Supporting Antimicrobial Stewardship from the Laboratory

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Acknowledgement of Country

NSW Health Pathology acknowledges the traditional custodians of the lands on which we work and pay our respects to ancestors and Elders, past and present.
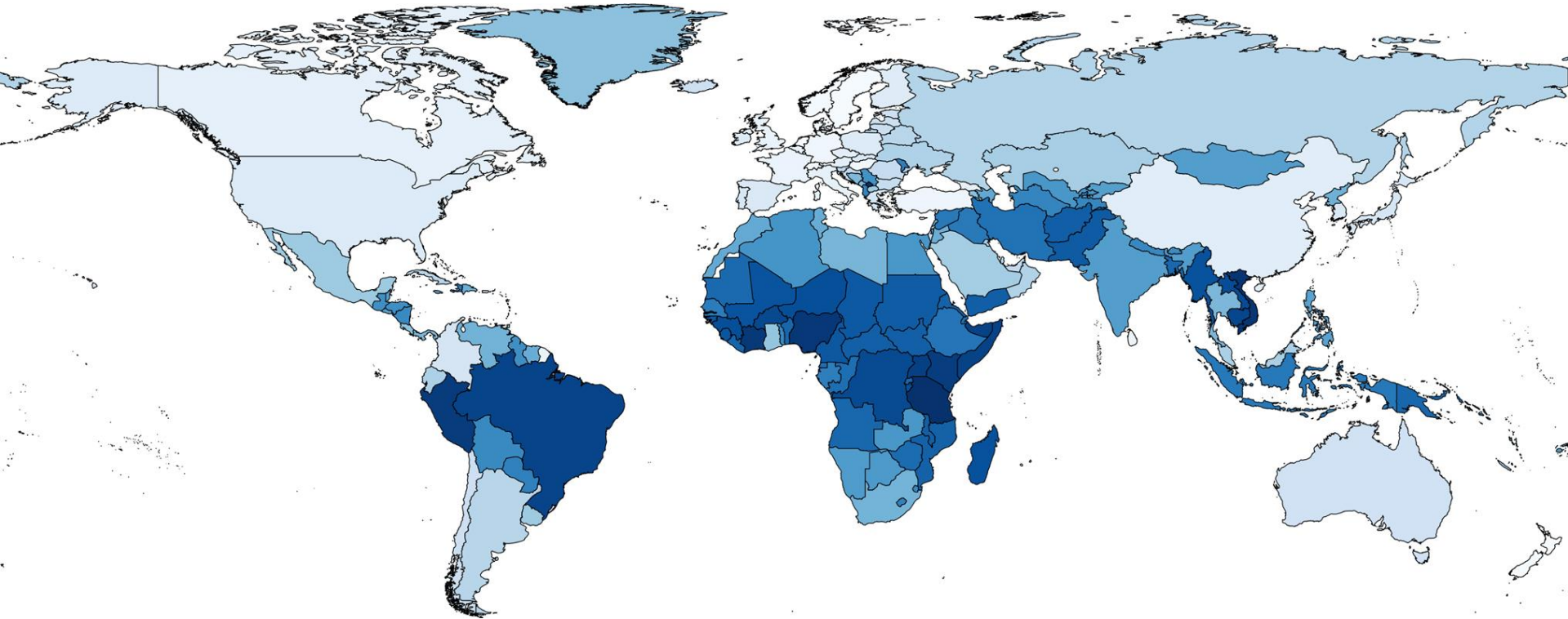
We are committed to honouring Australian Aboriginal and Torres Strait Islander peoples' unique cultural and spiritual relationships to the land, waters and seas and their rich contribution to society.
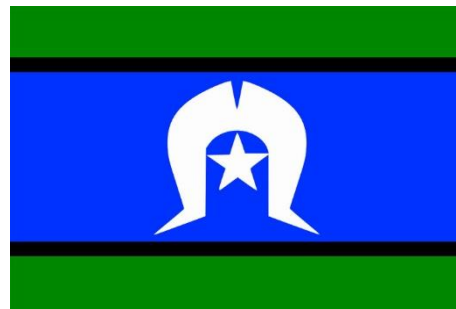
Data & information

Global monitoring of antimicrobial resistance based on metagenomics analyses of urban sewage

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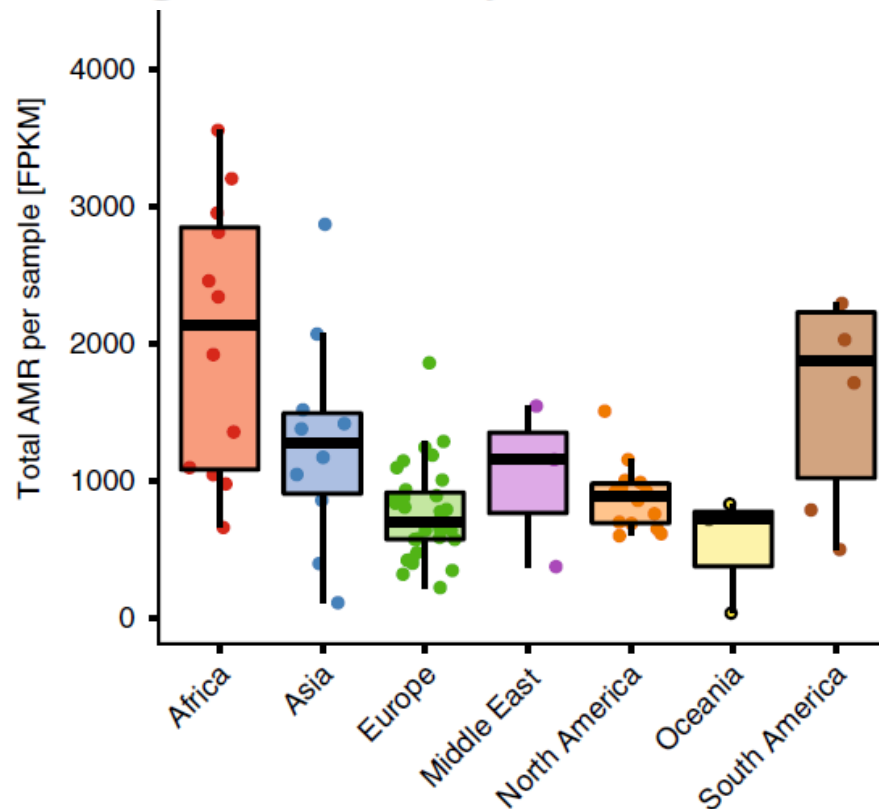
Nature of the data

- Molecular

  - CARAlert, *mec* gene detection

- Minimum inhibitory concentrations

  - Disk zones

- Epidemiological cut-offs (ECOFFs)

- Breakpoints

Minimum inhibitory concentrations

- Standardised inoculum

    – Broth: "McFarland 0.5" $\approx$ 1.5 x 10^8 CFU /ml

- 2 fold dilutions of antimicrobial in mg/L

    – Approximately log linear distribution of isolates

Benzylpenicillin / Staphylococcus aureus MSSA
International MIC Distribution - Reference Database 2019-06-19

ECOFF & Breakpoint

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MICs, ECOFFs & breakpoints

EUCAST Cefoxitin MICs MSSA & MRSA
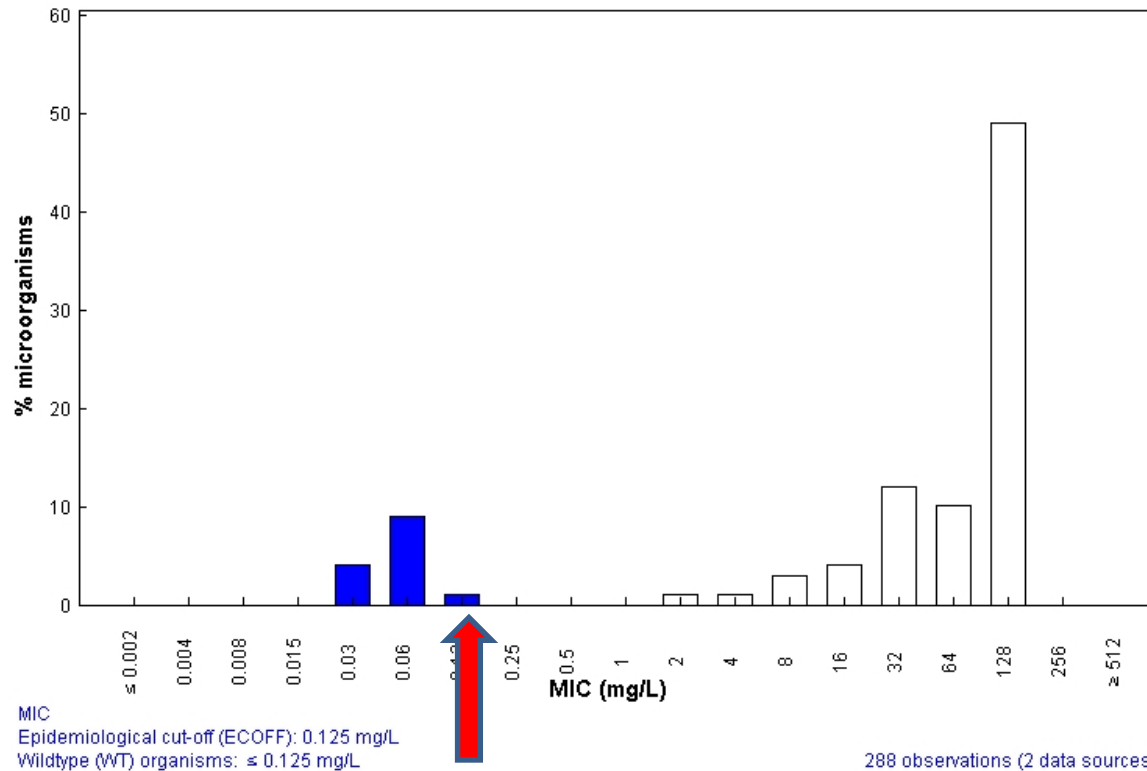
ECOFF
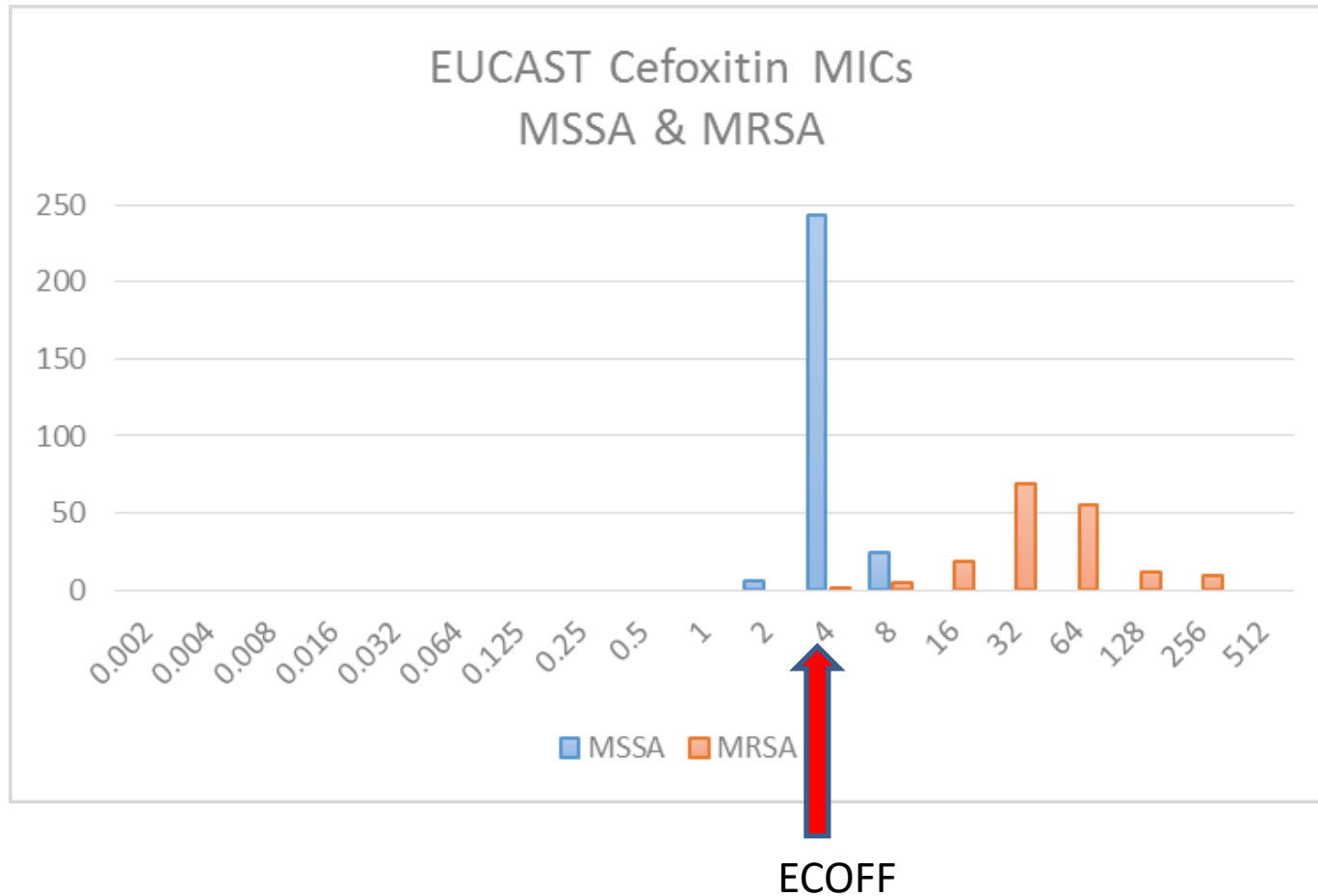
Cefazolin / Escherichia coli
International MIC Distribution - Reference Database 2019-06-19

Breakpoint

PK / PD & breakpoints

Mouton et al. Clin Microbiol Infect 2012; 18: E37–E45

Breakpoint: S or R (or I ?)

- Breakpoint determines if an isolate is classified as susceptible, resistant or intermediate

  – *unless trumped by a molecular marker*

- Three different standards for breakpoints

  – EUCAST, CLSI, CDS

  – Annual updates

- ISO 20776-1: 2006 (now 2019)

- Australian practice has been to report "intermediate" as "resistant", but that's about to change

Source of the data

Locations of NATA Accredited Microbiology Laboratories - Australia
By Laboratory Category and Remoteness

Mr. Fakhrul Islam, Health Surveillance, Population Health, Hunter New England Local Health District.
Updated on: 27/9/17

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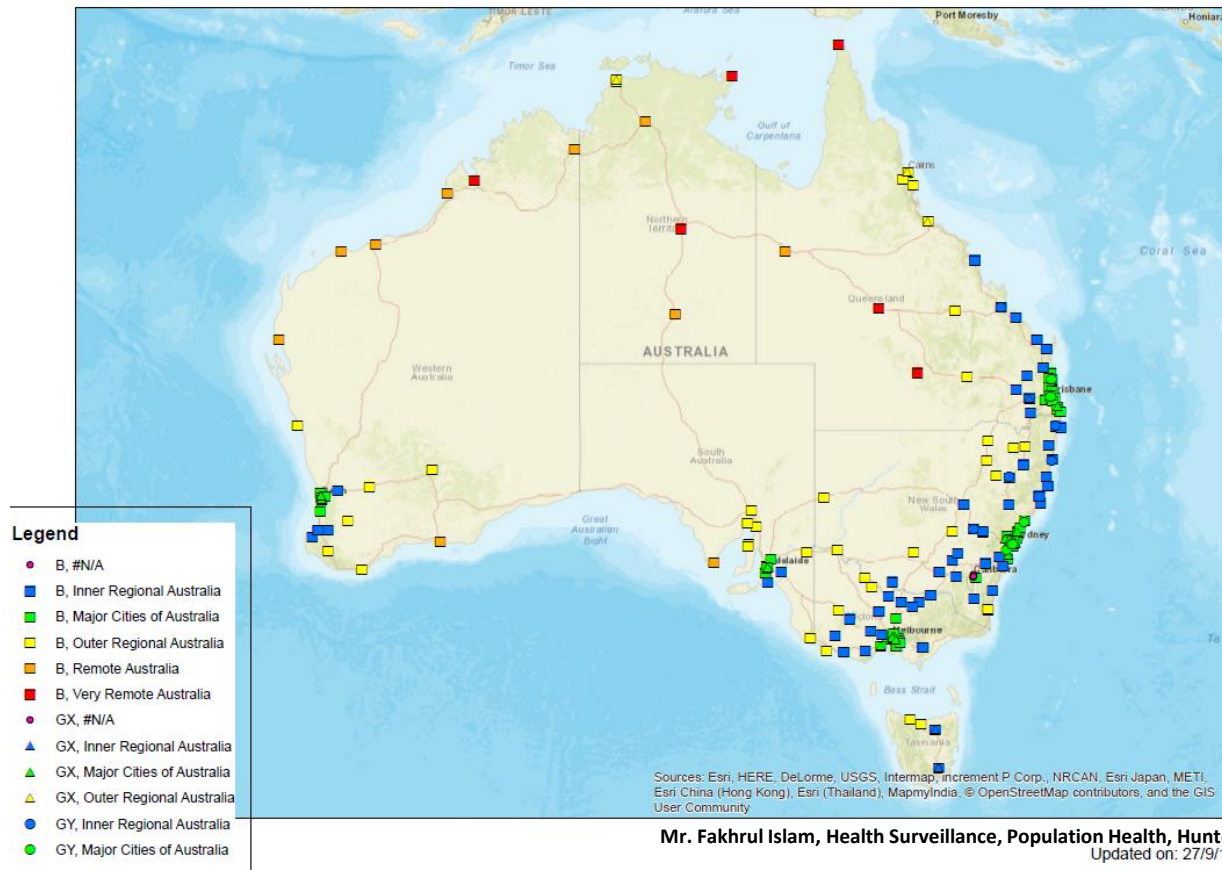
Turning data into information

- Antibiograms

  – Selective "cascade" reporting

- Cumulative antibiograms

INFORMATION: ANTIBIOGRAMS
Cascade reporting

* Page down for extra sensitivities *	AMP	AMC	AMU	KZ	KZU	TMP	F	CRO	CAZ	TZP	GM	TOB	AK	CIP	NRX	MEP
Escherichia coli >10^8/L	R	S		S		R	S	S	S		S			S	S	

Cascade reporting

Figure A: Methicillin-resistant *Staphylococcus aureus* (MRSA) and vancomycin-resistant enterococci (VRE) acquisitions with changes to piperacillin–tazobactam use (DDD/1,000 OBD)

Legend:
- Piperacillin–tazobactam use
- Hospital-onset VRE
- VRE trend
- Hospital-onset MRSA
- MRSA trend
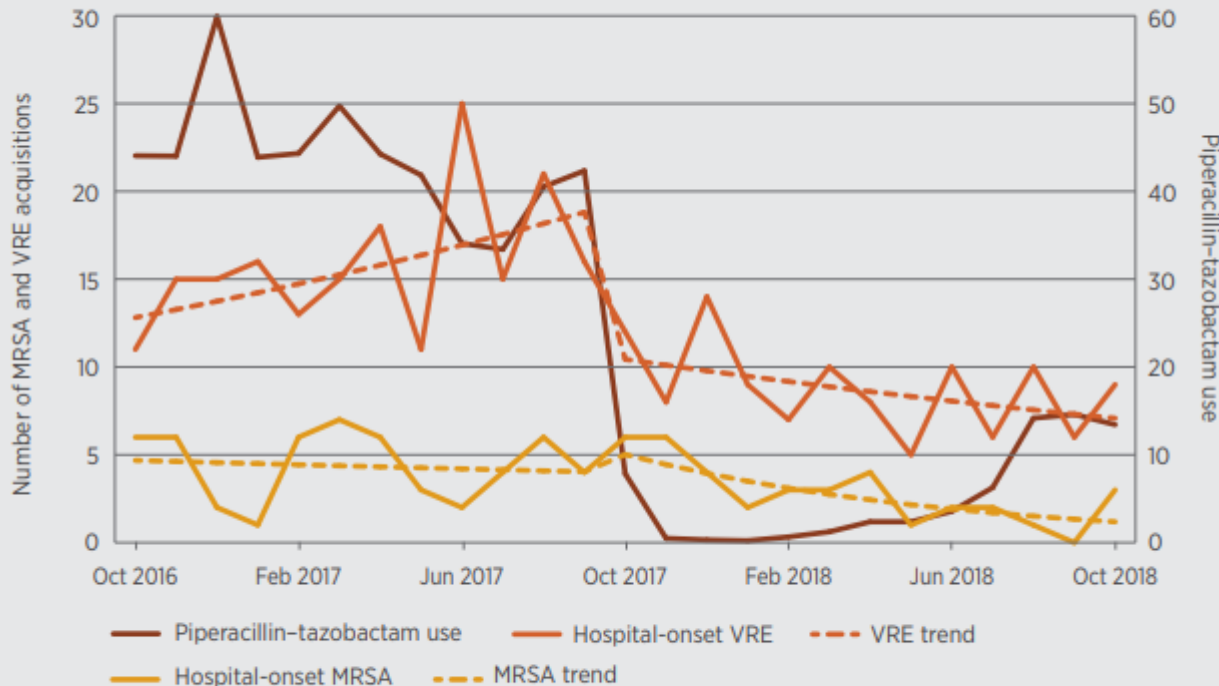
DDD/1,000 OBD = defined daily doses per 1,000 occupied bed days
Source: Ferguson JK, Kozierowski K, Munnoch SA, Oldmeadow C, Chiu S. Reduction in MRSA and VRE colonisation and infection associated with sustained reduction in broad spectrum antibiotic usage at a large tertiary hospital [article submitted to *Medical Journal of Australia*, January 2019].

Cascade reporting

- "We suggest selective and cascade reporting of antibiotics over reporting of all tested antibiotics *(weak recommendation, low-quality evidence)."* Implementing an Antibiotic Stewardship Program: Guidelines by the Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America CID 2016:62 (15 May)

……selective reporting of AST has never been evaluated using an experimental design……" Binda F, Fougnot S, De Monchy P on behalf of the ANTIBIO-CIBLÉ Scientific Committee, et al Impact of selective reporting of antibiotic susceptibility test results in urinary tract infections in the outpatient setting: a protocol for a pragmatic, prospective quasi-experimental trial BMJ Open 2018;8:e025810. doi: 10.1136/bmjopen-2018-025810

- Censored tests

  - "Pathology stewardship"

- Censored reports

  - *Stenotrophomonas maltophilia*
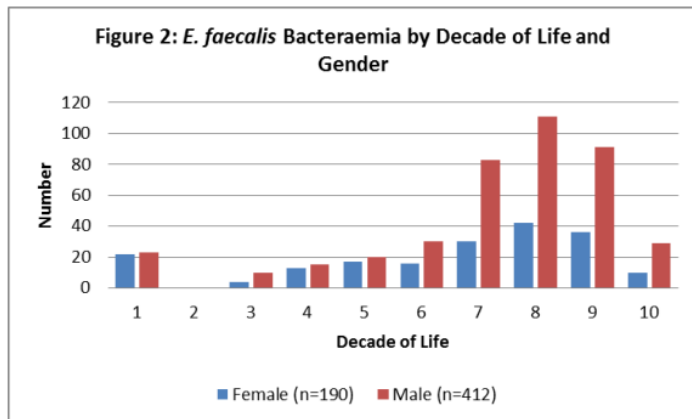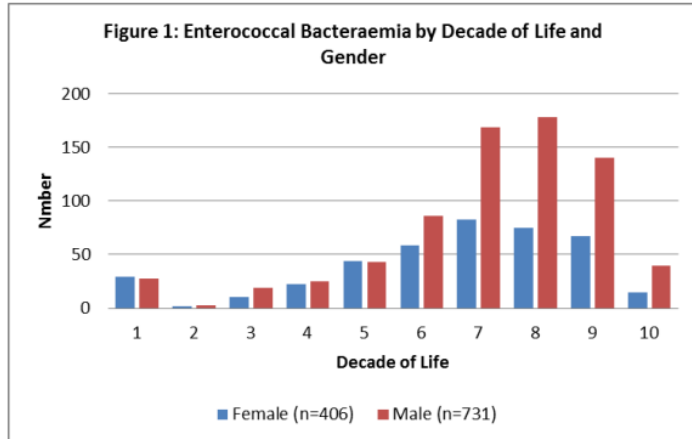
  - *Staphylococcus aureus?*

Cumulative antibiograms

Figure A1: Example of a cumulative, hospital-level antibiogram for blood culture isolates

Organism Group	No. Organisms	%Total		Penicillin	Amoxicillin	Flucloxacillin	Amoxicillin-clavulanate	Piperacillin-tazobactam	Cefalotin	Cefazolin	Ceftriaxone	Ceftazidime	Cefepime	Meropenem	Gentamicin	Amikacin	Sulpha-trimethoprim	Ciprofloxacin	Fusidic Acid	Rifampicin	Gentamicin (High Level)	Erythromycin/Clarithromycin	Clindamycin	Tetracyclines	Quinupristin-dalfopristin	Vancomycin
All isolates	**2142**	**100.0**																								
Coagulase negative Staphylococci	637	29.7	%	11		41	40		40			R					59	79	79	98		44	64	68		100
			n	627		621	621		621								629	609	623	626		626	625	628		632
Escherichia spp	407	19.0	%		43		79	92		77	90		93	100	91	99	69	86								
			n		407		407	406		407	407		406	407	407	*329	407	407								
Staphylococcus aureus (ALL)	211	9.9	%	26		89	89		89			R					95	92	95	100		86	87	95		100
			n	211		211	211		211								211	*185	*186	*186		211	211	211		211
Klebsiella spp	147	6.9	%		R		94	92		84	93		95	100	99	100	86	93								
			n				147	147		147	147		147	147	147	*119	147	147								
viridans Streptococci	118	5.5	%	85					100		89						68		R		100	50	85	74		100
			n	117					*15		115						*25				*83	117	117	117		116
Pseudomonas aeruginosa	100	4.7	%		R		R	89		R	R	92	94	94	96	96	R	94							R	
			n					100				100	100	100	100	*77		100								
Enterococcus spp	90	4.2	%	77					R	R	R	R					R		R	43	81	R	R	30	33	87
			n	90																*23	*83		90	90	*76	90
Spore forming GPB	57	2.7	%	17					75								92	97				76	49	78		98
			n	*54					*12								*25	*39				*21	*53	*50		*52
Enterobacter cloacae complex	56	2.6	%		R		R	66		R	71		86	98	93	100	77	93								
			n					56		56	56		56	56	56	*43	56	56								

DRAFT - Specification for a Hospital Cumulative Antibiogram – June 2019   15

"……it is noted that while national data is informative, local data may differ due to service provision or demographic differences in local populations. As a result, local data is the preferred reference for local AMR surveillance." …… "To avoid misinterpretation of antibiograms, clinical requests for access to antibiograms should be supported by concurrent consultation with an infectious diseases specialist or microbiologist

INFORMATION
Laboratory data *plus* epidemiology: AGAR

Figure 1: Enterococcal Bacteraemia by Decade of Life and Gender

Figure 2: *E. faecalis* Bacteraemia by Decade of Life and Gender

E.faecium bacteraemia: *VanA* positive among total Vancomycin resistant Enterococci	
Year	Number and (%)
2013	8 of 310 (2.6%)
2014	35 of 371 (9.4%)
2015	78 of 391 (19.9%)
2016	85 of 202 (21.3%)
2017	112 of 461 (25%)

There was no significant difference in mortality between vancomycin non-susceptible (VRE) and vancomycin susceptible E. faecium (VSE): 58/203 (29.1%) and 56/212 (26.4%) respectively (p=0.6)

The Australian Group on Antimicrobial Resistance

Australian Enterococcal Sepsis Outcome Program (AESOP) 2017

Miscellaneous

- Comments on microbiology reports

- Rapid notification of organism identification and susceptibilities

- Alternative diagnoses

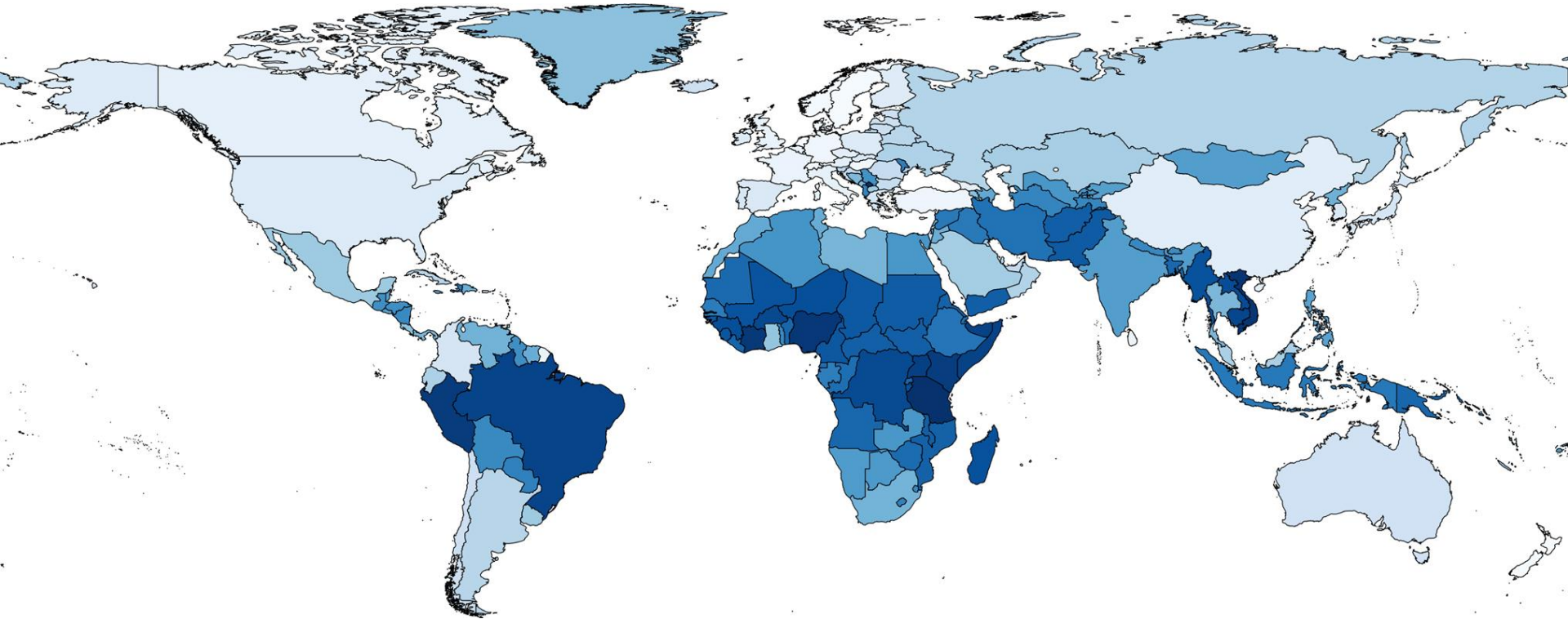- *Evidence for effect ?*

Summary

- Data & information

- Surveillance

  - *Surveillance is data for action*

  - *Evaluation of surveillance*

  - *Speed & action*

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Questions?

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