AMRDETECTOOL
Detection in 30 min

Update on the global situation of antimicrobial resistance. Impact of COVID-19

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WHO PRIORITY PATHOGENS FOR R&D OF NEW ANTIBIOTICS
March 2017

World Health Organization

Priority 1: CRITICAL#

Acinetobacter baumannii, carbapenem-resistant

Pseudomonas aeruginosa, carbapenem-resistant

Enterobacteriaceae*, carbapenem-resistant, 3rd generation cephalosporin-resistant

MAIN RESISTANT MICROORGANISMS

- Extended-spectrum β-lactamase (ESBL)-producing *Enterobacterales*
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- *Pseudomonas aeruginosa* and *Acinetobacter baumannii* multi, extensively and pandrug resistant

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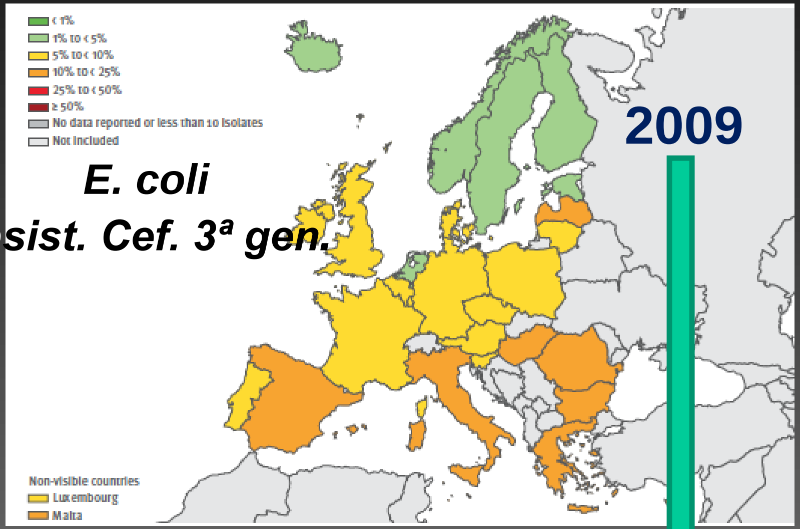
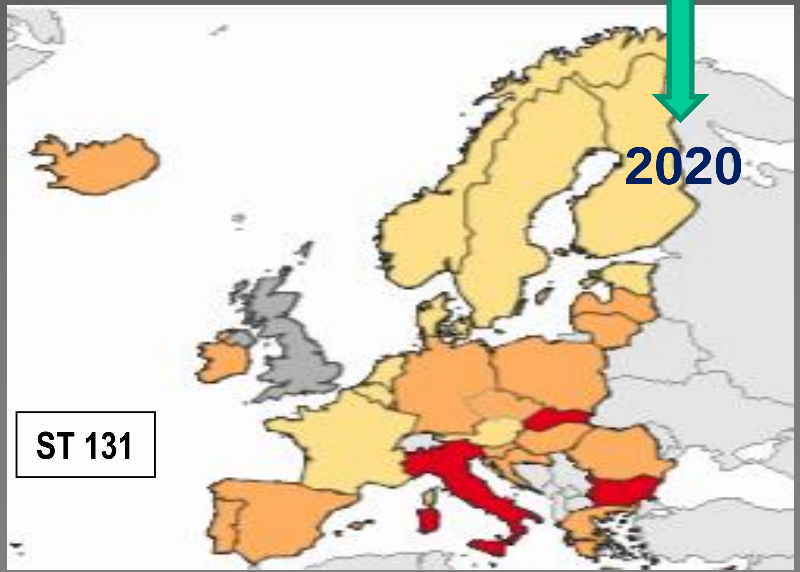
Enterobacteriales: ESBL

E. coli
Resist. Cef. 3ª gen.

2009



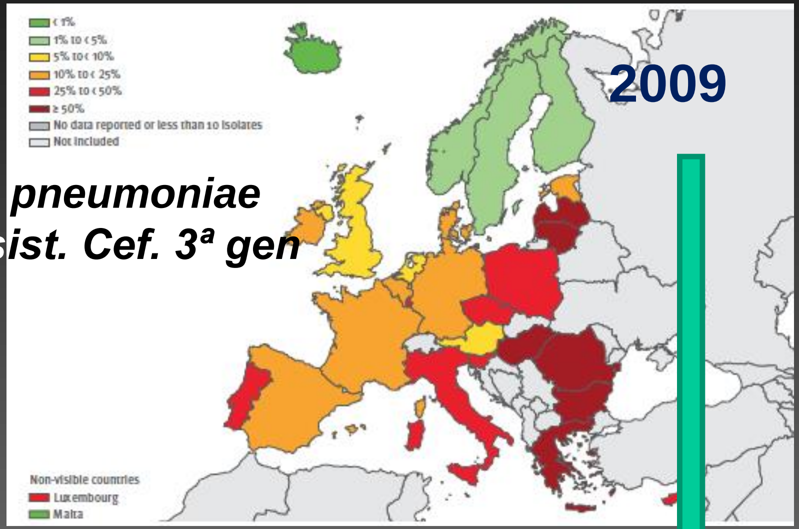
2020



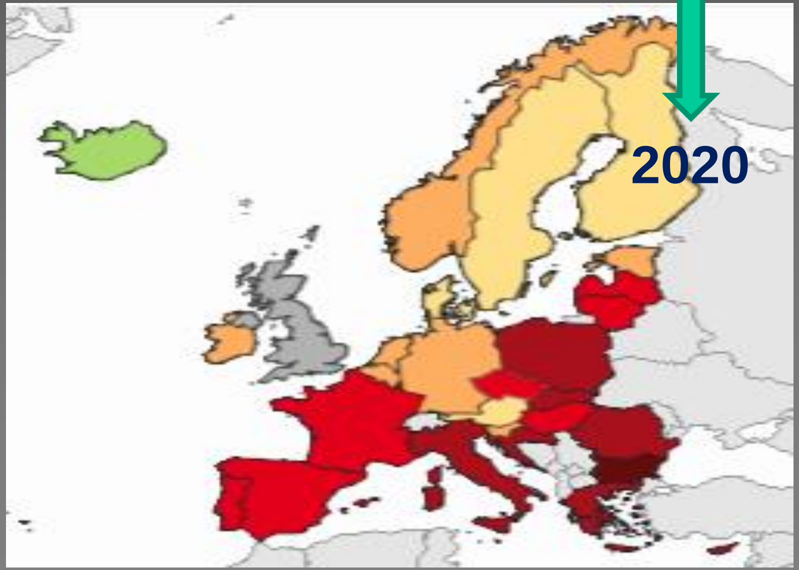
ST 131

K. pneumoniae
Resist. Cef. 3ª gen

2009



2020

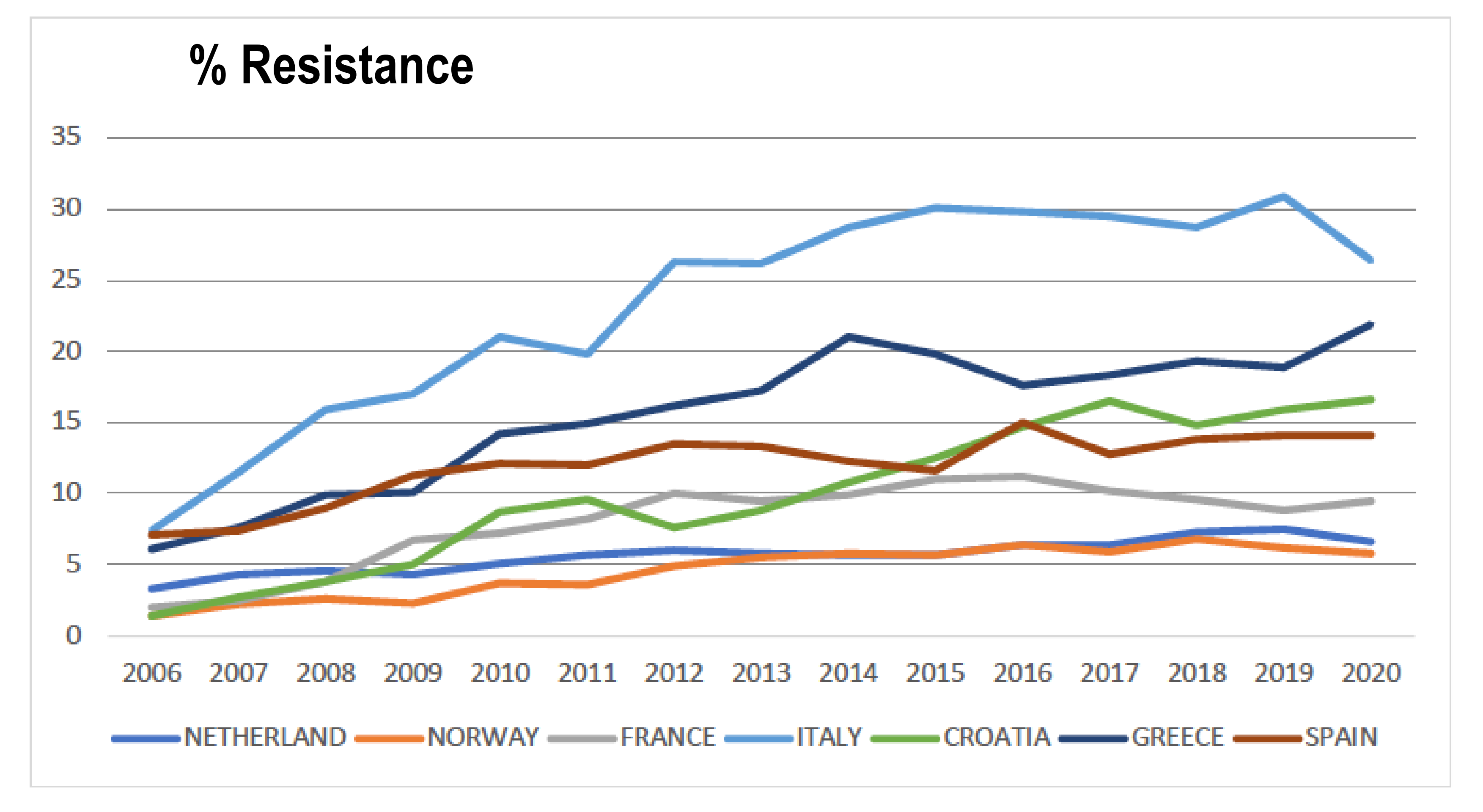


- <1%
- 1-<5%
- 5-<10%
- 10-<25%
- 25-<50%
- 50-<75%
- >=75%
- No data

http://ecdc.europa.eu/en/activities/surveillance/EARS-Net/database/Pages/database.aspx

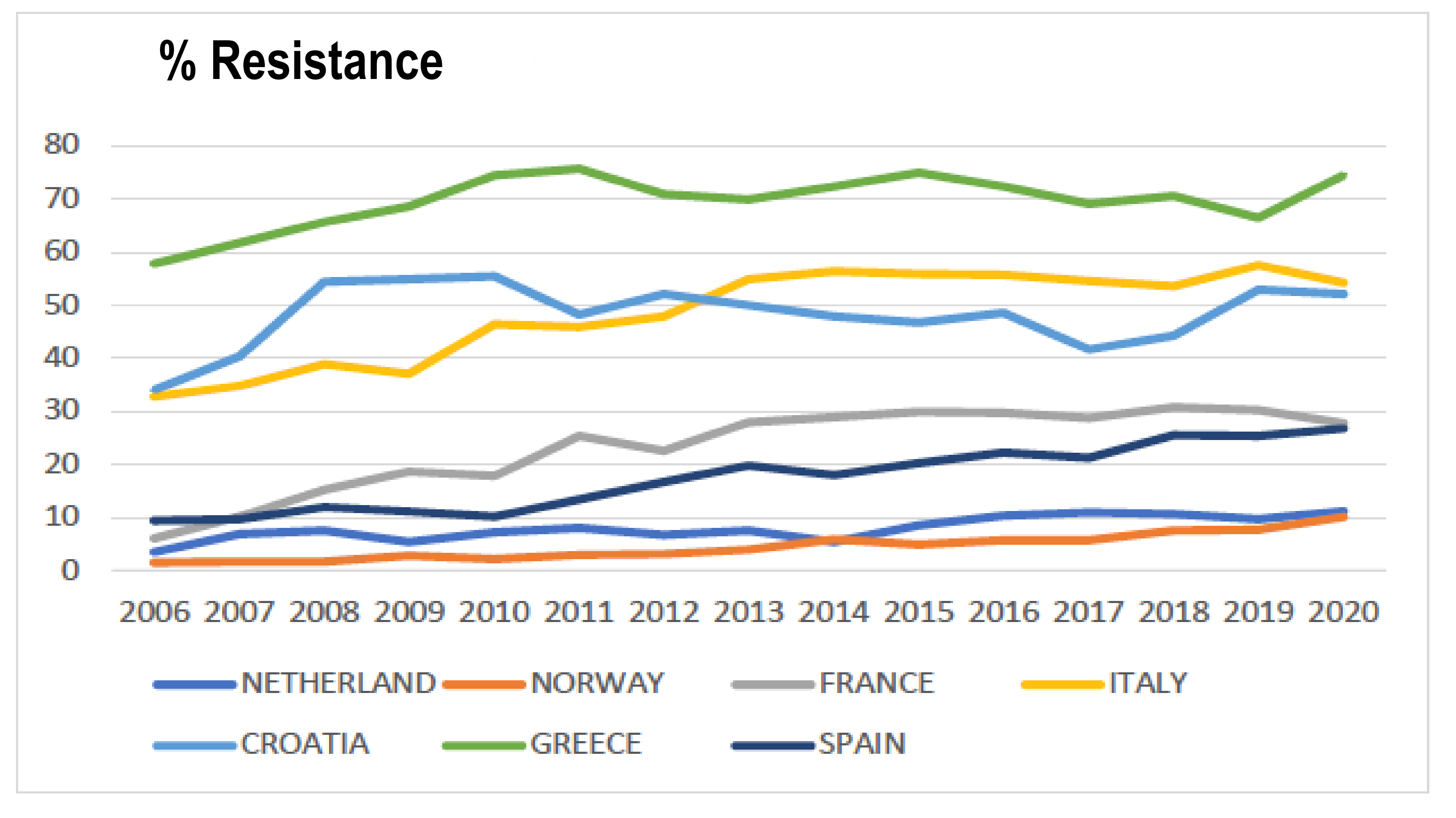
Evolution of AR in different countries in Europe

ESBL producing E. coli



Evolution of AR in different countries in Europe

ESBL producing K. pneumoniae



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Carbapenemases

Class	Type	Clavulanic ac. inh.	EDTA	Susceptibility to ATM	Genetic location
A	GES	+	-	S	P
	IMI	+	-	R	C
	SME	+	-	R	C
	KPC	+	-	R	P
B	NDM	-	+	S	C/P
	VIM	-	+	S	C/P
	IMP	-	+	S	C/P
D	OXA	+/-	-	S	C/P

Enterobacteriales: carbapenemases

Resistance to carbapenems

E. coli

2020

- <1%
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- 25-<50%
- 50-<75%
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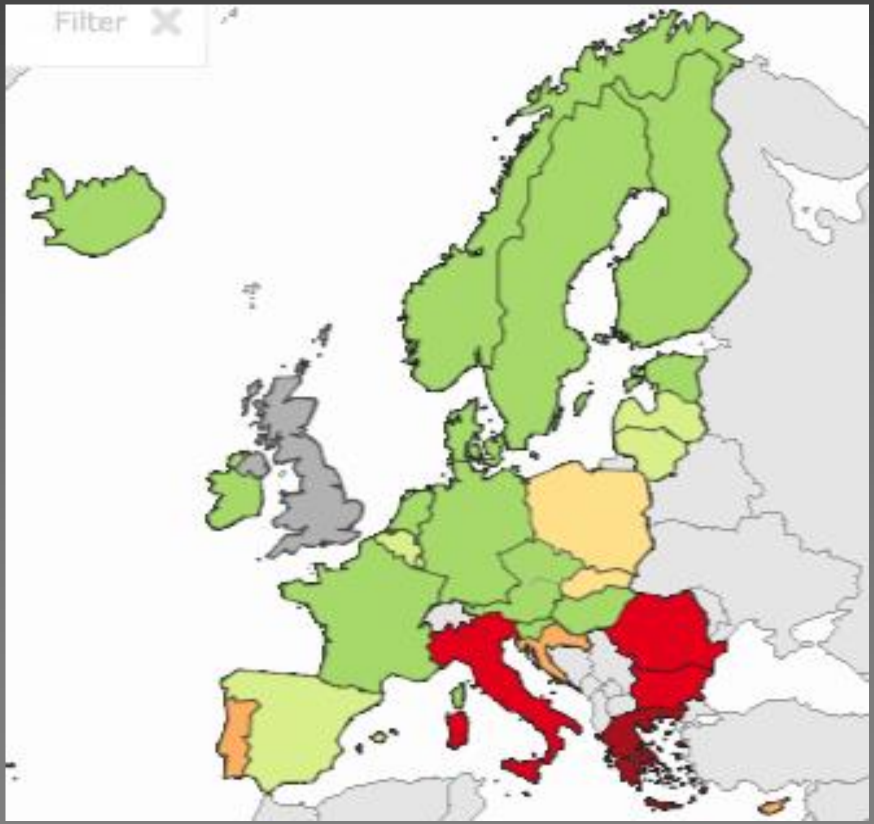
K. pneumoniae



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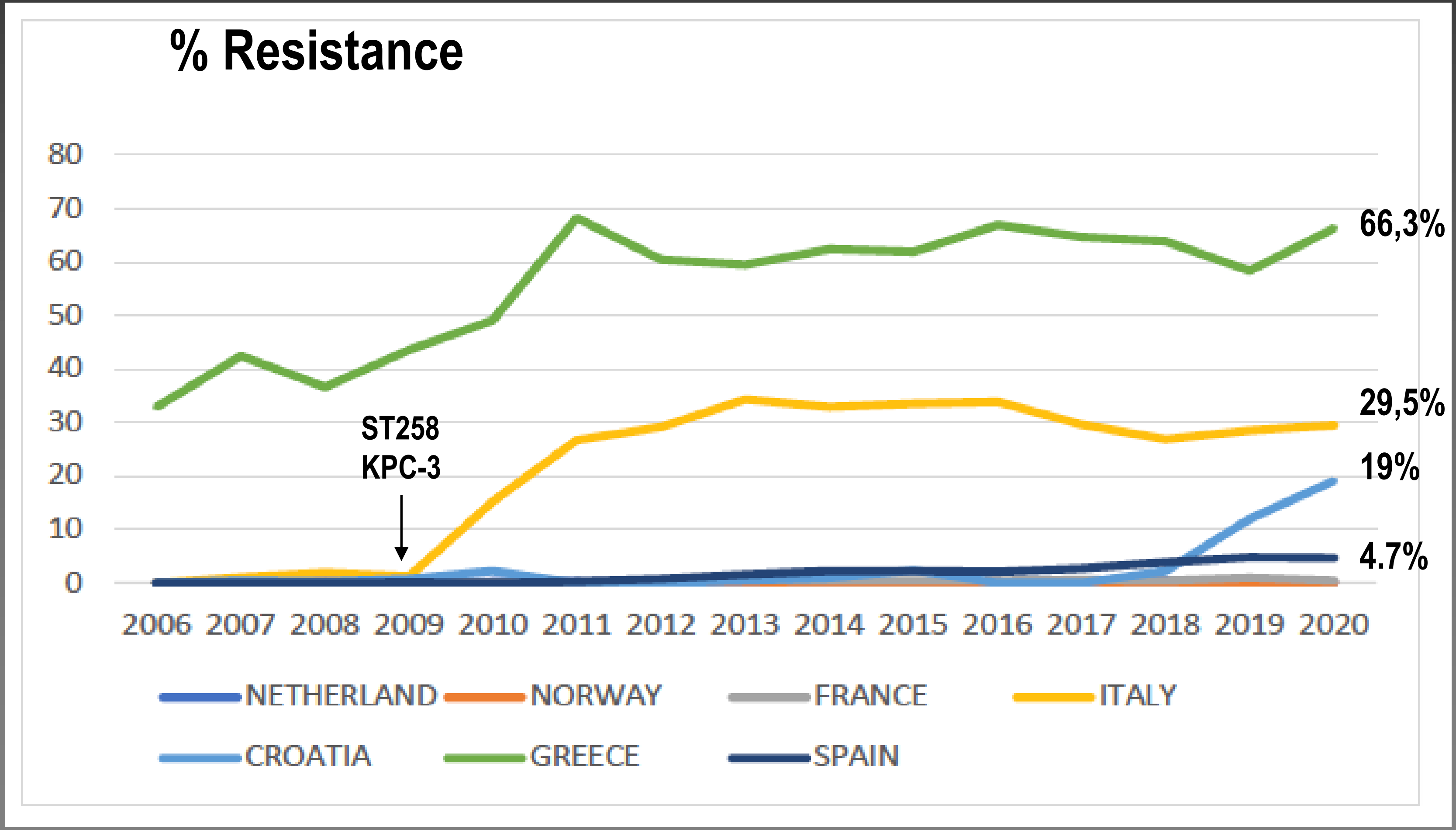
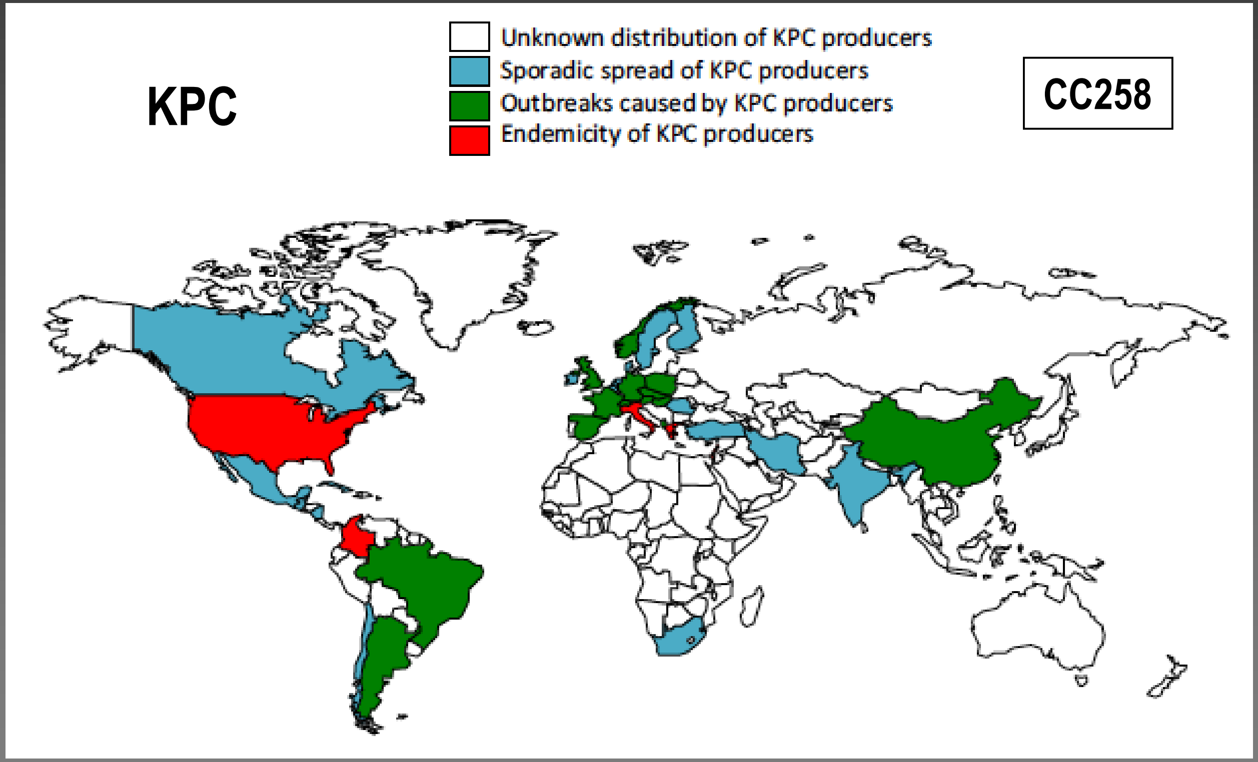
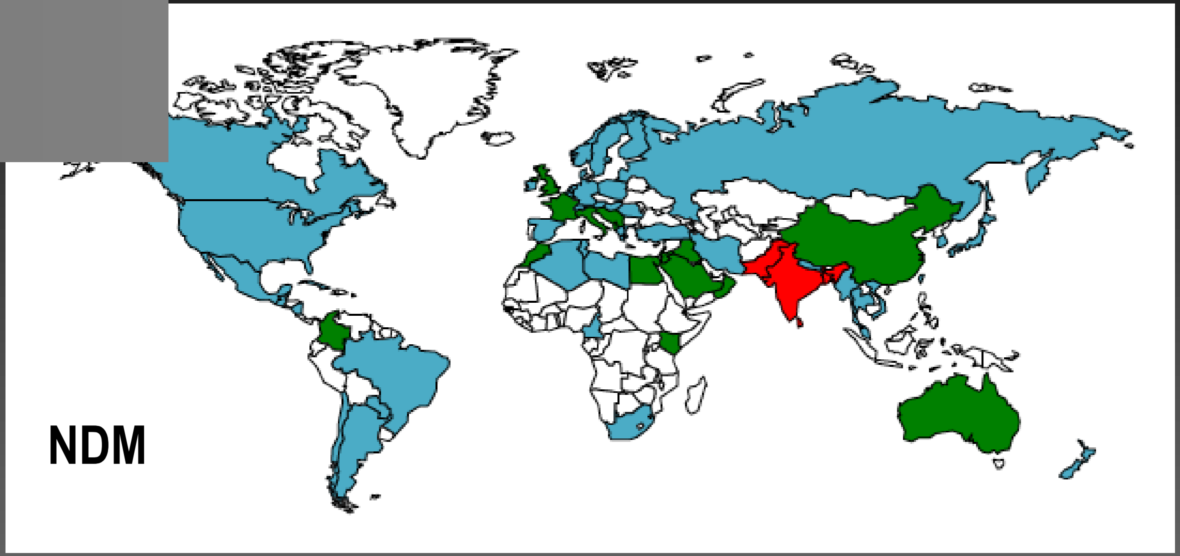
Evolution of AR in different countries in Europe

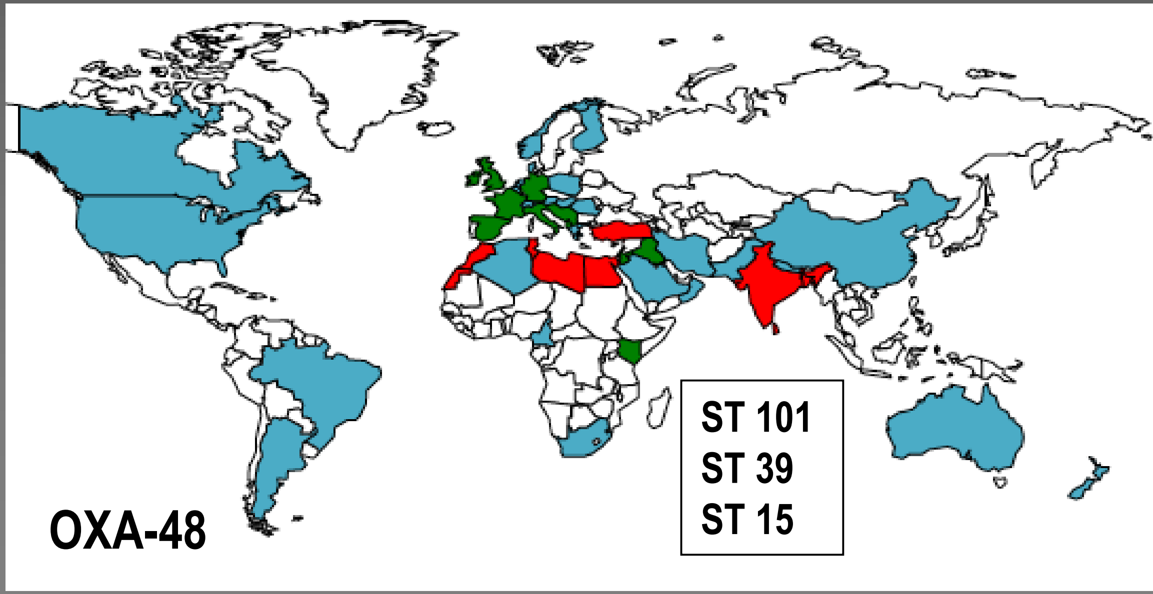
Carbapenemase producing K. pneumoniae



Global dissemination of carbapenemases







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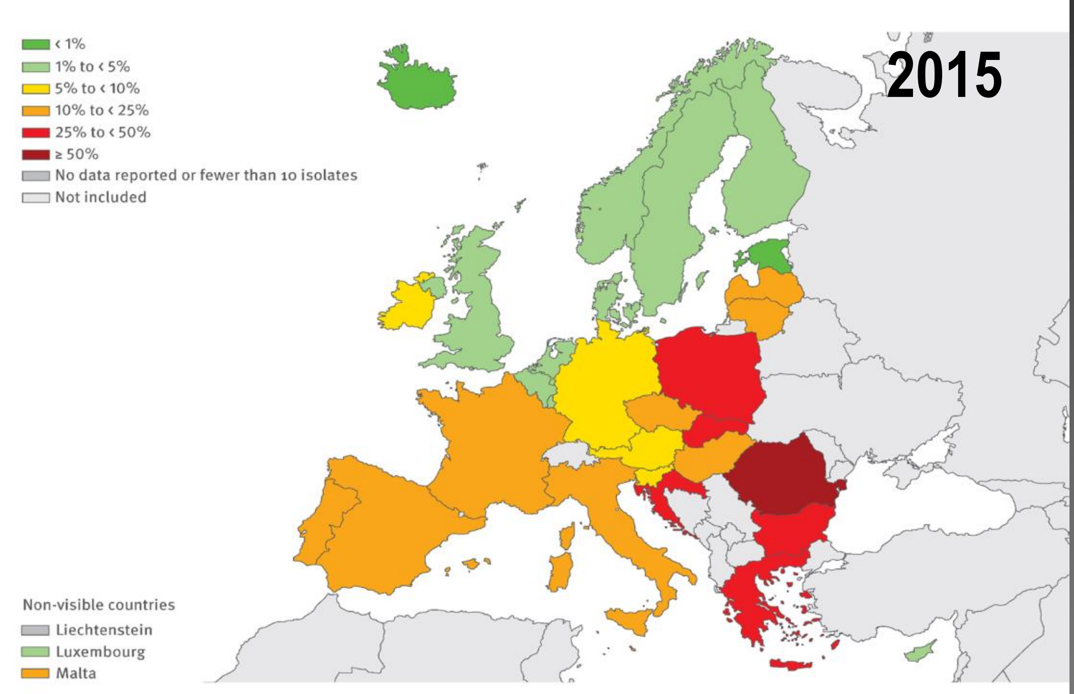
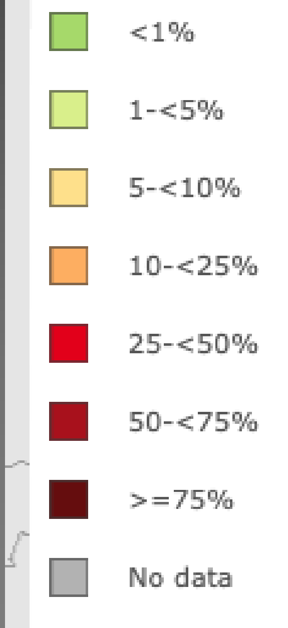
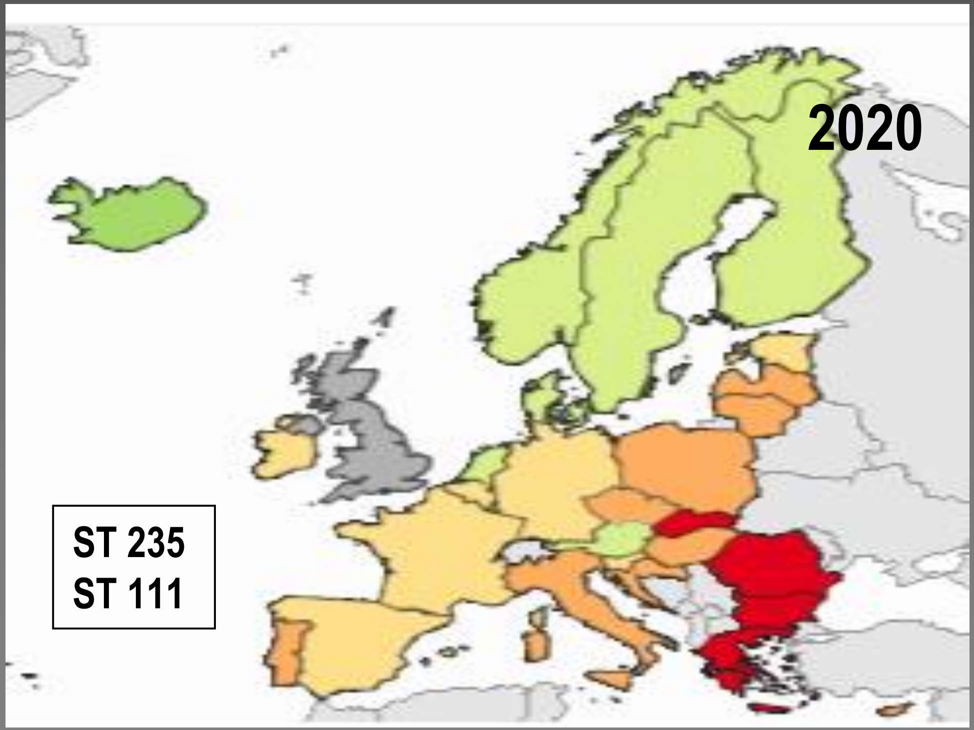
Multidrug resistant P. aeruginosa

EARSS-Net report







3,3 % in Denmark
55,4% in Romania
21,8% in Spain
Overall mean in Europe 16,5%

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Evolución de la resistencia en Acinetobacter baumannii

Antibiotic	GEIH-Ab 2000 (n=221) %	GEIH-Ab 2010 (n=446) %	Difference	*p* value
Piperacillin	93	94	1	0.74
Ceftazidime	83	99	16	0.000
Sulbactam	53	65	12	0.0042
Imipenem	48	82	34	0.000
Meropenem	43	83	40	0.000
Doripenem	NT	86	ND	ND
Gentamicin	96	70	-27	0.000
Tobramycin	79	60	-19	0.0001
Amikacin	65	49	-17	0.0001
Tetracycline	91	83	-8	0.0096
Doxycyline	68	70	2	0.53
Minocycline	34	30	-4	0.30
Tigecycline	NT	23.9	ND	ND
Ciprofloxacin	98	94	-5	0.0074
Rifampicin	51	30	-21	0.000
Colistin	0	3	3	0.000

NT: no probado, ND: no determinado

MDR: 98%
XDR: 86 %
PDR: 2 %

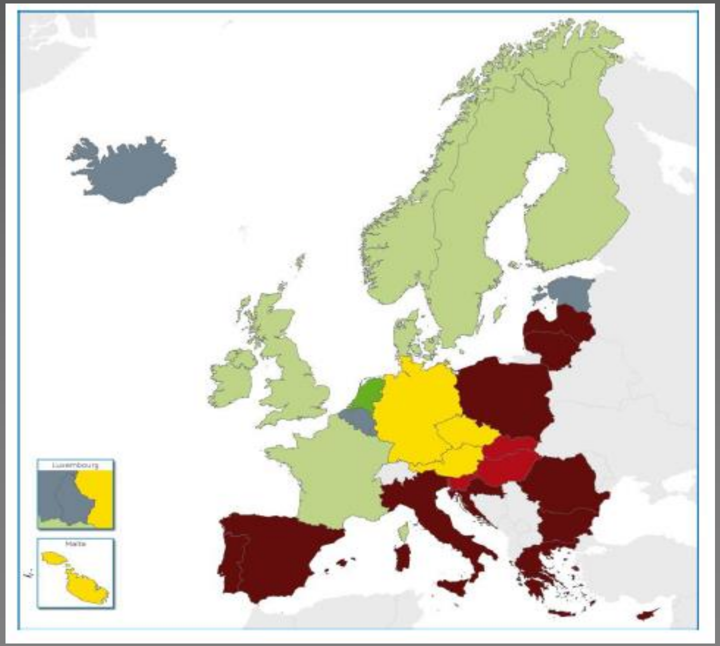
Fernández-Cuenca *et al*. Enferm Infecc Microbiol Clin. 2013; 31: 4-9

Multidrug resistance in *A. baumannii*

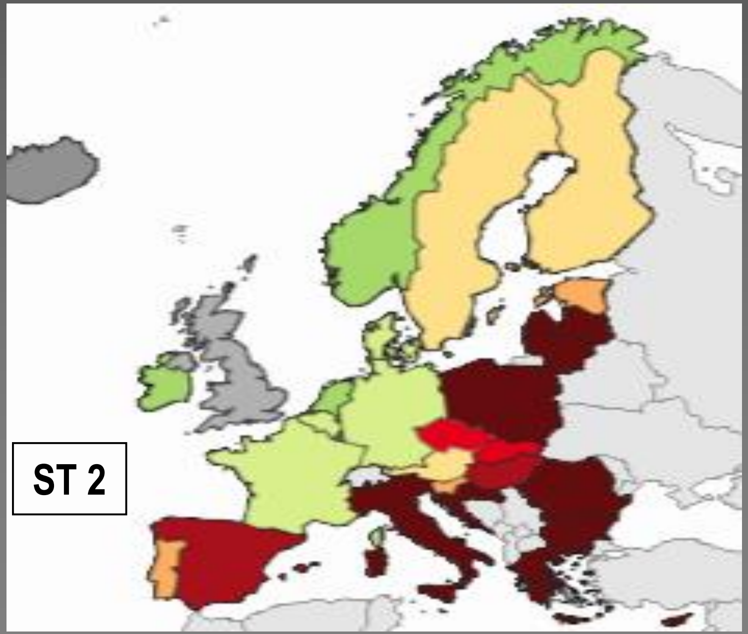
EARSS-Net report

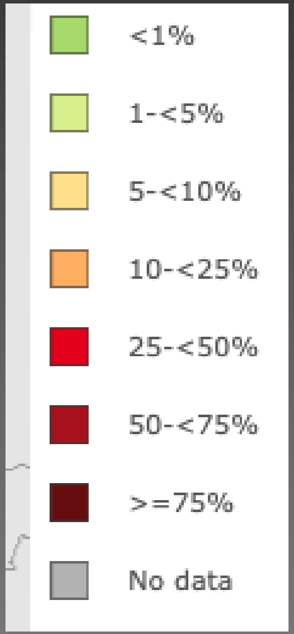
Acinetobacter spp. resistant to carbapenems

2014



2019



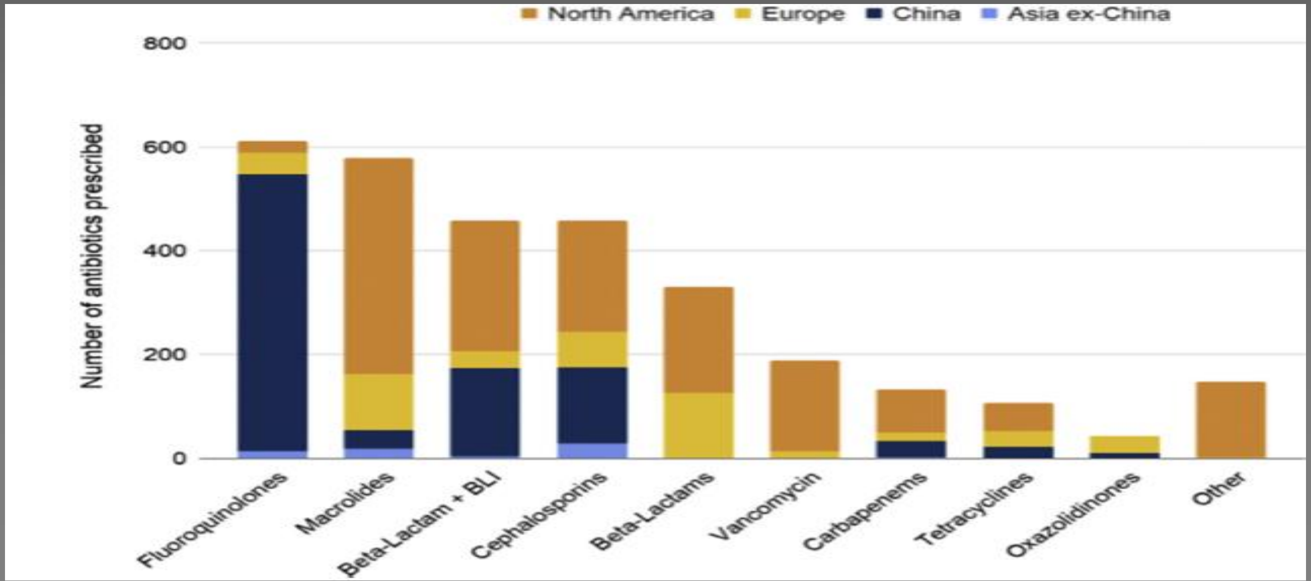


COVID-19 – ANTIBIOTIC RESISTANCE

Langford, B et al: Antibiotic prescribing in patients with COVID-19: rapid review and meta-analysis

Clinical Microbiology and Infections 2021; 27: 520

- Antibiotic use data were available for 30,623 patients.
- The prevalence of antibiotic prescription was 74.6% (95% CI 68.3 and 80.0%).
- In the univariate meta-regression, the prescription of antibiotics was lower in children (odds ratio for prescribing prevalence (OR) 0.10, 95% CI 0.03e0.33) compared to adults.
- The prescription of antibiotics was higher with increasing age of the patient (OR 1.45 per 10-year increase, 95% CI 1.18 to 1.77) and higher with an increasing proportion of patients requiring mechanical ventilation (OR 1.33 per 10% increase, 95% CI 1.15 e1.54).



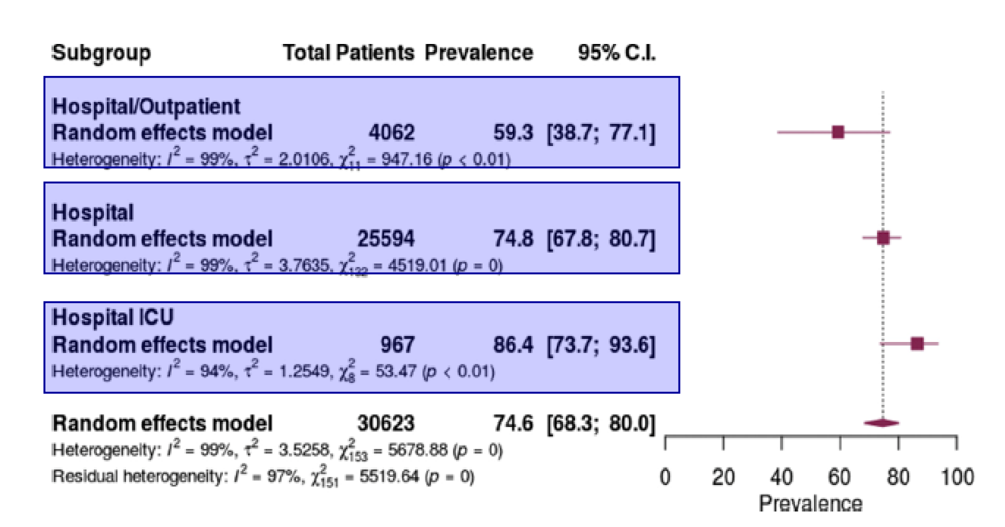
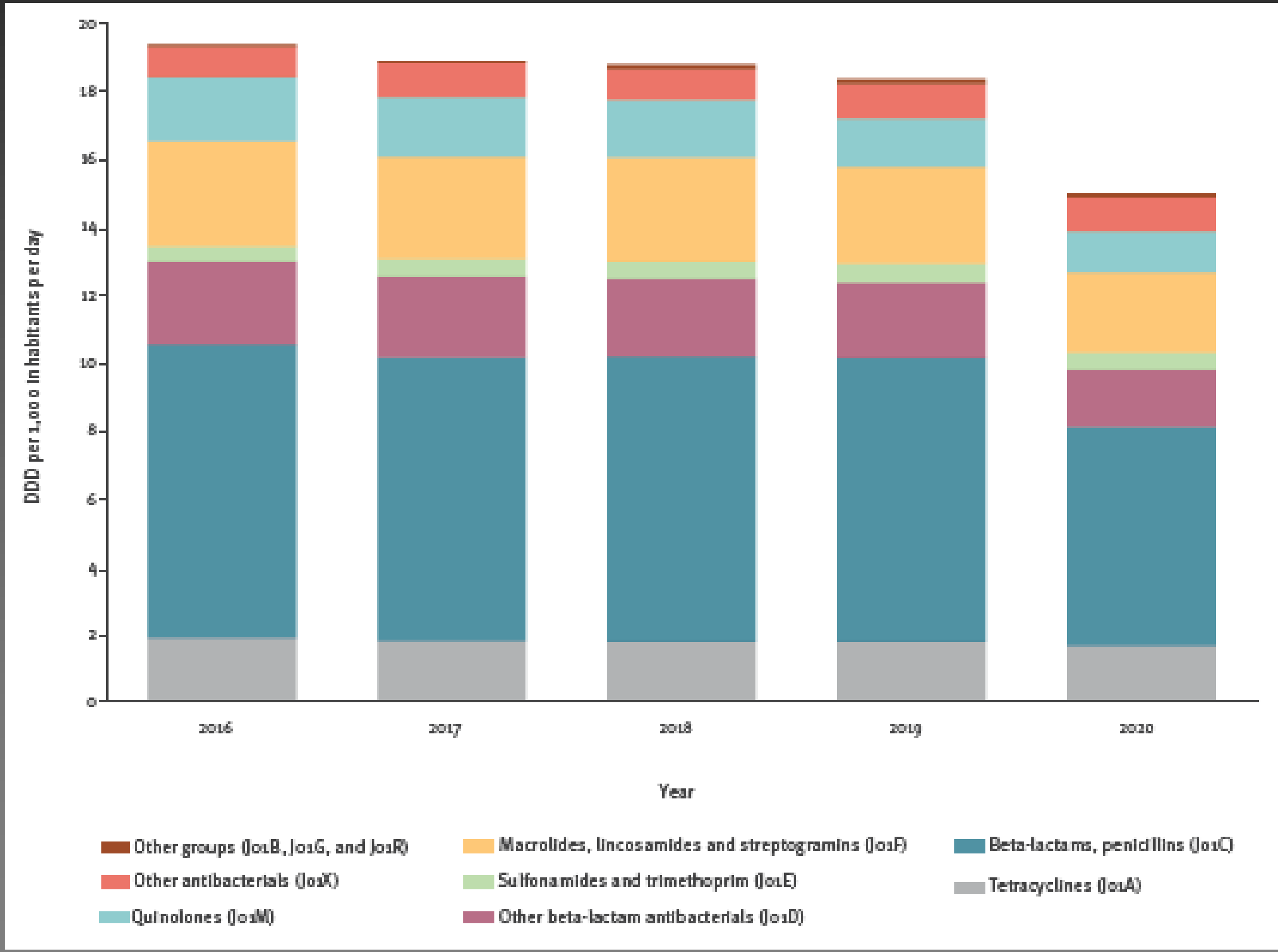


Fig. 5. Antibiotic prescribing in patients with COVID-19 by healthcare setting.

Diaz Högberg, L et al: Decrease in community antibiotic consumption during the COVID-19 pandemic, EU/EEA, 2020

Euro Surveillance 2021; 26: pii=2101020.



It is still unclear whether this reduced community antibiotic consumption was sustained throughout 2021 and what implications it may have on antibiotic resistance

Knight, BD et al: The impact of COVID-19 on community antibiotic use in Canada: an ecological study

Clinical Microbiology and Infection 2021; in press

Table 1
Rate of community-dispensed antibiotic prescriptions, 2019–2020, Canada

Month	Antibiotic prescriptions dispensed per 1000 inhabitants 2019	2020	Percent change (2019–2020)
January	60.03	61.33	2.17
February	49.68	50.62	1.89
March	54.71	48.38	−11.57
April	53.96	33.42	−38.07
May	52.73	31.87	−39.56
June	46.72	35.18	−24.70
July	47.49	36.88	−22.34
August	45.23	35.58	−21.34
September	47.94	36.83	−23.18
October	54.21	38.06	−29.79
Average (March to October)	50.37	37.03	−26.50

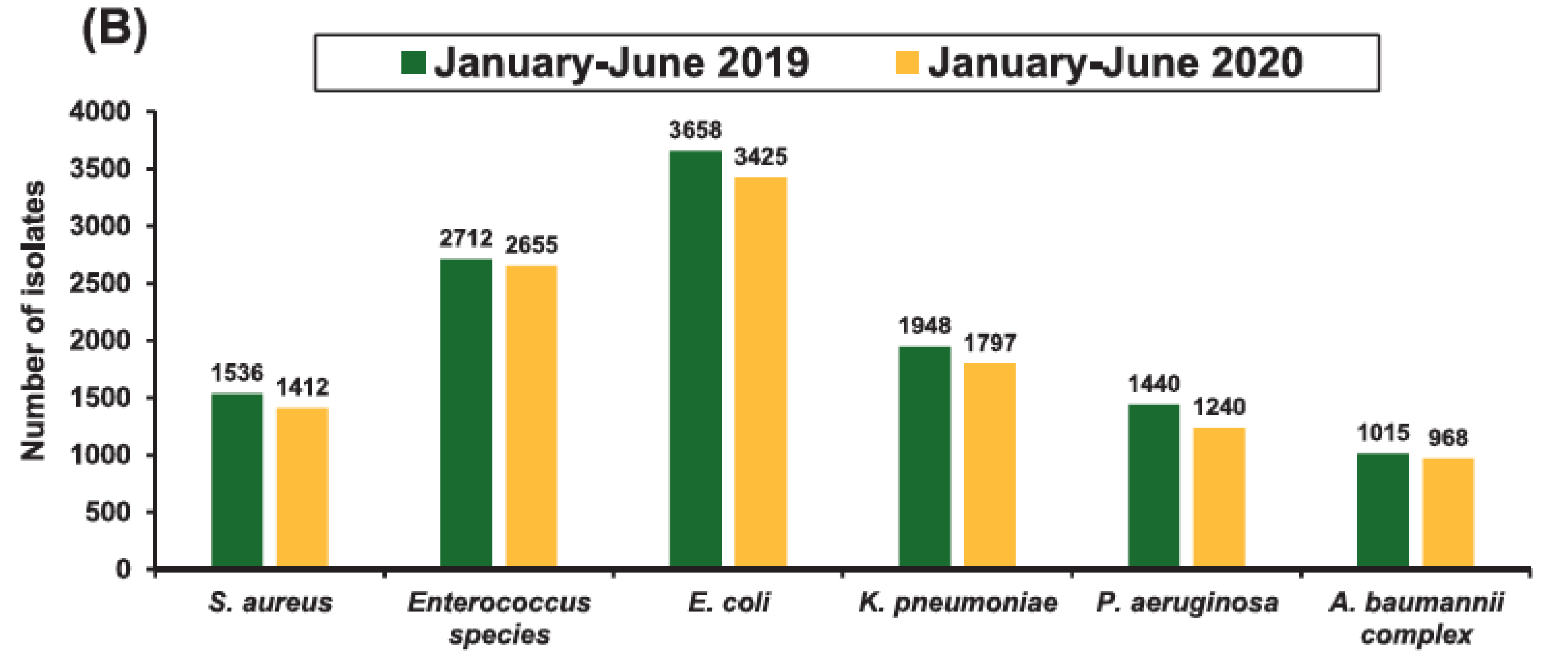
Lai L et al. Increased antimicrobial resistance during the COVID-19 pandemic
International Journal of Antimicrobial Agents (2021) 57:106324

Table 1
Consumptions of broad-spectrum antimicrobial agents at National Taiwan University Hospital during two time periods: January–

Antibio	% change
β-Lact	4.1
Extend	0.0
Quinol	10.7
Carbap	13.8
Amino	−6.6
Colisti	23.9
Tigecy	59.3
Fosfom	74.7
Glycop	12.9
Linezol	27.3
Dapton	23.0

DDD, def

(B)



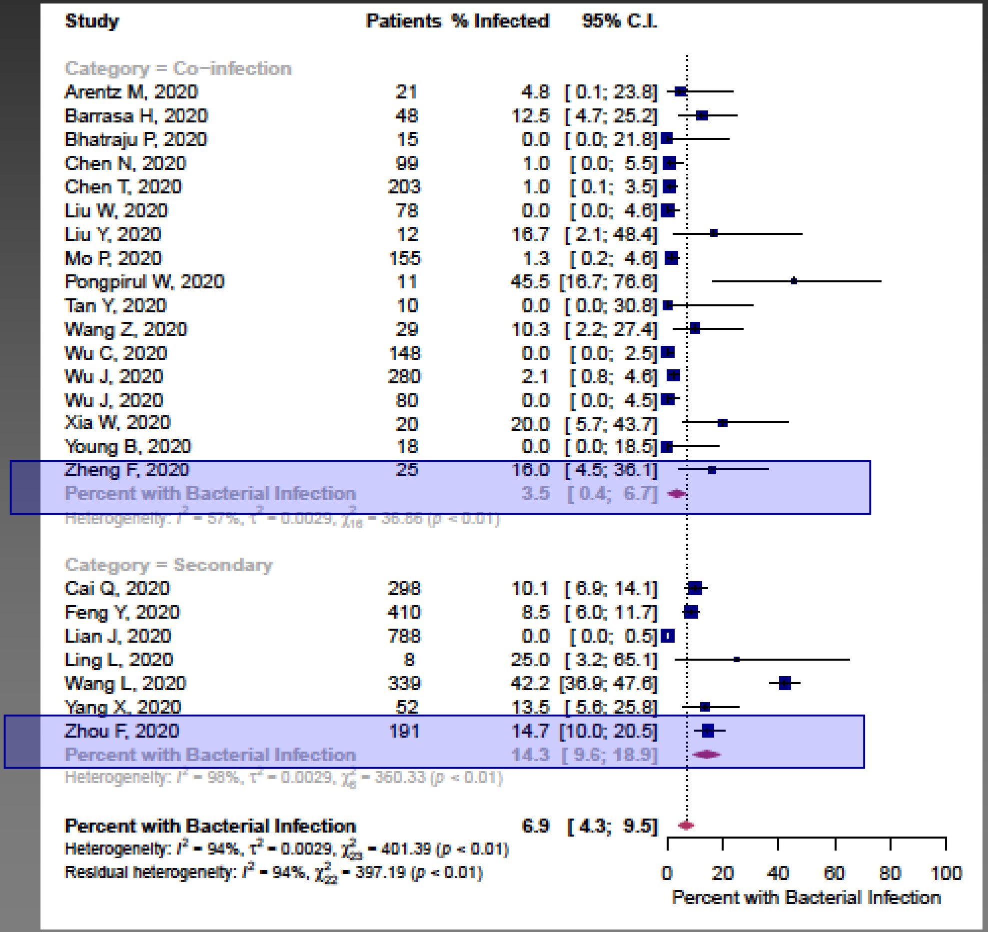
R	2019	2020	R	2019	2020	R	2019	2020	R	2019	2020	R	2019	2020	R	2019	2020
OX	37	38	VAN	20	21	CTX	33	31	CTX	25	27	CAZ	13	12	SAM	25	34
-	-	-	-	-	-	IMP	1	1	IMP	7	8	IMP	14	13	IMP	34	41
-	-	-	-	-	-	LVX	34	35	LVX	15	16	LVX	14	11	LVX	28	36

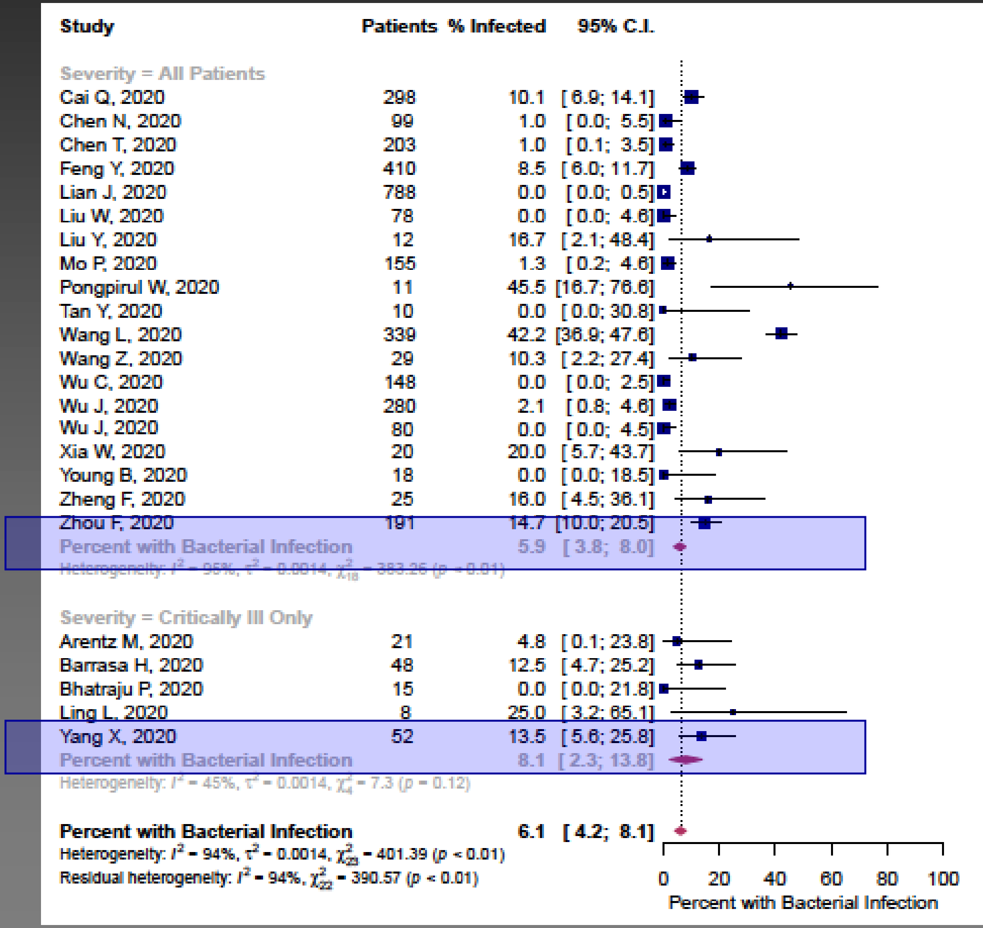
CO-INFECTIONS IN PATIENTS WITH COVID-19

Population	Country	Nº co-infections	Treatment	Ref.
99	China	2/99 (2%)	70/99 (70%)	Lancet (20) 395:507
29 / 69	China	5/29 (17%)	66/69 (95%)	CID (20) ciaa272
41	China	4/41 (9.7%)	41/41(100%)	Lancet (20) 395:497
191	China	28/191 (14.6%)	181/191 (94.7%)	Lancet (20) 395:1054
92	France	26/92 (28%)	SARM 31%	Ann Inten Care (20) 10:119
836	UK	26/836 (3.2%)	---	CMI (20) 26:1395
338	USA	19/338 (5.6%)	---	NEJM (20) 382:8732
21	USA	1/21 (4.7%)	pacientes de UCI	JAMA (20) 323:1612
1396	UK	37/1396 (2.7%)	97.8%	JAC (21) 76:796

Langford, B et al: Bacterial co-infection and secondary infection in patients with COVID-19: a living rapid review and meta-analysis

Clinical Microbiology and Infections 2021; 26: 1622





At diagnosis vs in hospital

All patients vs critical patients

Garcia-Vidal, C et al: Incidence of co-infections and superinfections in hospitalized patients with COVID-19: a retrospective cohort study
Clinical Microbiology and Infections 2021; 27: 83

Table 3
Detailed epidemiology of microbiologic documented bacterial infections in 74 patients hospitalized with COVID-19

Bacterial co-infection	*n/N* (%)
Infection at COVID-19 diagnosis	30/74 (40.5)
Community-acquired pneumonia co-infection	21/30 (70)
Streptococcus pneumoniae	12/21 (57.1)
Staphylococcus aureus	6/21 (28.6)
Haemophilus influenzae	2/21 (9.5)
Moraxella catarrhalis	1/21 (4.8)
Lower respiratory co-infection in patients with bronchiectasis	2/30 (6.6)
Pseudomonas aeruginosa	2/2 (100)
Concurrent urinary tract infection	7/30 (23.3)
Escherichia coli	1/7 (14.2)
Klebsiella pneumoniae	1/7 (14.2)
Enterococcus faecium	1/7 (14.2)
Proteus mirabilis	1/7 (14.2)
Citrobacter koseri	1/7 (14.2)
S. aureus	1/7 (14.2)
Hospital-acquired superinfections complicating patients admitted for COVID-19	44/74 (59.5)
Ventilator-associated pneumonia	11/44 (25)
S. aureus	4/11 (36.4)
P. aeruginosa	3/11 (27.3)
Stenotrophomonas maltophilia	2/11 (18.2)
K. pneumoniae	1/11 (9)
Serratia marcescens	1/11 (9)
Hospital-acquired pneumonia	4/44 (9)
S. aureus	1/4 (25)
P. aeruginosa	1/4 (25)
S. maltophilia	1/4 (25)
K. pneumoniae	1/4 (25)
Bacteraemia	16/44 (36.3)
Coagulase-negative staphylococci	7/16 (43.7)
P. aeruginosa	3/16 (18.7)
E. faecium	3/16 (18.7)
E. coli	2/16 (12.5)
Streptococcus anginosus	1/16 (6.2)
Urinary tract infection	12/44 (27.3)
E. coli	4/12 (33.5)
K. pneumoniae	3/12 (25)
Enterococcus faecalis	2/12 (16.7)
E. faecium	1/12 (8.3)
P. aeruginosa	1/12 (8.3)
S. marcescens	1/12 (8.3)
Polymicrobial intra-abdominal infection (*E. coli, E. faecium, E. faecalis*)	1/44 (2.3)

- 989 adults admitted with COVID-19 (Spain) for more than 48 hours, 7.4% co-infection (*S. pneumoniae* (16.2%); *S. aureus* (16.2%), *P. aeruginosa* (13.5%), *E. coli* (9.5%), *K. pneumoniae* (8.1%), *E. faecium* (5.4%) and *H. influenza* (2.7%)
- *S. pneumoniae* and *H. influenza* were associated with community acquired pneumonia while *S. aureus* was associated with CAP and HAP.

Impact of COVID on AMR

- Emergence of multi-resistant bacteria
  - Overprescribing antibiotics
  - Limited resources
- Spread of multi-resistant bacteria
  - Strict lockdown
  - Social distancing
  - Extensive implementation of hand hygiene and masks at both the health center and community levels
  - Limitation of international travel and migration

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Detection in 30 min

Thanks
Gracies
Gracias