MDR e immunodepressione

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Declaration of interest (DOI)

2016-2021

- Innovative Medicine Inititiative (IMI)
- European Commission
- Joint Antimicrobial Initiatives
- Horizon 2020
- WHO
- ESCMID
- German Center Infectious Diseases Research (DZIF)
- GARDP

1989

AIDS: IN MEMORIAM

2020

2001

List of priorities of antimicrobial resistant bacteria

World Health Organization

Panel: WHO priority list for research and development of new antibiotics for antibiotic-resistant bacteria

Multidrug-resistant and extensively-resistant *Mycobacterium tuberculosis*[25]

Other priority bacteria

Priority 1: critical

- *Acinetobacter baumannii*, carbapenem resistant
- *Pseudomonas aeruginosa*, carbapenem resistant
- Enterobacteriaceae, carbapenem resistant, third-generation cephalosporin resistant

Priority 2: high

- *Enterococcus faecium*, vancomycin resistant
- *Staphylococcus aureus*, methicillin resistant, vancomycin resistant
- *Helicobacter pylori*, clarithromycin resistant
- *Campylobacter* spp, fluoroquinolone resistant
- *Salmonella* spp fluoroquinolone resistant
- *Neisseria gonorrhoeae*, third-generation cephalosporin resistant, fluoroquinolone resistant

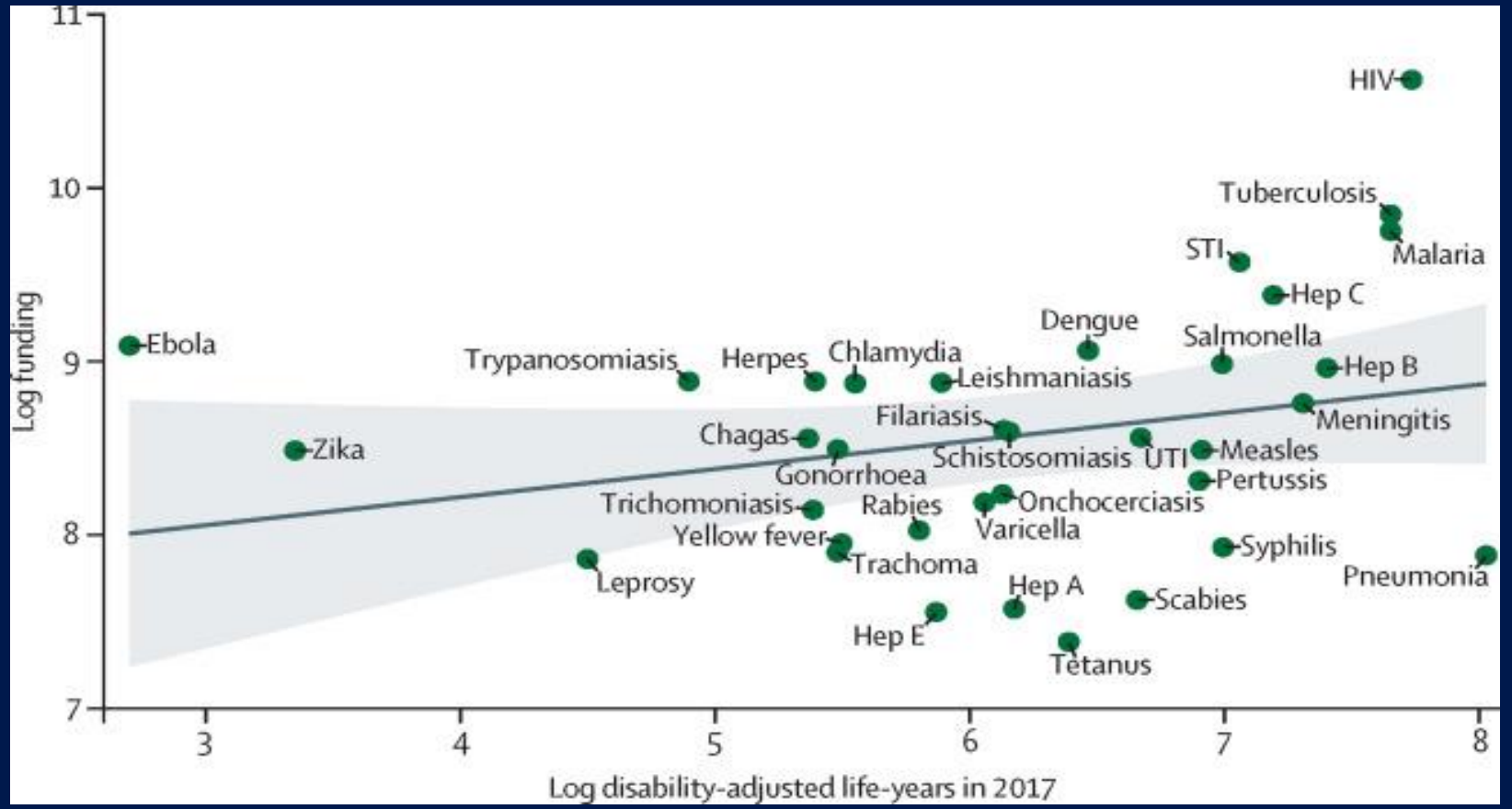
Priority 3: medium

- *Streptococcus pneumoniae*, penicillin non-susceptible
- *Haemophilus influenzae*, ampicillin resistant
- *Shigella* spp, fluoroquinolone resistant

FIGURE 1

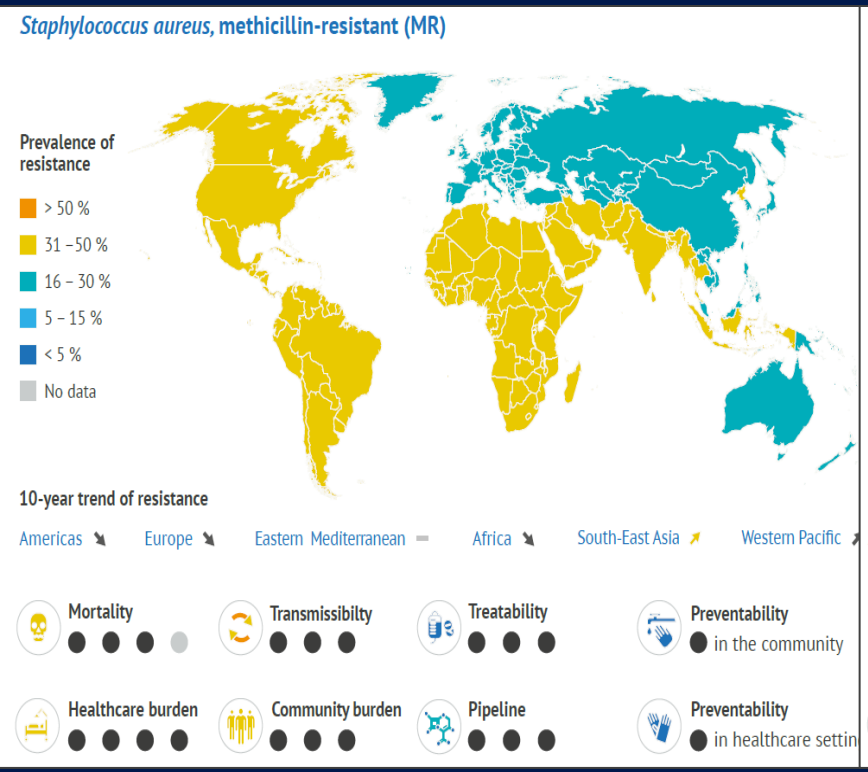
Tacconelli, Lancet Infect Dis 2017

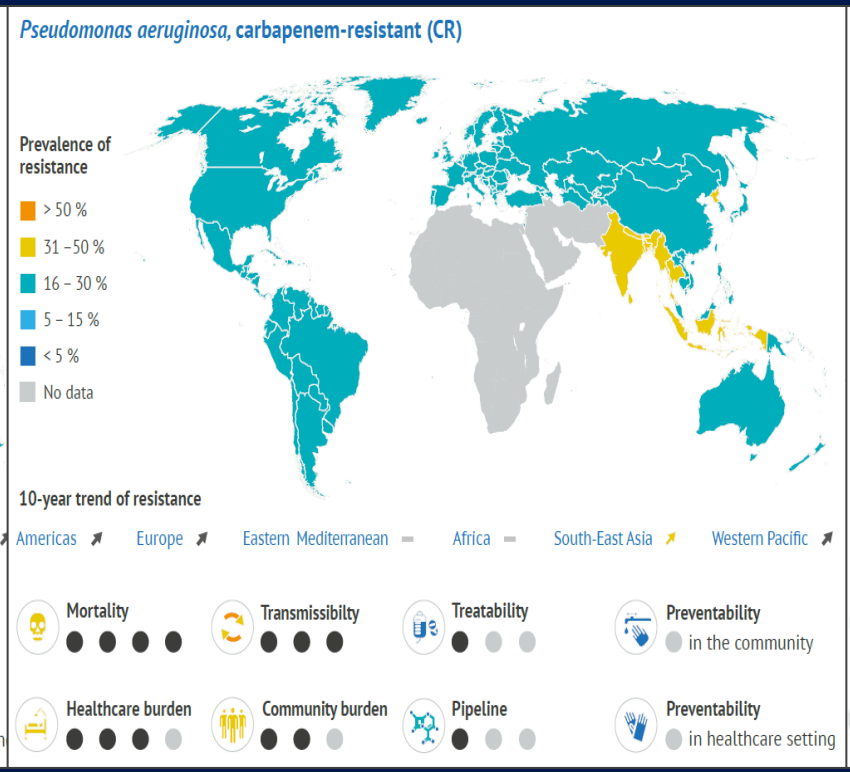
The allocation of US$105 billion in global funding from G20 countries for infectious disease research 2000 - 2017

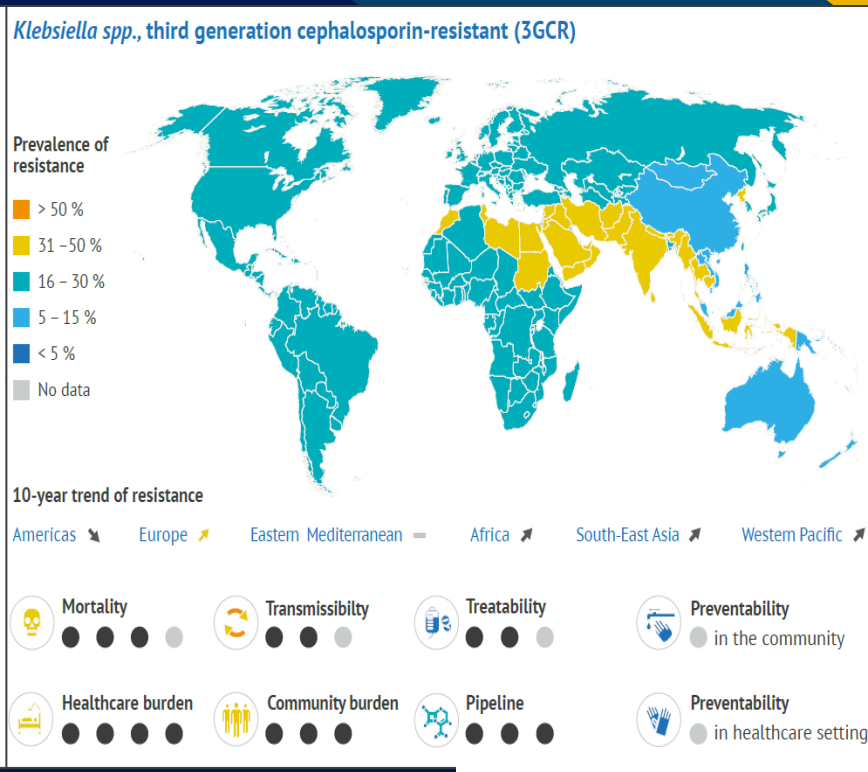


Head MD, Lancet Global Health Oct 2020

Knowledge of AMR pattern at global level



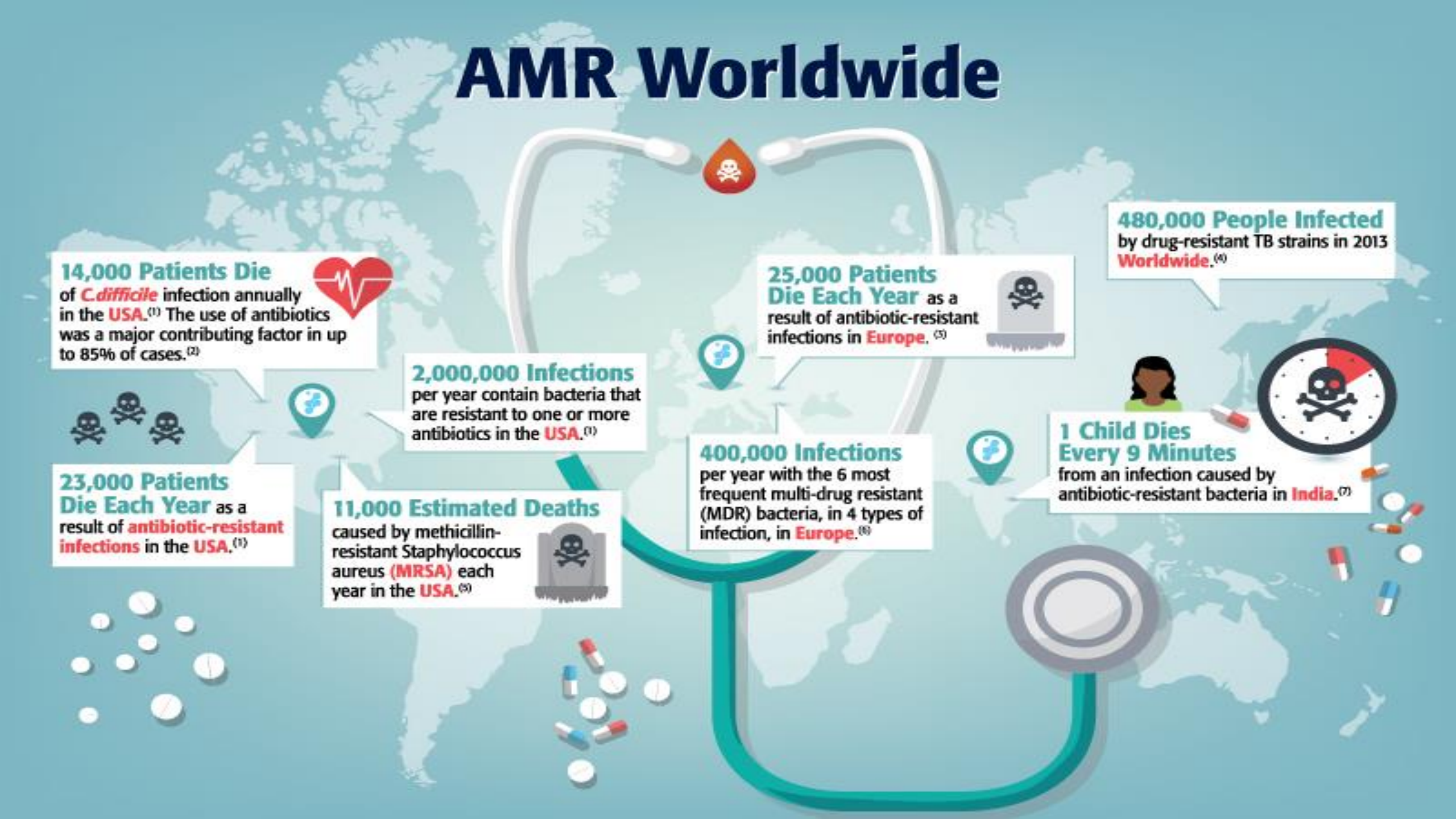




World Health Organization

Tacconelli, Report WHO, 2018
https://www.who.int/medicines/areas/rational_use/PPLreport_2017_09_19.pdf

AMR Worldwide



14,000 Patients Die of *C.difficile* infection annually in the USA.[1] The use of antibiotics was a major contributing factor in up to 85% of cases.[2]

23,000 Patients Die Each Year as a result of antibiotic-resistant infections in the USA.[1]

2,000,000 Infections per year contain bacteria that are resistant to one or more antibiotics in the USA.[1]

11,000 Estimated Deaths caused by methicillin-resistant Staphylococcus aureus (MRSA) each year in the USA.[3]

25,000 Patients Die Each Year as a result of antibiotic-resistant infections in Europe.[5]

400,000 Infections per year with the 6 most frequent multi-drug resistant (MDR) bacteria, in 4 types of infection, in Europe.[8]

480,000 People Infected by drug-resistant TB strains in 2013 Worldwide.[4]

1 Child Dies Every 9 Minutes from an infection caused by antibiotic-resistant bacteria in India.[7]

ANTIBIOTIC RESISTANCE
THE GLOBAL THREAT

Antibiotic resistance – *when bacteria change and cause antibiotics to fail* – is happening **RIGHT NOW,** across the world

The full impact is unknown. There is no system in place to track antibiotic resistance globally

Without urgent action, many modern medicines could become obsolete, turning even common infections into deadly threats.

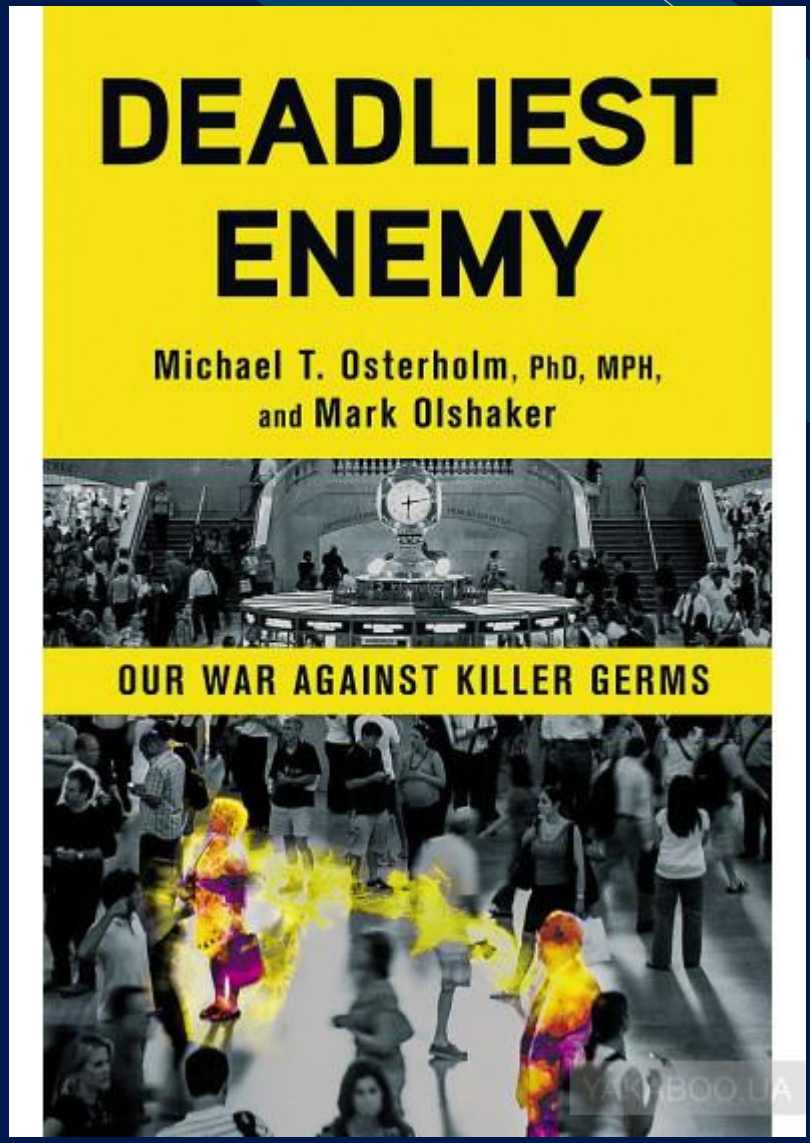
A GROWING CRISIS WORLDWIDE

In the **EUROPEAN UNION,** antibiotic resistance causes 25,000 deaths per year and 2.5m extra hospital days[1]

The Review on Antimicrobial Resistance - Jim O'Neill, Dec 2014

February 12, 2016 | 3 min read SAVE

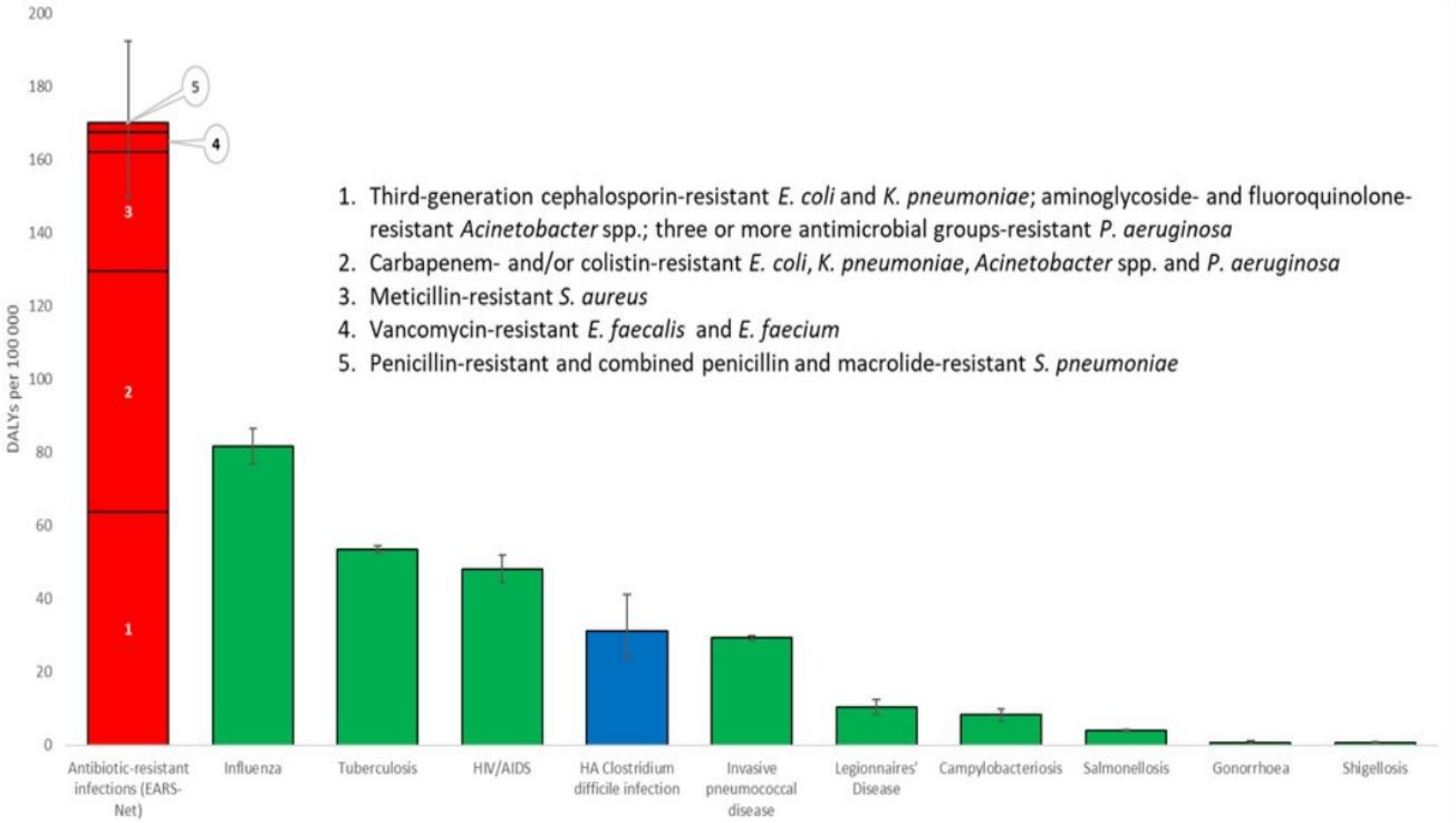
Obama administration proposes increased funding for antibiotic resistance, sustained investments for HIV



"There are only two infectious disease situations that can be considered inevitable, serious pandemic threats: influenza and antimicrobial resistance"

Mark Olshaker & Michael T. Osterholm, 2017

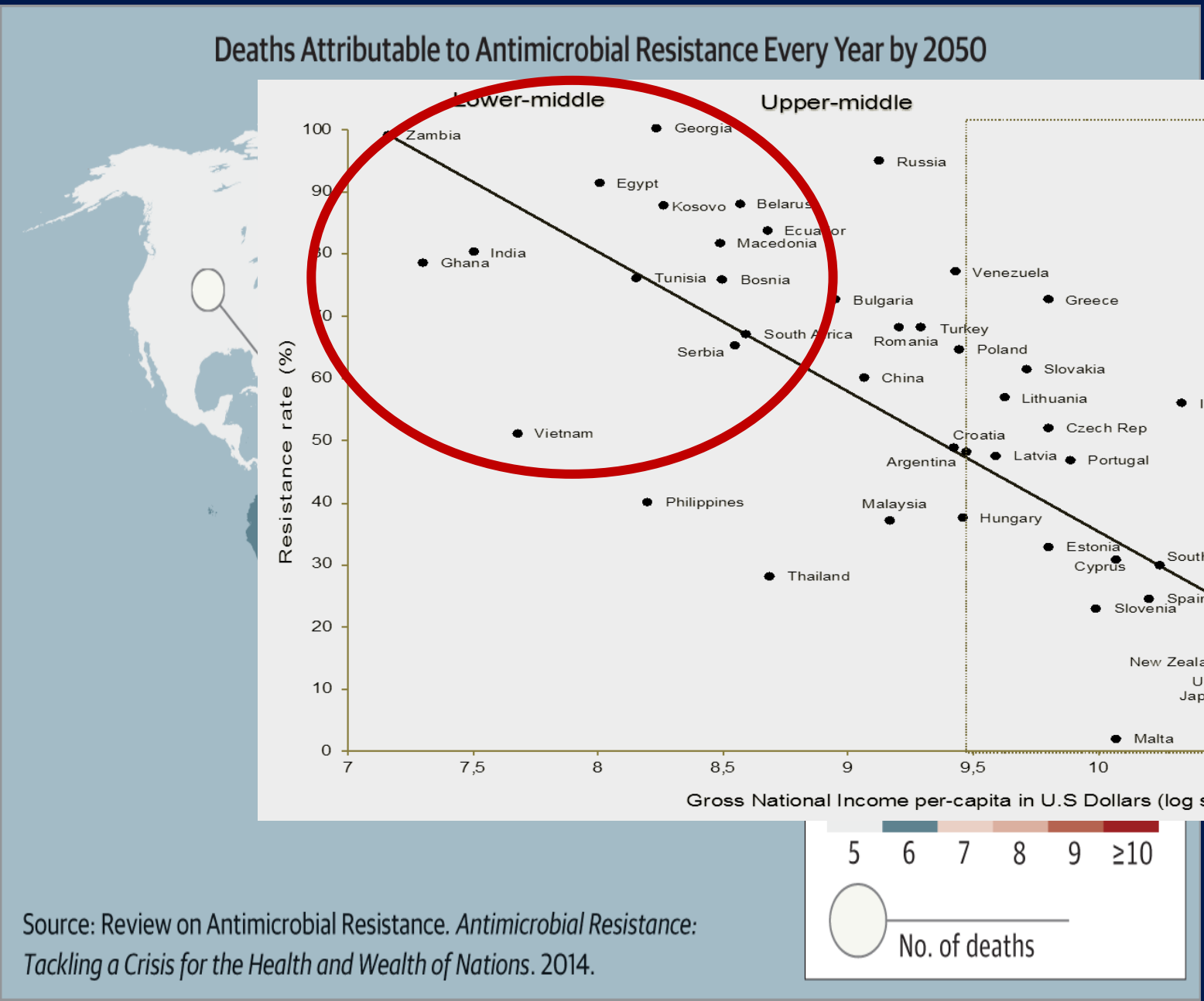
Burden is comparable to the combined burden of influenza, TB & HIV/AIDS



1. Third-generation cephalosporin-resistant *E. coli* and *K. pneumoniae*; aminoglycoside- and fluoroquinolone-resistant *Acinetobacter* spp.; three or more antimicrobial groups-resistant *P. aeruginosa*
2. Carbapenem- and/or colistin-resistant *E. coli*, *K. pneumoniae*, *Acinetobacter* spp. and *P. aeruginosa*
3. Meticillin-resistant *S. aureus*
4. Vancomycin-resistant *E. faecalis* and *E. faecium*
5. Penicillin-resistant and combined penicillin and macrolide-resistant *S. pneumoniae*

Adapted from: Cassini A, et al. Eurosurveillance 2018;23(16):pii=17-00454
Cassini A, et al. The Lancet Infectious Diseases. 5 November 2018

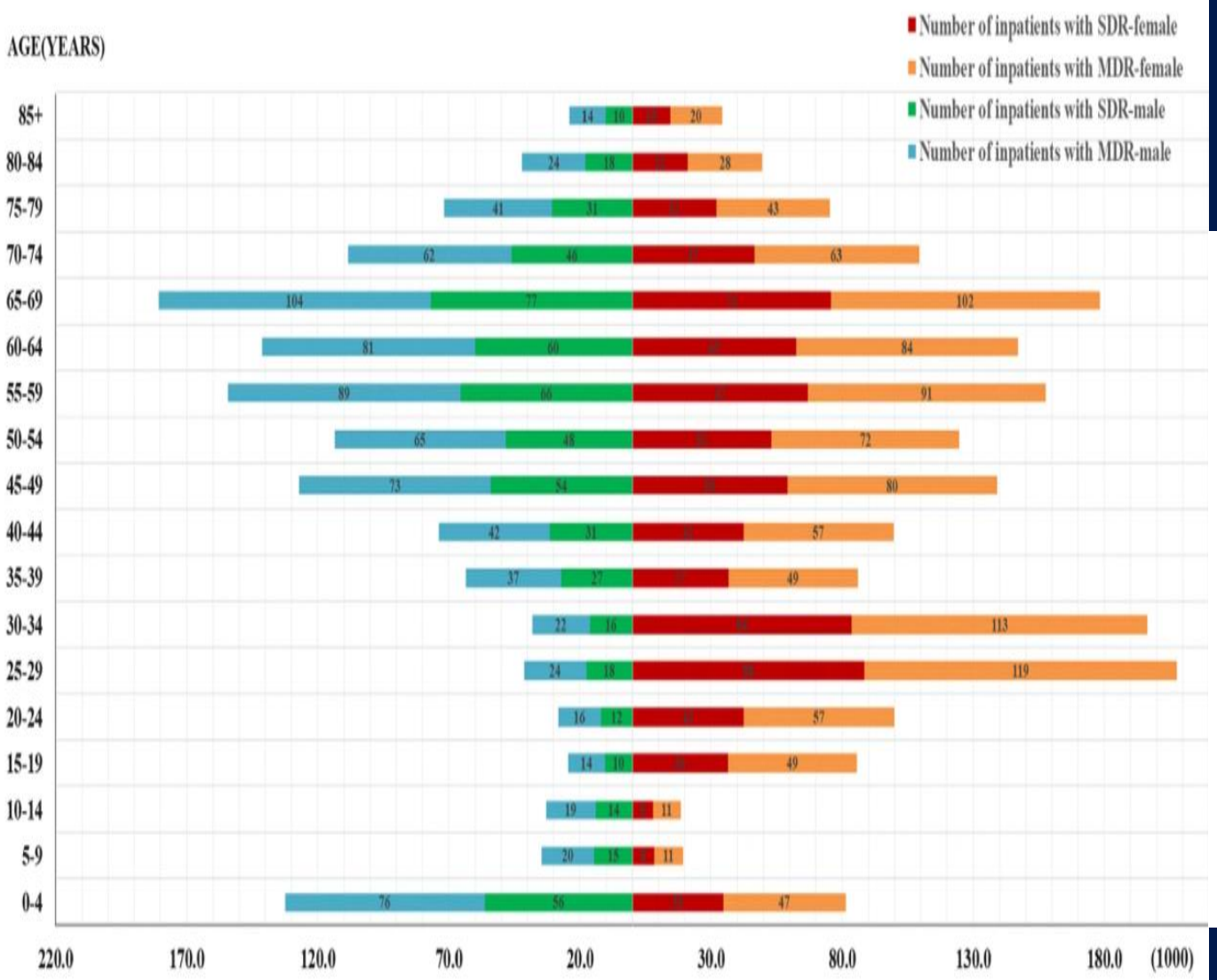
Impatto sui pazienti HIV?



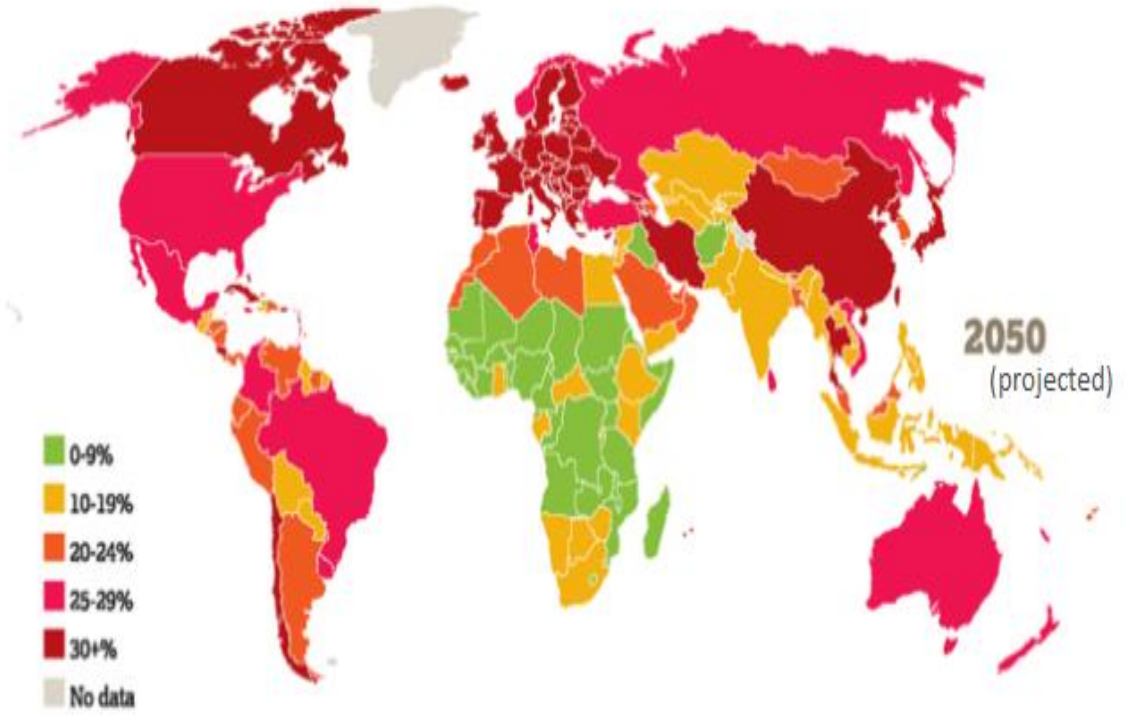
Source: Review on Antimicrobial Resistance. *Antimicrobial Resistance: Tackling a Crisis for the Health and Wealth of Nations*. 2014.

Savoldi & Tacconelli JAC 2019

From: Economic burden of antibiotic resistance in China: a national level estimate for inpatients



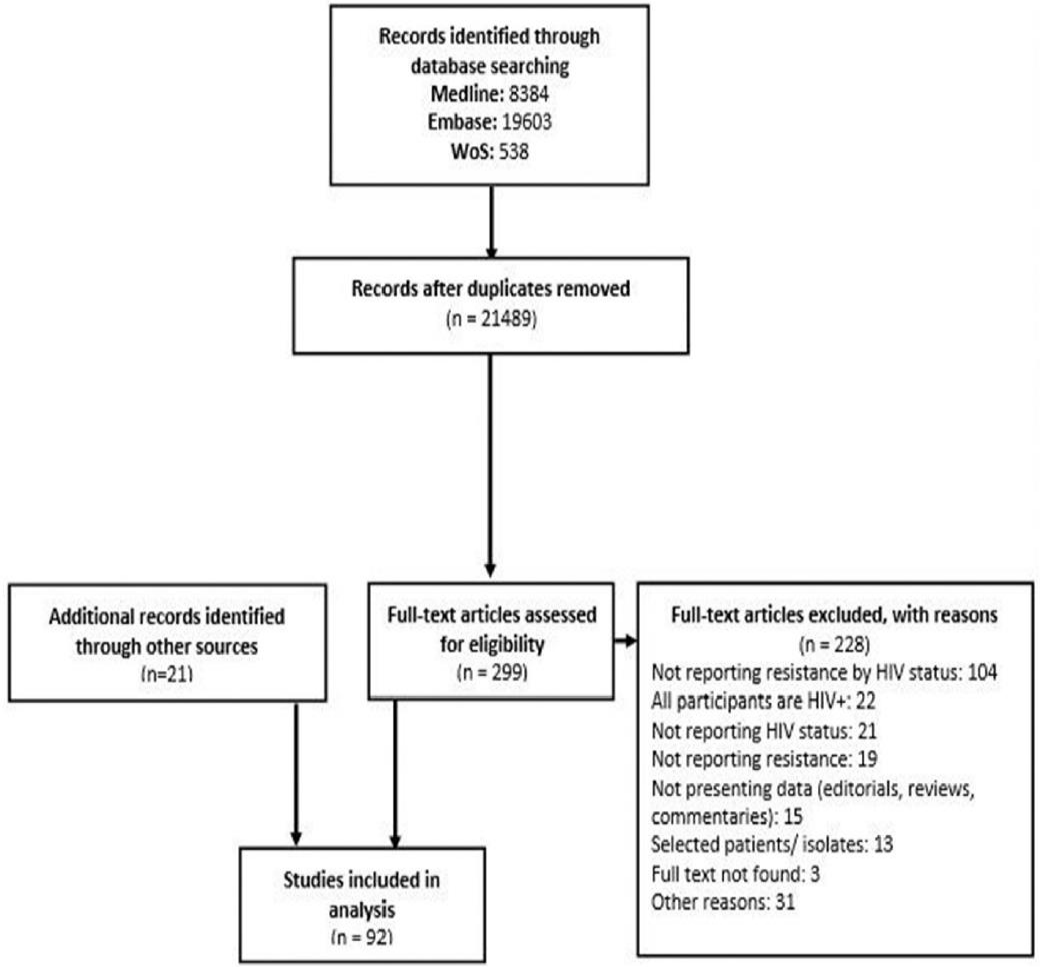
The estimated number of inpatients with antibiotic resistance in China. *SDR* single-drug resistance, *MDR* multiple-drug resistance

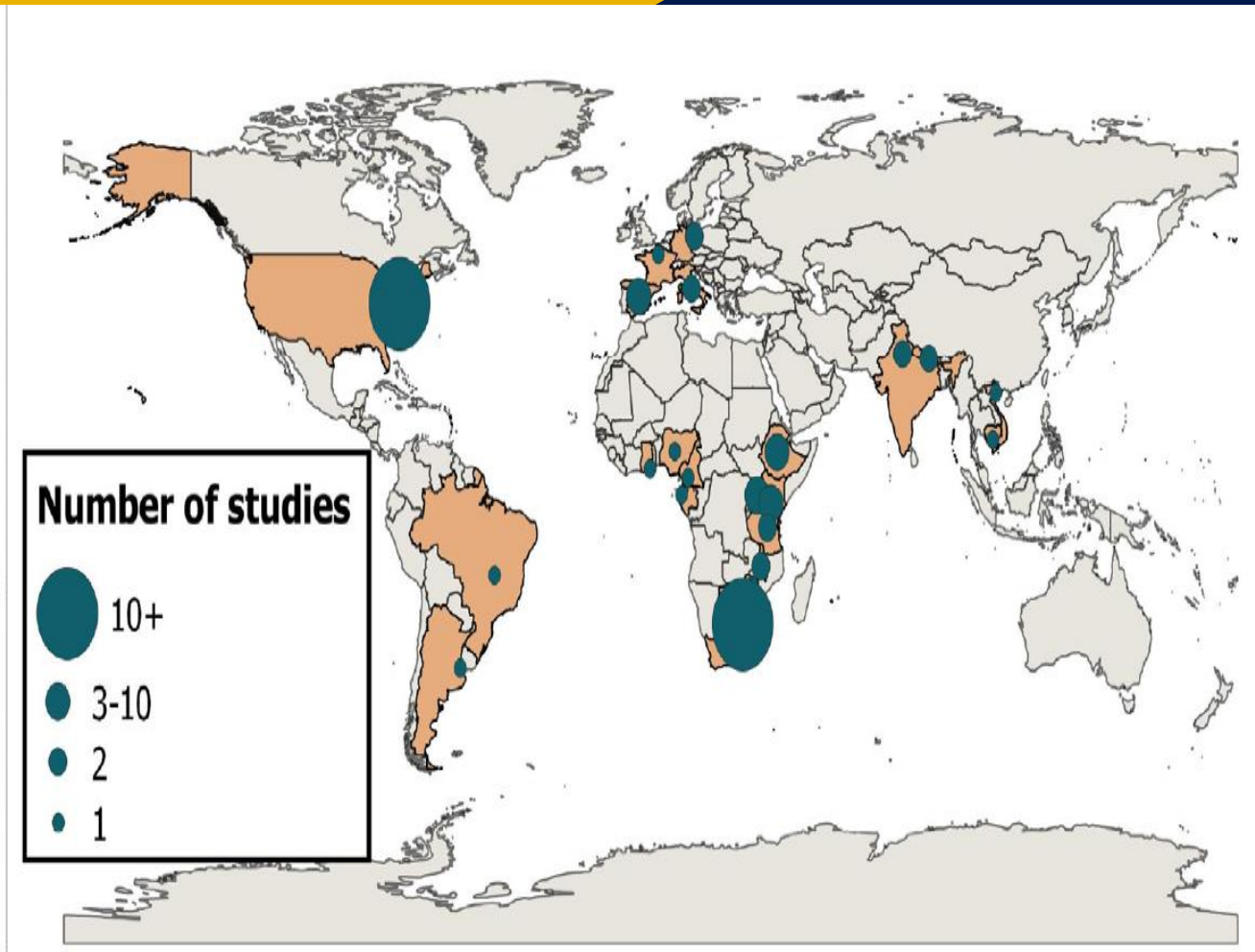


Popolazione > 60 anni

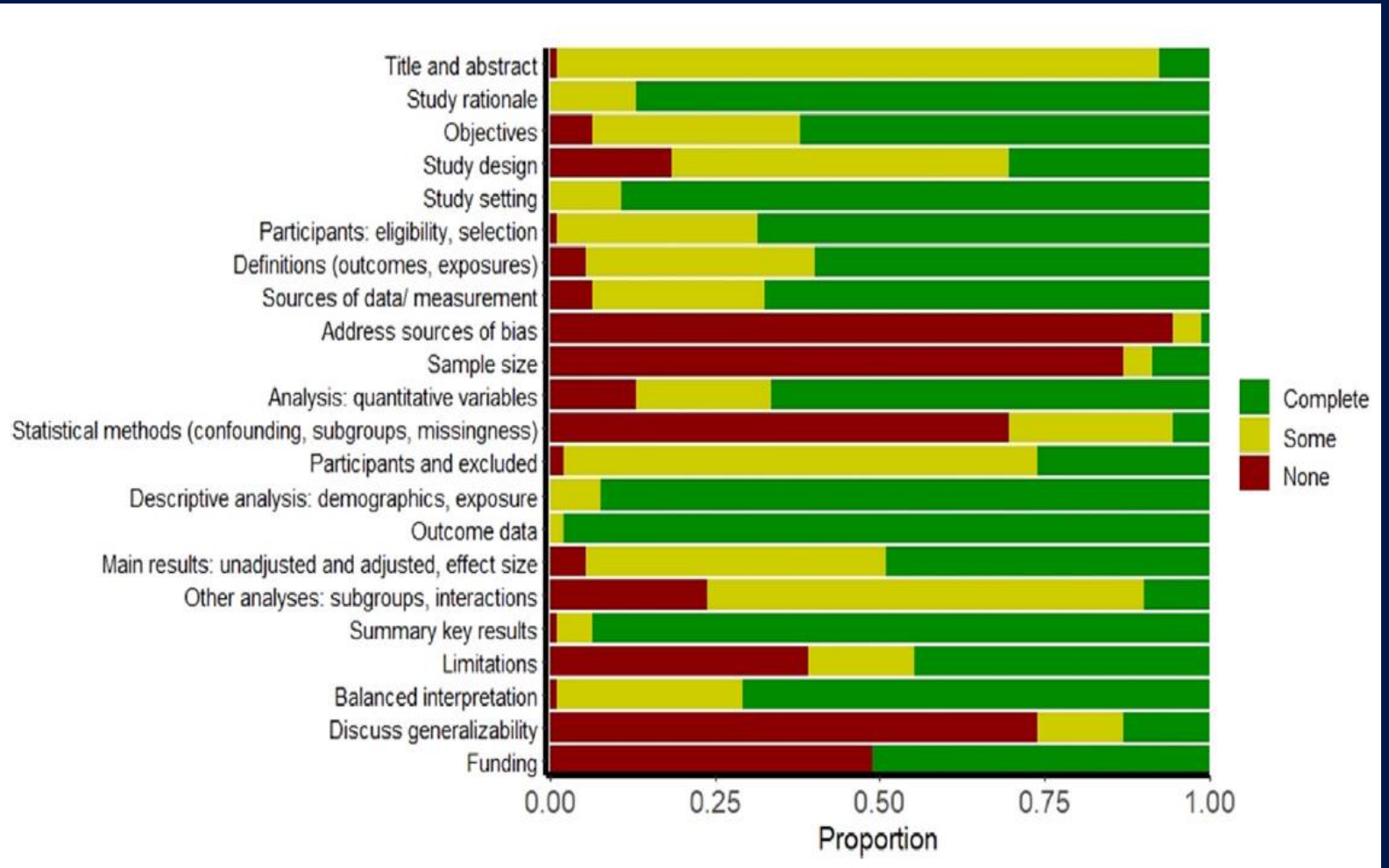
Zhen, ARIC 2021

Evidenze su MDR e HIV
92 studies: 1995-2020





Olaru & Tacconelli, CMI 2021



- Completeness of reporting (STROBE): moderate
- Modified Newcastlee Ottawa Scale: moderate /low quality
  7 studies high quality

Olaru & Tacconelli, CMI 2021

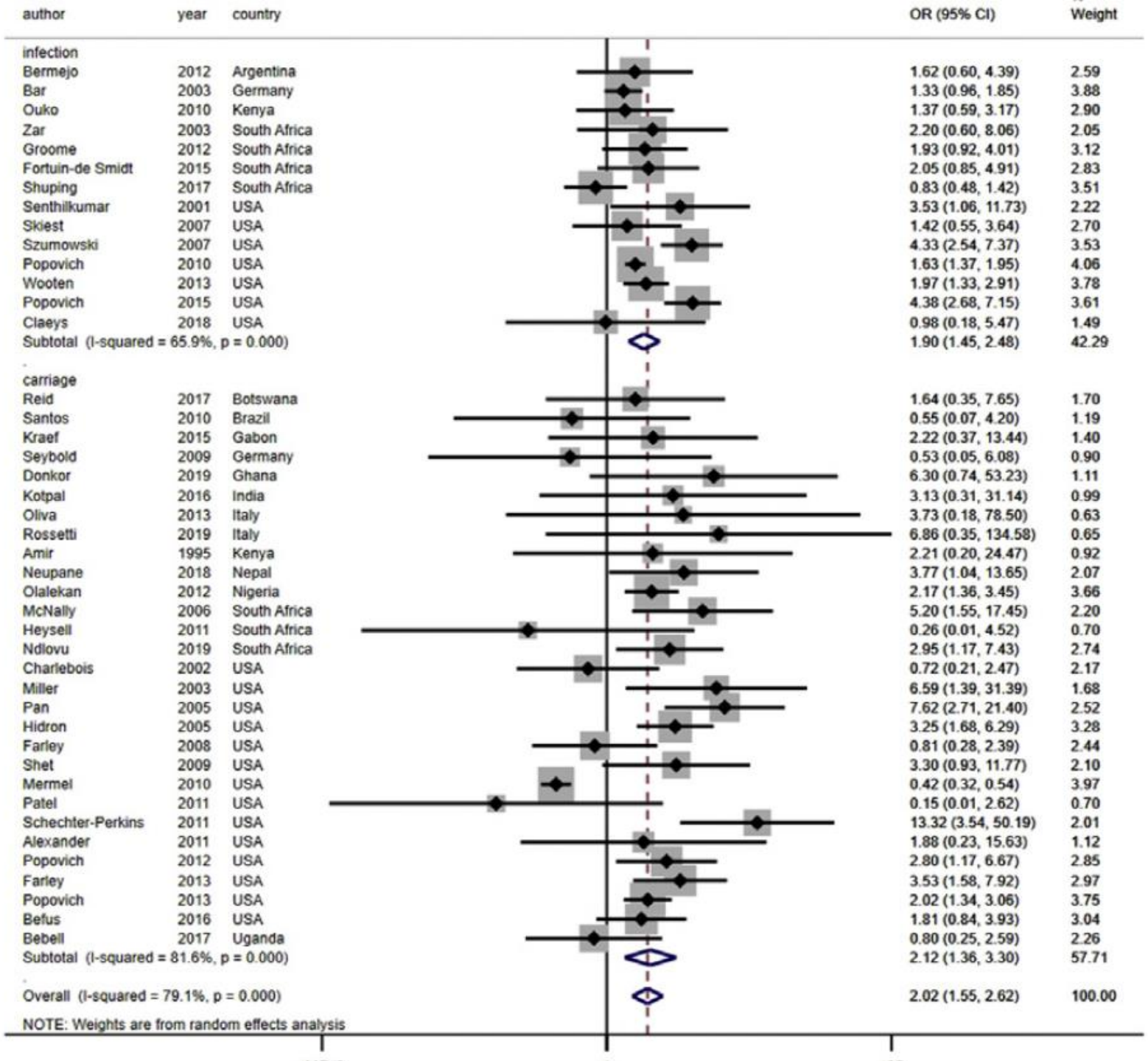
Resistenza nei Gram-positivi

Antimicrobial resistance to selected drugs

Organism	Antimicrobial	Number of studies reporting resistance by HIV status	Pooled prevalence of resistance (95%CI)	
			HIV+	HIV−
Staphylococcus aureus (infection)	MRSA	14	49% (32–65)	35% (25–44)
S. aureus (colonization)	MRSA	29	9% (7–11)	6% (4–8)
	Co-trimoxazole	5	65% (44–86)	55% (46–64)
Streptococcus pneumoniae (infection)	Penicillin	20	29% (23–36)	15% (11–19)
	Co-trimoxazole	7	38% (30–47)	20% (13–28)
	Tetracyclines	6	14% (8–20)	19% (12–26)
	Macrolides	6	8% (4–12)	8% (5–12)

Data were not pooled if there were three or fewer studies reporting prevalence by organism and drug class, or if the number of studies was small and estimates were highly heterogeneous. Studies where prevalence could not be calculated for both HIV-infected and non-infected individuals were also excluded. MRSA, methicillin-resistant *S. aureus*.

Olaru & Tacconelli, CMI 2021

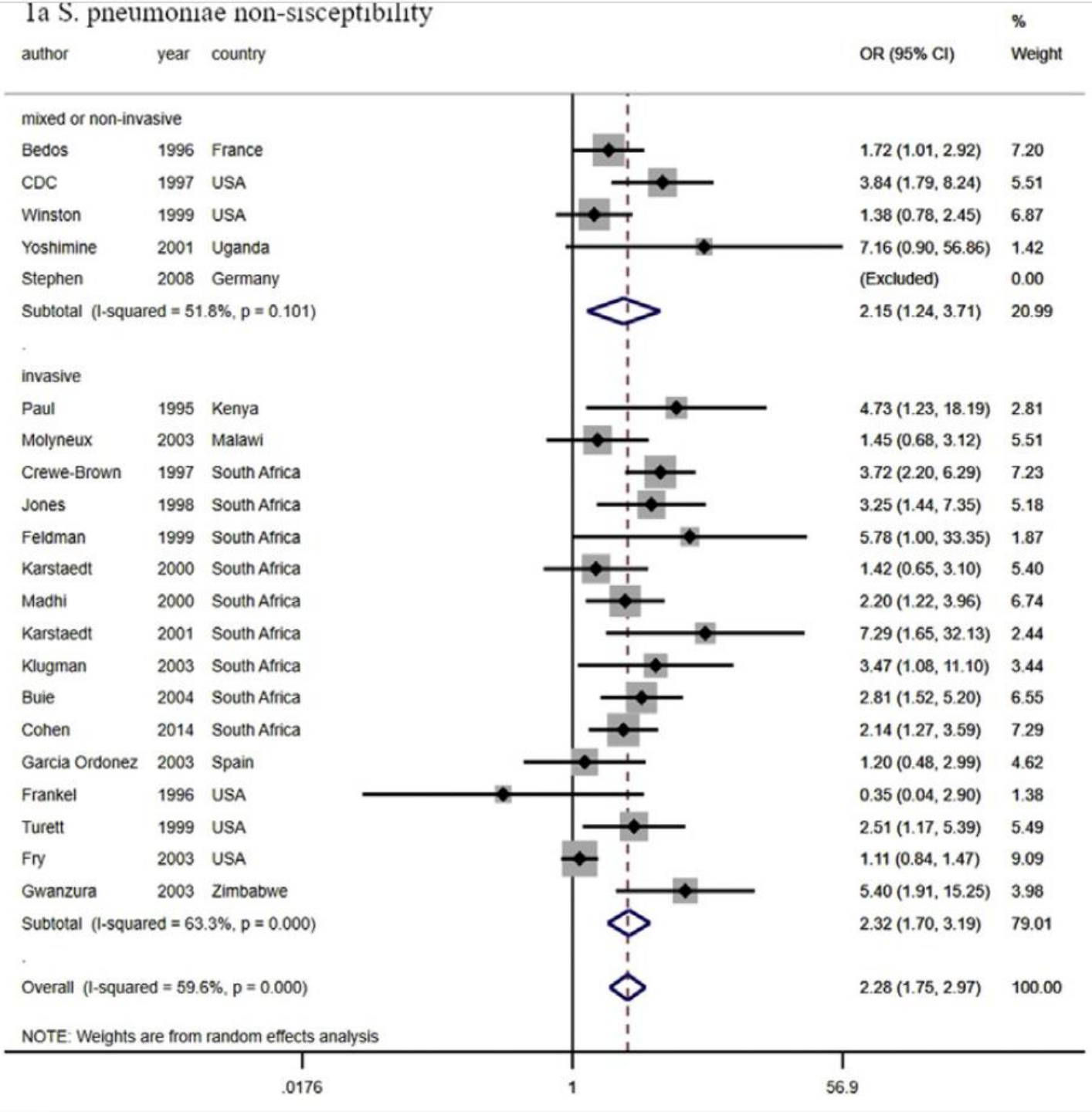


47 studies

1.90 (95%CI 1.45-2.48)

higher odds for infection with methicillin-resistant S. aureus

Olaru & Tacconelli, CMI 2021



28 studies

2.28 (95%CI 1.75-2.97) higher odds of infection with S. pneumoniae with decreased penicillin susceptibility

Olaru & Tacconelli, CMI 2021

Resistance/ organism	Category	Type	Studies	OR (95% CI)
Methicillin resistant S. aureus	All studies	Carriage	29	2.12 (1.36-3.30)
		Infection	14	1.90 (1.45-2.48)
	Pre-ART	Carriage	2	4.37 (1.48-12.90)
		Infection	2	2.84 (1.18-6.85)
	ART	Carriage	27	2.04 (1.29-3.22)
		Infection	11	1.88 (1.40-2.53)
	Published since 2015	Carriage	9	2.17 (1.41-3.33)
		Infection	4	1.75 (0.65-4.69)
	LMIC	Carriage	12	2.21 (1.60-3.05)
		Infection	6	1.39 (0.98-1.96)
	HIC	Carriage	17	2.14 (1.15-4.00)
		Infection	8	2.19 (1.54-3.12)
	CD4 <200	Carriage	2	1.02 (0.13-7.76)
		Infection	3	1.67 (1.41-1.99)
	CD4 ≥200	Carriage	11	2.42 (1.78-3.28)
		Infection	3	3.67 (2.31-5.85)
	ART <50%	Carriage	4	3.33 (1.67-6.67)
		Infection	1	3.53 (1.06-11.73)
	ART ≥50%	Carriage	6	2.99 (1.65-5.43)
		Infection	2	3.24 (1.58-6.62)
Penicillin non-susceptible S. pneumoniae	All studies	Infection	20	2.28 (1.75-2.97)
	Pre-ART	Infection	18	2.39 (1.78-3.22)
	ART	Infection	2	1.82 (1.09-3.03)
	Published after 2010	Infection	1	2.14 (1.27-3.59)
	LMIC	Infection	13	2.74 (2.14-3.49)

Olaru & Tacconelli, CMI 2021

MDR – Gram negative

resistance to third-generation cephalosporins and co-trimoxazole

- 7 studies
- E. coli / K. pneumoniae
  - 849 HIV-infected and 12 573 non-HIV-infected individuals
  - +++ BSI /UTI

- E. coli infections: OR 1.59 (95%CI 0.83-3.05)
- K. pneumoniae: OR 2.43 (95%CI 1.36-4.32)

Olaru & Tacconelli, CMI 2021

E’ piu’ facile oggi prescrivere una terapia per un paziente con HIV naive o per una UTI recidivante in una donna di 50 anni?

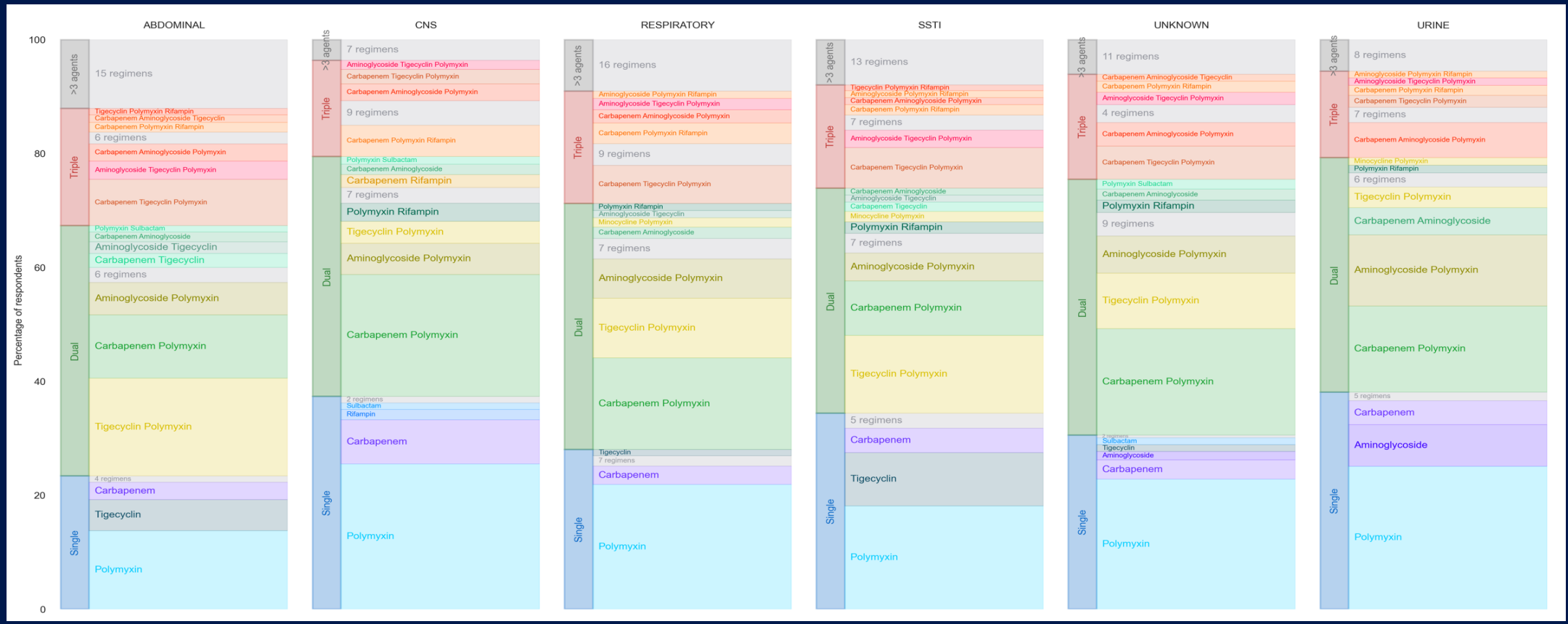
E’ piu’ facile oggi prescrivere una terapia in un paziente con AIDS, diagnosi tardiva e resistenze multiple o in un paziente in TI con sospetta infezione da KPC?

Clinical management of sepsis caused by CR-GN In real life

36-item survey, 1012 respondents, 95 countries, 687 hospitals, worldwide

40 regimens in *Acinetobacter spp*.

100 regimens in Enterobacterales



Carrara & Tacconelli CMI 2021

Retrospective cohort study 2016 - 2018, 46 hospitals in the Michigan Hospital Medicine Safety Consortium.
A total of 2733 hospitalized medical patients with ASB, defined as a positive urine culture without any documented signs or symptoms attributable to urinary tract infection.
A total of 2259 patients (82.7%) were treated with antibiotics for a median of 7 days (IQR, 4-9 days).

Treatment of ASB was associated with longer duration of hospitalization after urine testing

Table 4. Outcomes for Treatment vs No Treatment for Asymptomatic Bacteriuria (N = 2733)

Outcome[a]	No. (%)		Unadjusted Odds Ratio (95% CI)	Unadjusted *P* Value	Adjusted Odds Ratio (95% CI)	Adjusted *P* Value
	Antibiotics (n = 2259)	No Antibiotics (n = 474)				
30-d Postdischarge mortality[b]	63 (2.8)	11 (2.3)	1.22 (0.66-2.26)	.53	1.34 (0.72-2.49)	.35
30-d Postdischarge readmission[b]	362 (16.0)	66 (13.9)	1.16 (0.87-1.56)	.31	1.29 (0.92-1.81)	.14
30-d Postdischarge ED visit[b]	272 (12.0)	62 (13.1)	0.91 (0.70-1.18)	.48	0.90 (0.66-1.24)	.52
Discharge to post-acute care facility[b,c]	811 (35.9)	102 (21.5)	1.98 (1.58-2.48)	<.001	1.19 (0.90-1.57)	.22
Clostridioides difficile infection[d]	14 (0.6)	2 (0.4)	1.39 (0.41-4.68)	.59	0.88 (0.20-3.86)	.86
Duration of hospitalization, median (IQR), d[e]	4 (3-6)	3 (2-5)	1.37 (1.28-1.47)[f]	<.001	1.37 (1.28-1.47)[f]	<.001

Petty, JAMA Intern Med 2019

Patient

- Symptoms
- Source of infection
- Comorbidities
- Risk for future infections

Bacteria

- Sensitivity pattern
- Risk of relapse
- Risk of development of new resistance

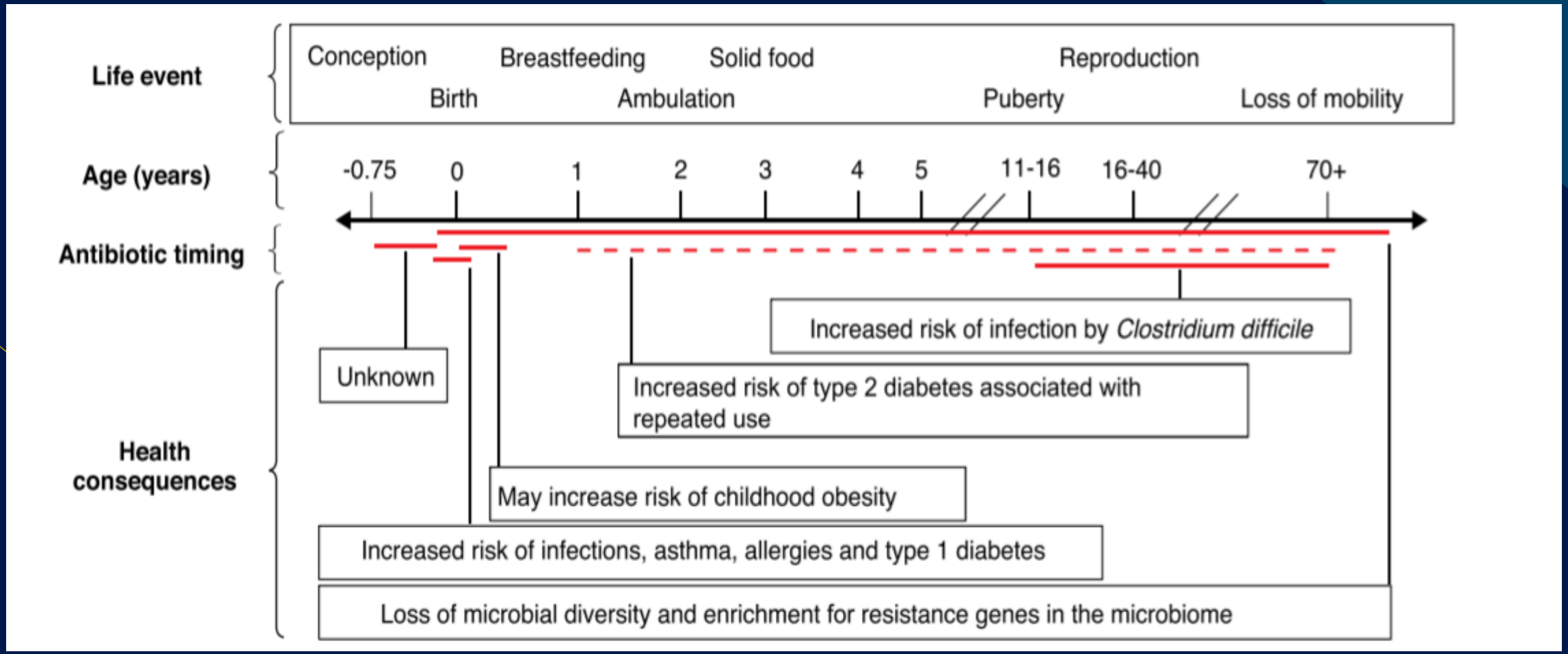
Drug

- Penetration
- Side effects
- Selection of resistance
- Mono vs combi

Society

- Ward colonisation pressure
- Risk of resistance in community

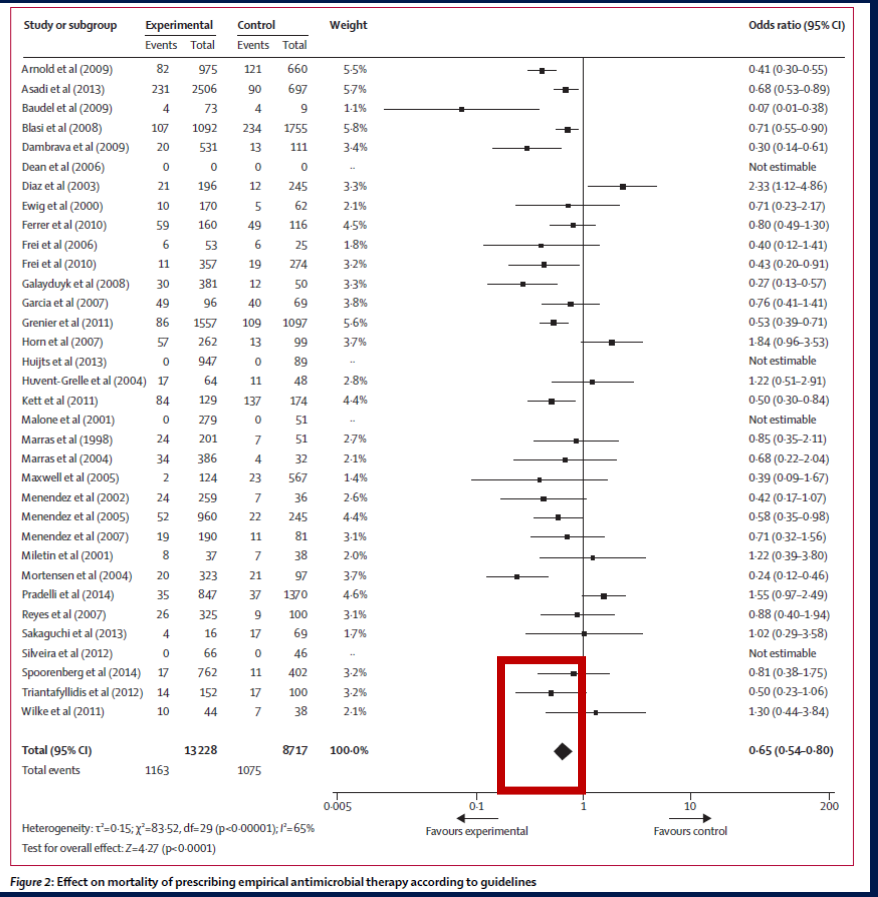
Health consequences linked to the disruption of human-associated microbiota involving antibiotic use during development and adulthood



Langdon, Genome Medicine 2016

Evidenza Stewardship

Guideline-adherent empirical therapy was associated with a RR for mortality of 35%



Study or subgroup	Experimental Events	Experimental Total	Control Events	Control Total	Weight	Odds ratio (95% CI)
Arnold et al (2009)	82	975	121	660	5·5%	0·41 (0·30–0·55)
Asadi et al (2013)	231	2506	90	697	5·7%	0·68 (0·53–0·89)
Baudel et al (2009)	4	73	4	9	1·1%	0·07 (0·01–0·38)
Blasi et al (2008)	107	1092	234	1755	5·8%	0·71 (0·55–0·90)
Dambrava et al (2009)	20	531	13	111	3·4%	0·30 (0·14–0·61)
Dean et al (2006)	0	0	0	0	..	Not estimable
Diaz et al (2003)	21	196	12	245	3·3%	2·33 (1·12–4·86)
Ewig et al (2000)	10	170	5	62	2·1%	0·71 (0·23–2·17)
Ferrer et al (2010)	59	160	49	116	4·5%	0·80 (0·49–1·30)
Frei et al (2006)	6	53	6	25	1·8%	0·40 (0·12–1·41)
Frei et al (2010)	11	357	19	274	3·2%	0·43 (0·20–0·91)
Galaydyuk et al (2008)	30	381	12	50	3·3%	0·27 (0·13–0·57)
Garcia et al (2007)	49	96	40	69	3·8%	0·76 (0·41–1·41)
Grenier et al (2011)	86	1557	109	1097	5·6%	0·53 (0·39–0·71)
Horn et al (2007)	57	262	13	99	3·7%	1·84 (0·96–3·53)
Huijts et al (2013)	0	947	0	89	..	Not estimable
Huvent-Grelle et al (2004)	17	64	11	48	2·8%	1·22 (0·51–2·91)
Kett et al (2011)	84	129	137	174	4·4%	0·50 (0·30–0·84)
Malone et al (2001)	0	279	0	51	..	Not estimable
Marras et al (1998)	24	201	7	51	2·7%	0·85 (0·35–2·11)
Marras et al (2004)	34	386	4	32	2·1%	0·68 (0·22–2·04)
Maxwell et al (2005)	2	124	23	567	1·4%	0·39 (0·09–1·67)
Menendez et al (2002)	24	259	7	36	2·6%	0·42 (0·17–1·07)
Menendez et al (2005)	52	960	22	245	4·4%	0·58 (0·35–0·98)
Menendez et al (2007)	19	190	11	81	3·1%	0·71 (0·32–1·56)
Miletin et al (2001)	8	37	7	38	2·0%	1·22 (0·39–3·80)
Mortensen et al (2004)	20	323	21	97	3·7%	0·24 (0·12–0·46)
Pradelli et al (2014)	35	847	37	1370	4·6%	1·55 (0·97–2·49)
Reyes et al (2007)	26	325	9	100	3·1%	0·88 (0·40–1·94)
Sakaguchi et al (2013)	4	16	17	69	1·7%	1·02 (0·29–3·58)
Silveira et al (2012)	0	66	0	46	..	Not estimable
Spoorenberg et al (2014)	17	762	11	402	3·2%	0·81 (0·38–1·75)
Triantafyllidis et al (2012)	14	152	17	100	3·2%	0·50 (0·23–1·06)
Wilke et al (2011)	10	44	7	38	2·1%	1·30 (0·44–3·84)
Total (95% CI)		**13228**		**8717**	**100·0%**	**0·65 (0·54–0·80)**
Total events	1163		1075			

0·005 0·1 1 10 200

Favours experimental Favours control

Heterogeneity: τ^2=0·15; χ^2=83·52, df=29 (p<0·00001); I^2=65%

Test for overall effect: Z=4·27 (p<0·0001)

Figure 2: **Effect on mortality of prescribing empirical antimicrobial therapy according to guidelines**

Schuts, Lancet Infect Dis 2016

Antibiotic stewardship interventions was associated with a reduction of incidence of MDR-GNB by 48%

	MDR GNB	Events/patient-days Before	Events/patient-days After	Incidence ratio (95% CI)
Apisarnthanarak et al[18]	MDR *Pseudomonas aeruginosa*	13/2889	1/1324	0·08 (0·00–1·41)
Marra et al[31]	Imipenem-resistant *Acinetobacter baumannii*	23/8421	2/8066	0·09 (0·02–0·39)
Apisarnthanarak et al[18]	XDR *A baumannii*	33/2889	2/1324	0·13 (0·03–0·55)
Takesue et al[32]	Metallo-β-lactamase GNB	27/698794	6/635794	0·24 (0·10–0·59)
Cook and Gooch[37]	Carbapenem-resistant *P aeruginosa*	44/220474	13/261318	0·25 (0·13–0·46)
Peto et al[42]	MDR *P aeruginosa*	2/4280	1/4217	0·25 (0·01–5·63)
Takesue et al[32]	MDR GNB	39/698794	10/635794	0·28 (0·14–0·56)
Arda et al[36]	Meropenem-resistant *Acinetobacter* spp	28/285606	10/308852	0·33 (0·16–0·68)
Leverstein-van Hall et al[45]	MDR Enterobacteriaceae	9/19142	4/23583	0·36 (0·11–1·17)
Yeo et al[23]	Carbapenem-resistant *P aeruginosa*	17/20469	8/21798	0·44 (0·19–1·02)
Arda et al[36]	Meropenem-resistant *P aeruginosa*	8/285606	4/308852	0·46 (0·14–1·54)
Marra et al[31]	Imipenem-resistant *Klebsiella pneumoniae*	6/8421	3/8066	0·52 (0·13–2·09)
Marra et al[31]	Imipenem-resistant *P aeruginosa*	15/8421	8/8066	0·56 (0·24–1·31)
Arda et al[36]	Meropenem-resistant *A baumannii*	45/285606	29/308852	0·60 (0·37–0·95)
Meyer et al[34]	Imipenem-resistant *P aeruginosa*	34/13502	33/21420	0·61 (0·38–0·99)
Yeo et al[23]	Carbapenem-resistant *A baumannii*	10/20469	9/21798	0·85 (0·34–2·08)
Zou et al[20]	Meropenem-resistant *P aeruginosa*	185/834560	172/883500	0·88 (0·71–1·08)
Niwa et al[25]	Imipenem-resistant *P aeruginosa*	11/128146	15/113873	1·53 (0·70–3·34)
Aubert et al[43]	Imipenem-resistant *P aeruginosa*	49/5100	44/2548	1·80 (1·20–2·70)
Overall				**0·49 (0·35–0·68)**
I^2=76·2%, p=0·000				

0 0·5 1·0 1·5 2·0

Antibiotic stewardship programme effective

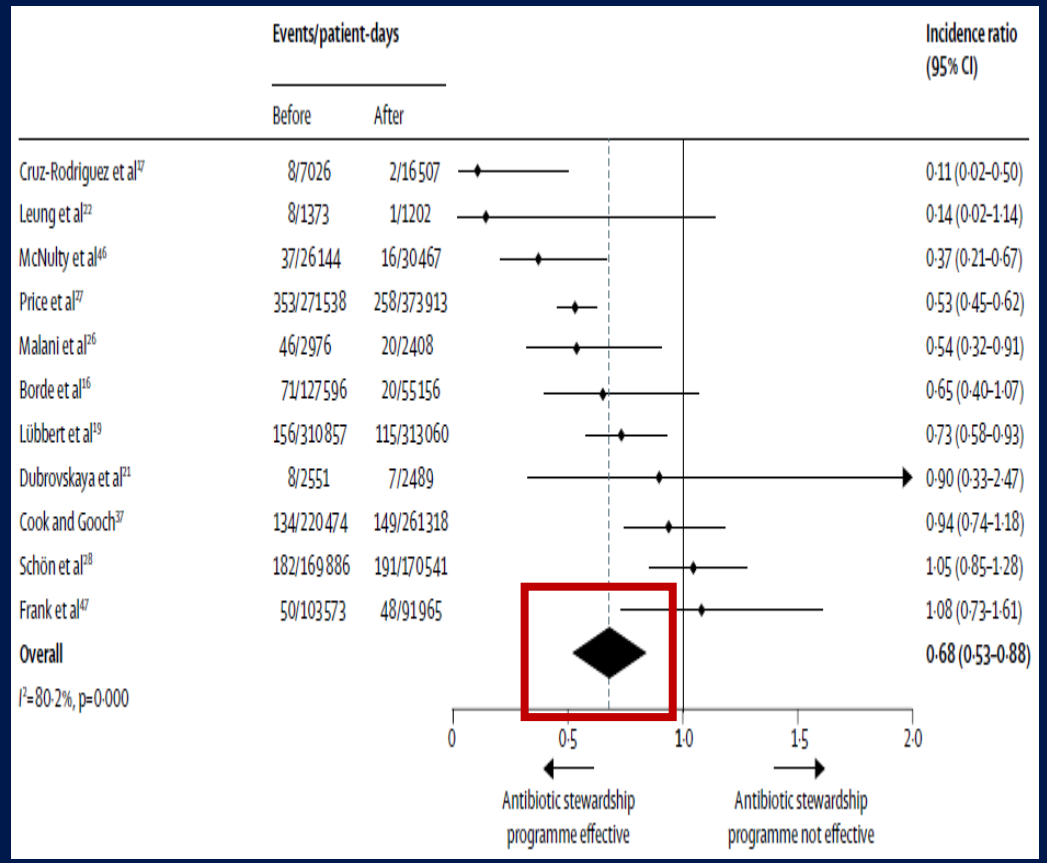
Antibiotic stewardship programme not effective

Figure 2: **Forest plot of the incidence ratios for studies of the effect of antibiotic stewardship on the incidence of MDR GNB**
GNB=Gram-negative bacteria. MDR=multidrug-resistant. XDR=extensively drug-resistant.

Tacconelli, Lancet Infect Dis 2017

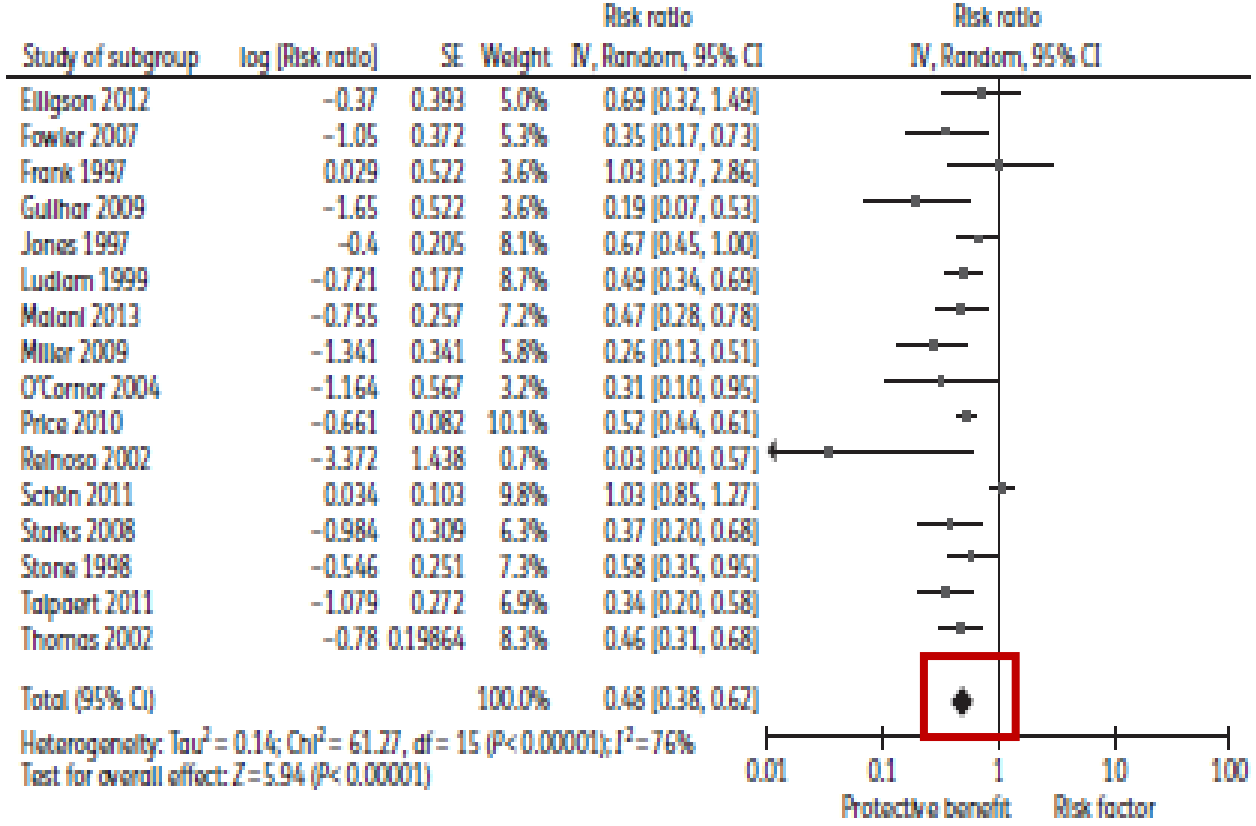
Evidence
Antibiotic Stewardship

ATBS intervention was associated with a reduction of incidence of CDI by 32% (IR 0·68, 0·53–0·88; p=0·0029)



Tacconelli Lancet Infect Dis 2017

Restrictive ATBS were particularly effective in geriatric settings



Feazel JAC 2014
Pooled RR 0.48, 95%CI 0.38 – 0.62

ATBS plus IC and CDI

4-year, non-restrictive, multi-faceted intervention
Intervention: ATBS plus ICPM (education)

ITS study design
42886 patients evaluated in ED
receiving an antibiotic treatment

140 | Phase I | Phase II | Phase III | Phase IV

INCIDENCE RATE OF *C. DIFFICILE* INFECTIONS per 100 patient days

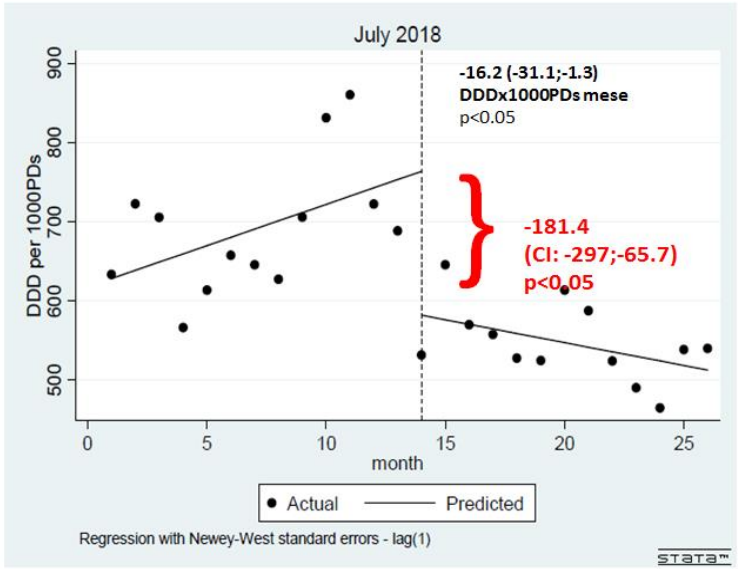
Study phase	Baseline level (β0)	Baseline slope	Change in level (CI 95%)	P value	Change in slope (CI 95%)	P value
Phase I	0.80	0.12	—	—	—	—
Phase II	—	—	−0.45 (−0.52 to 0.43)	0.847	0.04 (−0.01 to 0.09)	0.133
Phase III	—	—	−0.23 (−0.75 to −0.29)	0.381	−0.06 (−0.10 to −0.01)	**0.014**
Phase IV	—	—	0.11 (−0.31 to 0.54)	0.588	0.002 (−0.05 to 0.05)	0.946

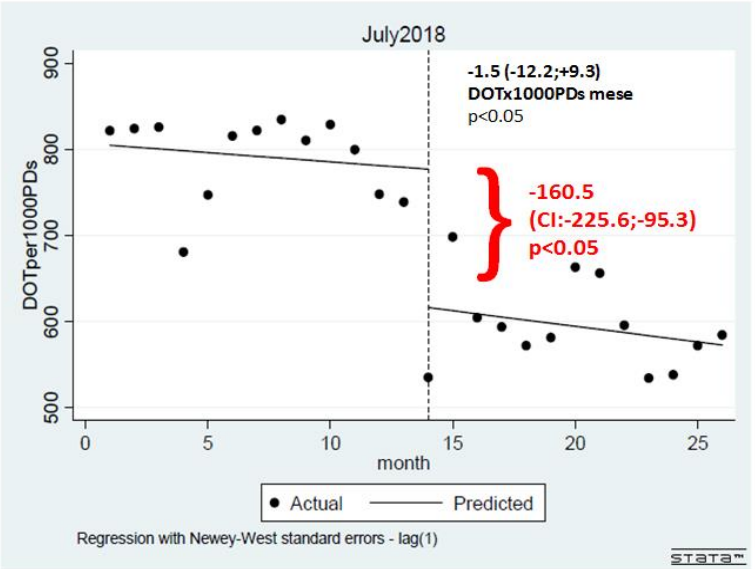
Savoldi & Tacconelli Scientific Reports Nature Research 2020

- ANTIBIOTICI + EDUCAZIONE = SALUTE

https://www.save.veneto.it

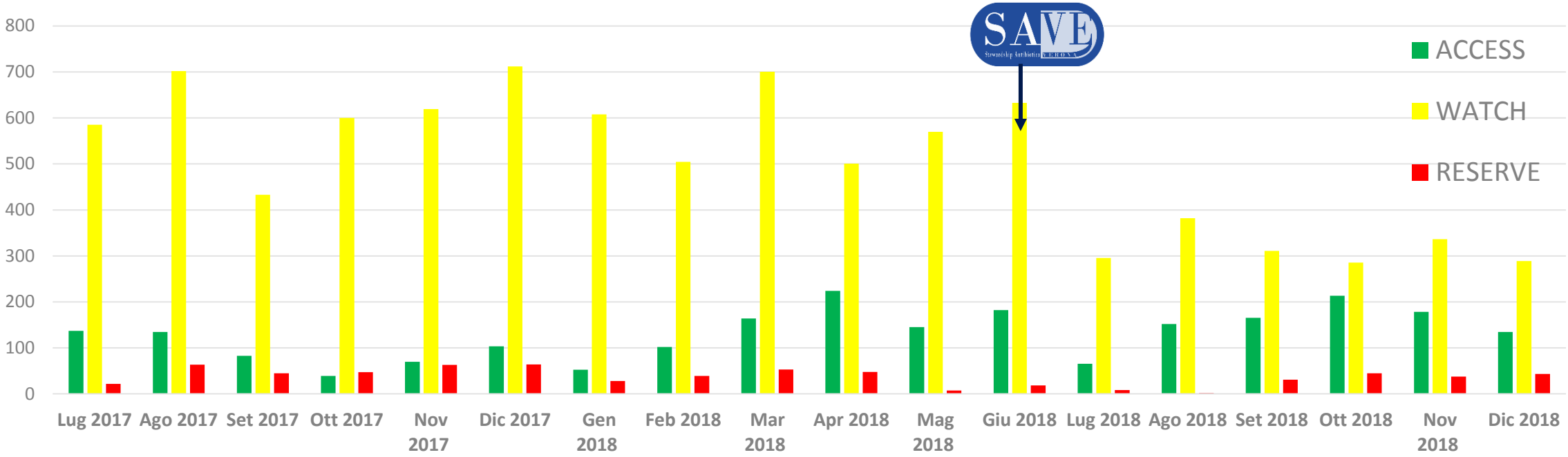
AREA MEDICO-GERIATRICA
consumo antibiotici DDD e DOT





SAVE Stewardship Antibiotica VErona

ANTIMICROBIAL CONSUMPTION: DOT CLASSIFICAZIONE AWARE OMS



DOT/1000gg	before						after						media before	media after	p ≤ 0,05
ACCESS	135,8	134,6	72,2	43,8	81,8	82,6	65,5	166,4	161,9	213,5	171,6	133,1	92	152	0,0376
WATCH	585,1	701,9	433,1	599,8	620,4	712,8	295,7	381,9	310,8	285,6	340,5	288,7	609	317	0,0001
RESERVE	26,0	65,1	55,6	54,2	65,2	89,2	8,4	1,6	34,4	44,7	40,5	44,8	59	29	0,0252

QUADRO 1: TERAPIA EMPIRICA DELLE INFEZIONI DELLE VIE URINARIE

minore impatto ecologico | consulenza per prosecuzione terapia | consulenza obbligatoria entro 48h

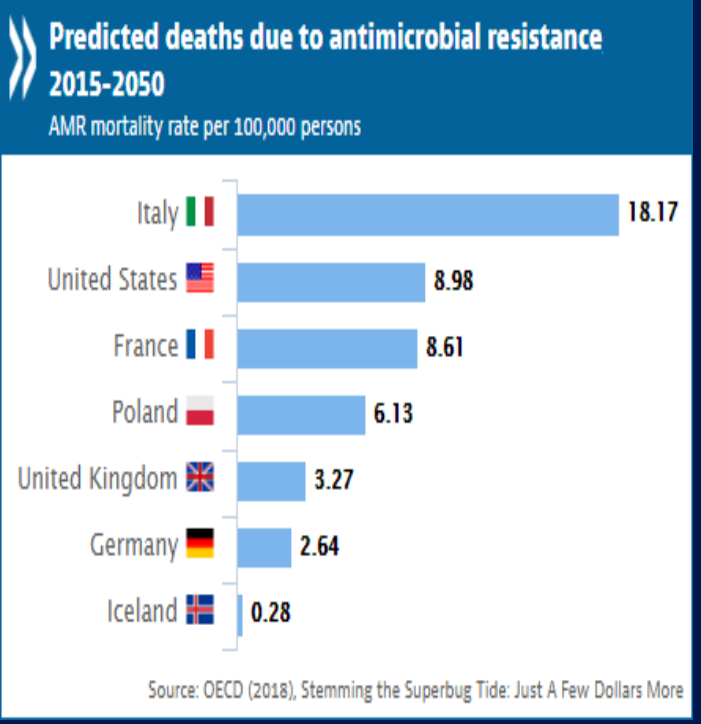
TIPO DI INFEZ	QUADRO		ALTERNATIVE	DURATA ISTA
Infezio vie uri (in ass segni e infezio sistemi	complicazione	Se anamnesi di IVU da germi MDR nei 12 mesi precedenti **Preferibile attendere l'antibiogramma**	Se necessario iniziare una terapia empirica **fosfomicina trometamolo** 3 g q48h (proseguire con 3 dosi totali se sensibile)	7 gg

QUADRO 2: BATTERIURIA ASINTOMATICA*

Definizione: pre positive ad una carica di almeno 10^5 CFU/ml in assenza di segni o sintomi di infezio

QUAND	QUANDO NON TRATTARE
- prima di proc urinarie: pos nefrostomia/ - procedure e un'interruzio - donna in gra	- diabete mellito - trapianto di rene oltre il 1° mese - presenza di catetere urinario, *stent* ureterale o derivazioni urinarie - neutropenia - uropatia ostruttiva o anomalia funzionale del tratto urinario

NOTA: la sola pi o allo *stick*-urine non costituisce indicazione ad inviare urinocoltura.
Per le indicazioni all'esecuzione di urinocoltura in paziente portatore di catetere vescicale vedere Figura 1.



Cosa fare?

1. La **prescrizione corretta dell´antibiotico** e´ un **diritto** del paziente ed un **dovere** dell´operatore sanitario
1. E‘ necessario sviluppare moemnti educazionali indipendenti e corsi di studio dedicati nel corso di Medicina
2. La discussione con esperti senza conflitti di interesse sul posizionamento delle ultime molecole riveste un ruolo importante
3. Definire indicazioni di terapia locale:
   - Selezione delle molecole a basso impatto ecologico (vedi classificazione AWARE di OMS)
   - Definire la durata della terapia
   - Definire le indicazioni per l’associazione degli antibiotici
   - Attenzione massima alla prescrizione empirica e alla de-escalation dopo 48-72 ore

5. AUDIT interni periodici !!!!!

6. Definire protocolli di terapia antibiotica nei pazienti con infezione da SARS-CoV-2 (solo se co-infezione…!)

1. Define leadership, budget, personnel
2. Invite for dinner your microbiologist
3. Define your targets
4. Define the settings
5. Choose your indicators (including for side effects)
6. Share a bottle of Italian wine with your infection control practitioner
7. Revise careful national or regional guidelines and stay update with new studies on stewardship
8. Go multidisciplinary
9. Get married with IT expert
10. Let´s do it together

https://epi-net.eu/publications/

Which resistant pathogens should be targeted
3.1) Essential Monitor methicillin-resistant *Staphylococcus aureus*, vancomycin-resistant *Enterococci*, carbapenem-resistant Gram-negatives, ESBL-producing bacteria and colistin resistant Gram-negative bacteria in all blood cultures and *Clostridioides difficile*.
3.2) Essential In highly endemic settings for tuberculosis, check availability of local data on resistance in tuberculosis and consider having a section of the periodic report summarising most important information
3.3) Essential Before starting a surveillance program, ensure minimum infrastructural requirements and alignment with quality control programs to support AMR surveillance.
3.4) Essential Monitor antibiotic resistance to new antibiotics in settings highly endemic for multidrug resistant Gram negatives.
3.5) Desirable Monitor resistance in *Candida* spp. if the stewardship intervention is targeting institutions/wards with high rates of invasive fungal infections (i.e. haematology, transplant centre, ward with high consumption of broad spectrum antibiotics).
How should resistance be monitored
3.6) Desirable Monitor MICs (or inhibition zones) of resistant bacteria of primary clinical importance at the local/unit level.
3.7) Desirable Where resources allow, monitor molecular mechanisms of resistance in clinically-relevant strains according to the antimicrobial stewardship team.
Should non-clinical samples (screening and colonisation status) be monitored
3.8) Desirable Monitor resistance in screening samples in settings with infection control measures applied to colonised patients (e.g. targeting screening and contact precautions, preventive isolation).
Which time interval for reporting

JAC Dec 2020

Downloadable checklists from the website

Numerose posizioni disponibili per ricerca

Specializzandi per stage on stewardship nel progetto SAVE (da 4 a 12 mesi)

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