methenamine hippurate.

Appendix 2b: Defined daily doses per 1,000 inhabitants per day (DIDs) per antibiotic group



Appendix 3a: Analysis per WHO AWaRe groups

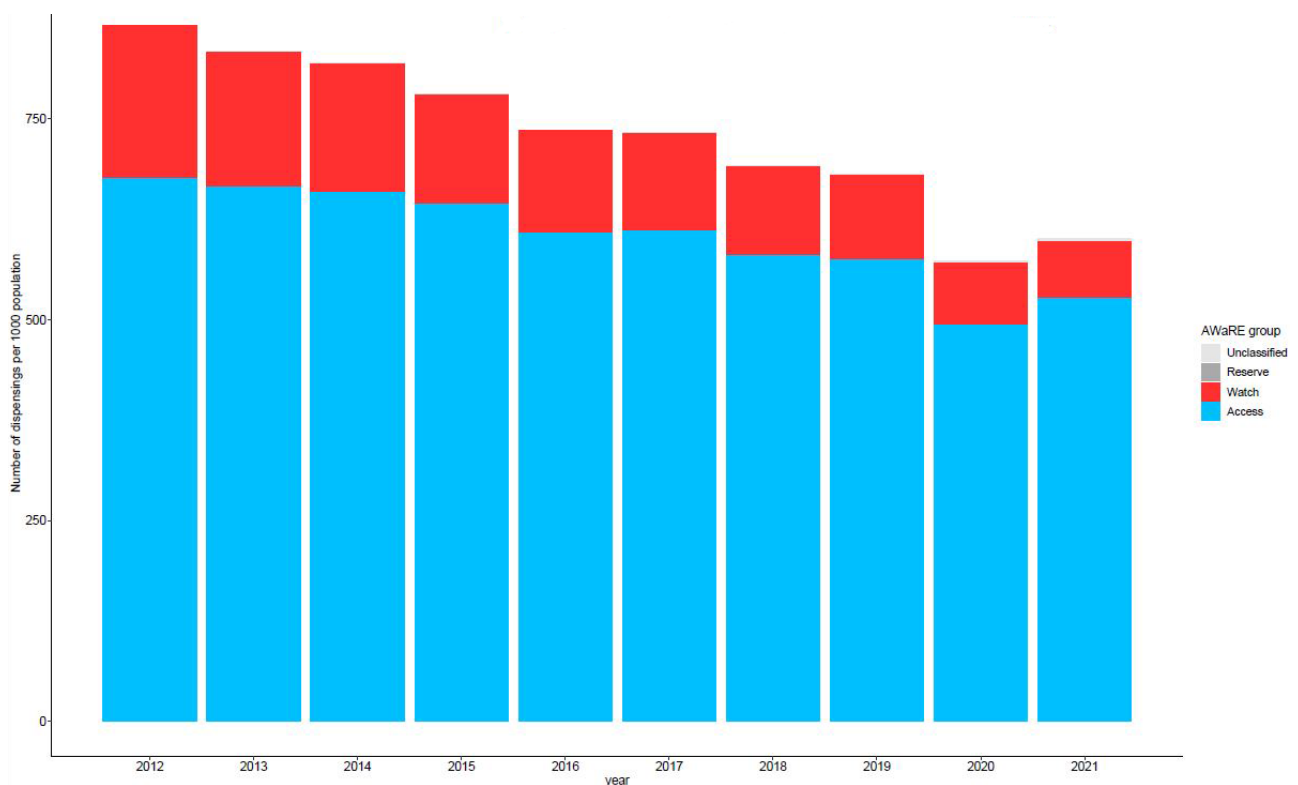
WHO AWaRe groups —number of dispensings per 1,000 inhabitants per year						
AWaRe	Number of dispensings per 1,000 inhabitants, year 2012	Number of dispensings per 1,000 inhabitants, year 2021	Delta 2021 to 2012 for number dispensings per 1,000 inhabitants	Average annual change between 2012-2021, RR (95% CI)	Delta: 2019 minus 2012 for number dispensings per 1,000 inhabitants	Average annual change in number of dispensings 2012–2019 RR (95% CI)
Access	675	527	-149	-3.2 (-3.2 to -3.1)	-101	-3.2 (-3.3 to -3.2)
Watch	191	71	-120	9.5 (-9.6 to -9.5)	-85	-9.9 (-10 to -9.8)
Reserve	0	0	0	12.1 (1.8 to 23.9)	0	14.5 (2.2 to 29.1)
Unclassified	0	3	2	26.7 (25.3 to 28.1)	0	17.6 (16.1 to 19.2)

Appendix 3a (continued): Analysis per WHO AWaRe groups

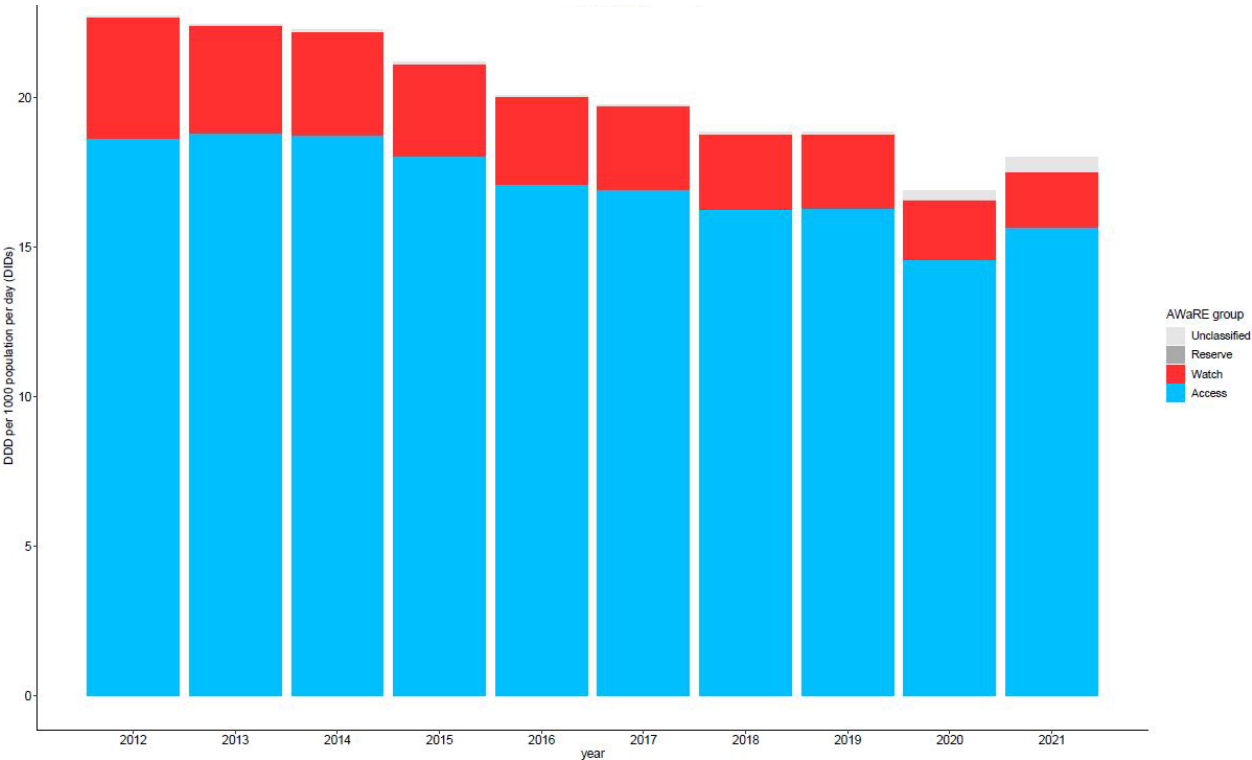
WHO AWaRe groups—defined daily doses per 1,000 inhabitants per day (DIDs) per antibiotic group						
AWaRe	DIDs, year 2012	DIDs, year 2021	Delta 2021 to 2012 for DIDs	Average annual change in DIDs between 2012–2021, Beta (95% CI)	Delta: 2019 minus 2012 for DIDs	Average annual change in DIDs Beta (95% CI)
Access	18.6	15.6	-3.0	-0.45 (-0.56 to -0.34)	-2.35	-0.42 (-0.53 to -0.32)
Watch	4.1	1.9	-2.2	-0.23 (-0.25 to -0.21)	-1.57	-0.22 (-0.26 to -0.19)
Reserve	0.0	0.0	0.0	0 (0 to 0)	0.00	0 (0 to 0)
Unclassified	0.1	0.5	0.4	0.04 (0.01 to 0.06)	0.04	0 (0 to 0.01)

DIDs: Defined daily doses per 1,000 inhabitants per day.

Appendix 3b: Dispensings per 1,000 inhabitants per WHO AWaRe group (figure).



Appendix 3c: Defined daily doses per 1,000 inhabitants per day (DIDs) per WHO AWaRe group (figure).



Appendix 4a: Stratified analysis for age and ethnicity.

Age groups—number of dispensings per 1,000 inhabitants per year						
Age groups	Number of dispensings per 1,000 inhabitants year 2012	Number of dispensings per 1,000 inhabitants year 2021	Delta 2021 to 2012 for number dispensings per 1,000 inhabitants	Average annual change between 2012–2021, RR (95% CI)	Delta 2019 to 2012 for number dispensings per 1,000 inhabitants	Average annual change between 2012–2019, RR (95% CI)
0–4 years	1,652	881	-772	-7.6 (-7.7 to -7.5)	-593	-5.6 (-5.7 to -5.5)
5–9 years	613	335	-278	-5.4 (-5.5 to -5.2)	-132	-1.6 (-1.8 to -1.4)
10–19 years	686	456	-229	-4.5 (-4.6 to -4.4)	-152	-3.4 (-3.5 to -3.2)
20–19 years	665	521	-144	-3.1 (-3.2 to -3.1)	-91	-2.6 (-2.7 to -2.5)
60 years and above	1,155	860	-296	-3.5 (-3.6 to -3.5)	-173	-3 (-3 to -2.9)

Appendix 4a (continued): Stratified analysis for age and ethnicity.

Ethnicity groups—number of dispensings per 1,000 inhabitants per year						
Ethnicity groups	Number of dispensings per 1,000 year 2012	Number of dispensings per 1,000 year 2021	Delta 2021 to 2012 for number dispensings per 1,000	Average annual change between 2012–2021, RR (95% CI)	Delta 2019 to 2012 for number dispensings per 1,000 inhabitants	Average annual change between 2012–2019, RR (95% CI)
Other	849	629	-220	-3.6 (-3.6 to -3.6)	-136	-2.8 (-2.8 to -2.7)
Māori	572	598	26	0.8 (0.7 to 1)	88	1.7 (1.5 to 1.9)
Pacific peoples	800	637	-163	-2.3 (-2.5 to -2.1)	19	0.3 (0 to 0.6)
Asian	357	378	-21	0.1 (0 to 0.3)	58	2 (1.8 to 2.2)

Appendix 5: International comparison for defined daily doses per 1,000 inhabitants per day.

