UAE International Conference on Antimicrobial Resistance (ICAMR)

ICAMR
UAE International Conference on Antimicrobial Resistance
UAE 2018

15th & 16th March, 2018

Le Meridien Dubai Hotel (Airport) & Conference Centre, United Arab Emirates

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Updates on AMR Surveillance in the UAE

Presented by:

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on behalf of the **UAE AMR Surveillance Sub-Committee**

Presentation outline & Learning objectives

To describe:

- The UAE National AMR Surveillance System
  - Development and implementation
  - Current status and next steps

- Antimicrobial Resistance patterns and trends in UAE
  - Preliminary results and findings from eight years of AMR surveillance in Abu Dhabi and the UAE

What is AMR Surveillance? An integrated system:

Clinical Management

Lab

Public Health/ Epidemiology
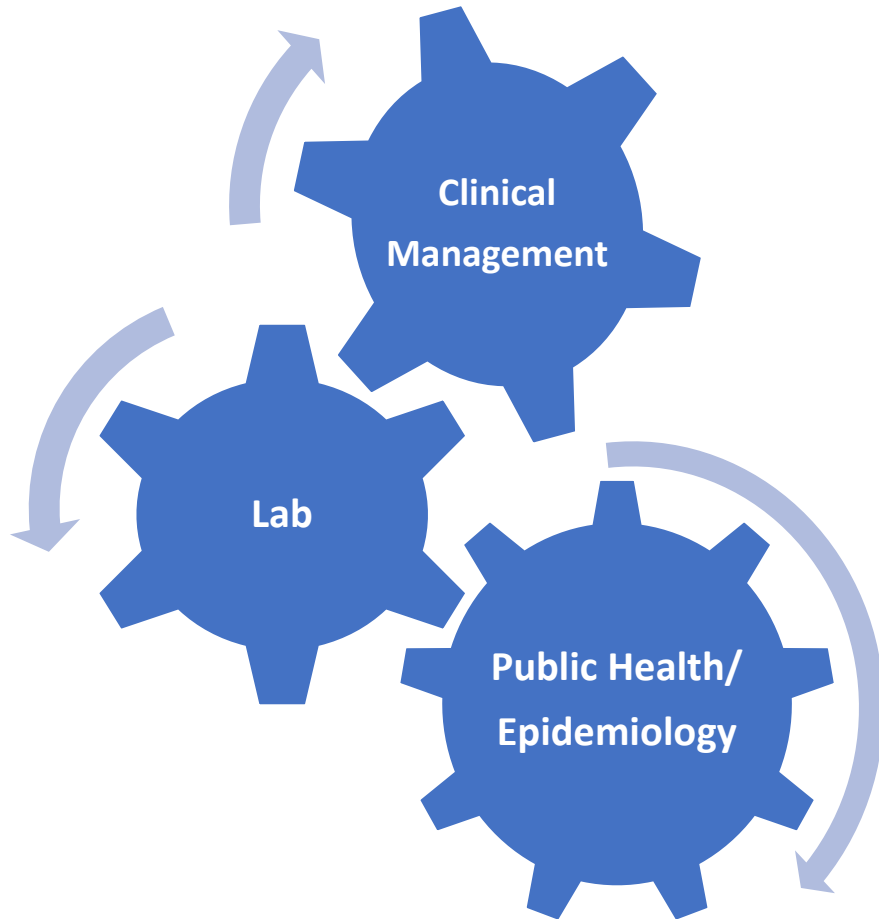
Public health **surveillance** is the continuous, systematic collection, analysis and interpretation of health-related data needed for the planning, implementation, and evaluation of public health practice.

Such surveillance can:
- serve as an **early warning system** for impending public health emergencies;
- document the **impact of an intervention**, or **track progress** towards specified goals; and
- monitor and clarify the **epidemiology of health problems**, to allow **priorities to be set** and to **inform public health policy and strategies**.

WHO, 2018 [1]

Challenges in 2015:

How to develop a National Surveillance System for AMR?

UAE National AMR Surveillance System: Goals and Objectives
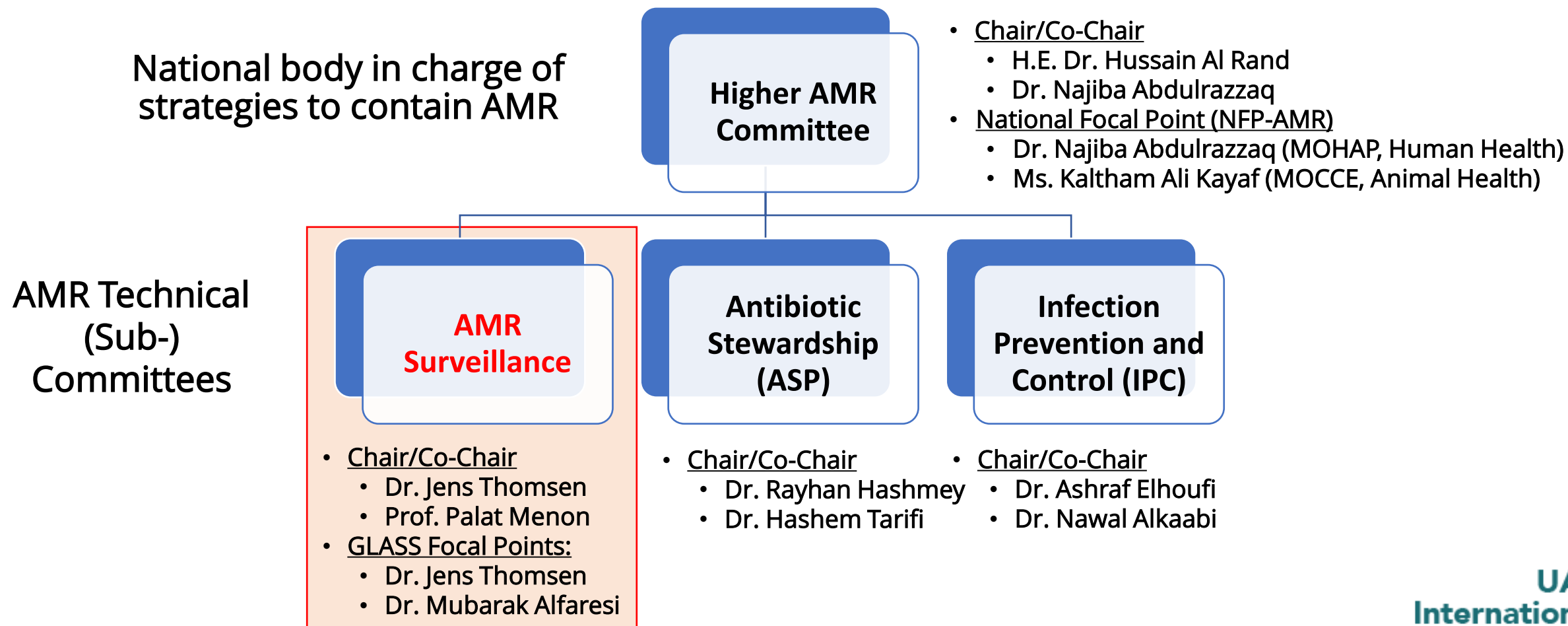
Overall goal:

- Strengthen the UAE knowledge and evidence base on antimicrobial resistance (AMR) through surveillance

Objectives:

- Develop and implement a UAE National AMR Surveillance System, to:

- Collect and analyze AMR surveillance data

- Monitor and report on AMR patterns and trends

- Guide and inform AMR prevention and control strategies in the UAE

UAE National AMR Committee: Structure

National body in charge of strategies to contain AMR

Higher AMR Committee

- Chair/Co-Chair
  - H.E. Dr. Hussain Al Rand
  - Dr. Najiba Abdulrazzaq
- National Focal Point (NFP-AMR)
  - Dr. Najiba Abdulrazzaq (MOHAP, Human Health)
  - Ms. Kaltham Ali Kayaf (MOCCE, Animal Health)

AMR Technical (Sub-) Committees

AMR Surveillance

- Chair/Co-Chair
  - Dr. Jens Thomsen
  - Prof. Palat Menon
- GLASS Focal Points:
  - Dr. Jens Thomsen
  - Dr. Mubarak Alfaresi

Antibiotic Stewardship (ASP)

- Chair/Co-Chair
  - Dr. Rayhan Hashmey
  - Dr. Hashem Tarifi

Infection Prevention and Control (IPC)

- Chair/Co-Chair
  - Dr. Ashraf Elhoufi
  - Dr. Nawal Alkaabi

UAE National Sub-Committee for AMR Surveillance

UAE Subcommittee for AMR Surveillance: Members

Ministry of Health and Prevention (MOHAP)
1. Dr. Manal al Fattah — MF — Specialist Microbiology (Saqr hospital)
2. Dr. Najiba Abdulrazzaq (NFP) — NA — Consultant Internist (Al Baraha Hospital)
3. Prof. Hala Ahmed Fouad Ismail — HF — Consultant (A) Microbiology & Immunology, Al Baraha hospital

Department of Health Abu Dhabi (DoH)
4. Dr. Jens Thomsen (Chair) — JT — Section Head, Environmental Health
5. Dr. Bashir Aden — BA — Sr. Officer, Surveillance
6. Dr. Hashem Tarifi — HT — Manager, Drug and Medical Products Regulation
7. Yousuf Naqvi — YN — Regulation Officer, Drug and Medical Product Regulation

Dubai Health Authority (DHA)
8. Dr. Anju Nabi — AN — Specialist Senior Registrar (Dubai Hospital)

Ministry of Presidential Affairs (MOPA)
9. Dr. Mubarak Alfaresi — MA — Consultant Medical Microbiologist & ID Epidemiologist (SKGH UAQ)
10. Dr. Duckjin Hong — DH — Consultant Clinical Pathologist, Laboratory Medicine (SKSH RAK)
11. Dr. Fouzia Jabeen — FJ — Consultant Microbiologist, (SKMC Ajman)

Universities:
12. Prof. Tibor Pal — TP — Professor of Microbiology, Consultant Clinical Microbiologist (UAEU)
13. Prof. Agnes Sonnevend — AS — Associate Professor, Consultant Clinical Microbiologist (UAEU)
14. Prof. Palat Menon (Co-Chair) — PM — Director, CABRI (GMU Ajman)

Hospitals:
15. Dr. Martin Pitout — MP — Consultant Physician, Medical Affairs/Microbiology (SKMC)
16. Dr. Stefan Weber — SW — Consultant Physician, Medical Affairs/Microbiology (SKMC)
17. Dr. Adnan Alatoom — AA — Staff Physician, Clinical Pathology and Microbiology (CCAD)
18. TBN — Representative private sector labs

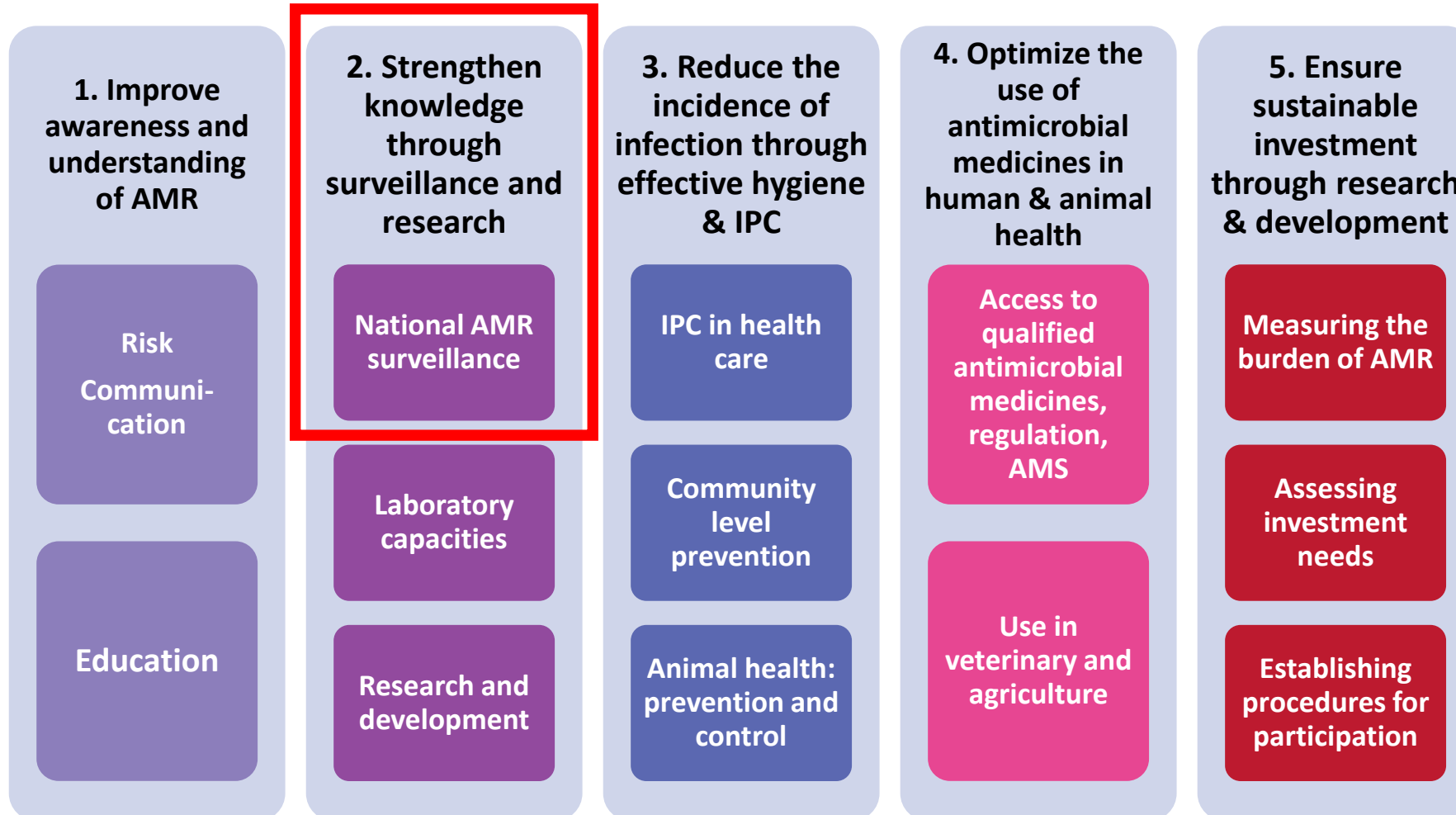# UAE National Sub-Committee for AMR Surveillance: Functions

- Functions:
  - Serves as interim National Coordination Center for AMR Surveillance (NCC)
  - Reports to National AMR Committee
  - Oversees National AMR Surveillance
  - Provides input in National Strategy and Action Plan, and national policies, regulations, and laws
  - Conducts capacity building an training activities for AMR Surveillance, including WHONET
  - Collects & analyses on AMR data from national surveillance sites
  - Develops and shares national AMR Surveillance reports
  - Reports AMR data annually to GLASS
  - Local, national, and international cooperation

Global Action Plan on AMR – Key Objectives and Areas

Focus of this presentation

1. Improve awareness and understanding of AMR

Risk Communication

Education

2. Strengthen knowledge through surveillance and research

National AMR surveillance

Laboratory capacities

Research and development

3. Reduce the incidence of infection through effective hygiene & IPC

IPC in health care

Community level prevention

Animal health: prevention and control

4. Optimize the use of antimicrobial medicines in human & animal health

Access to qualified antimicrobial medicines, regulation, AMS

Use in veterinary and agriculture

5. Ensure sustainable investment through research & development

Measuring the burden of AMR

Assessing investment needs

Establishing procedures for participation

WHO-GAP (2015) [2]

UAE National AMR Surveillance

Structure & Mechanisms

Guidance from WHO: GLASS

GLASS
Global AMR Surveillance System
(2015)

GLASS: From Local, to National, to Global AMR Surveillance
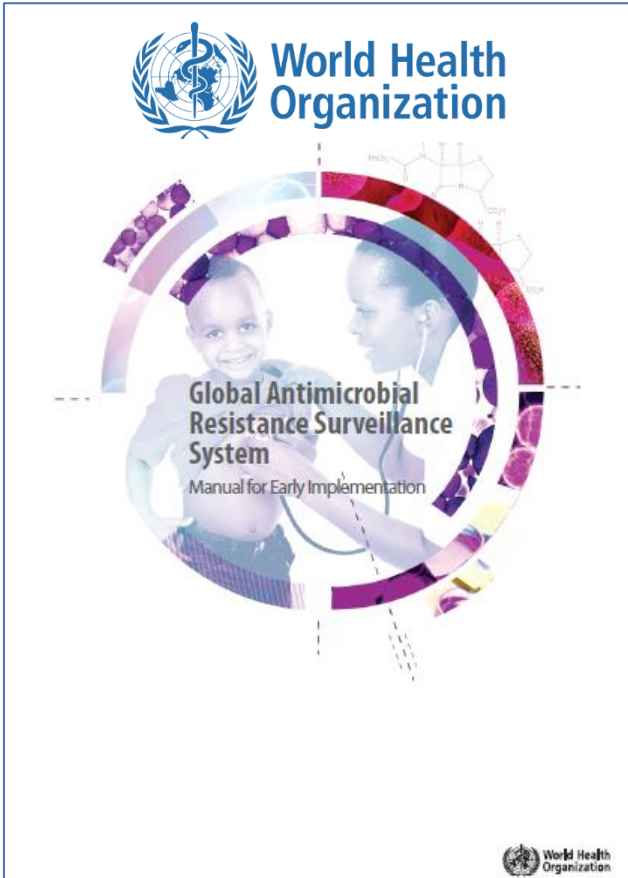
GLASS Manual for Early Implementation (WHO-GLASS, 2015) [3]

World Health Organization, http://www.who.int/glass/en/
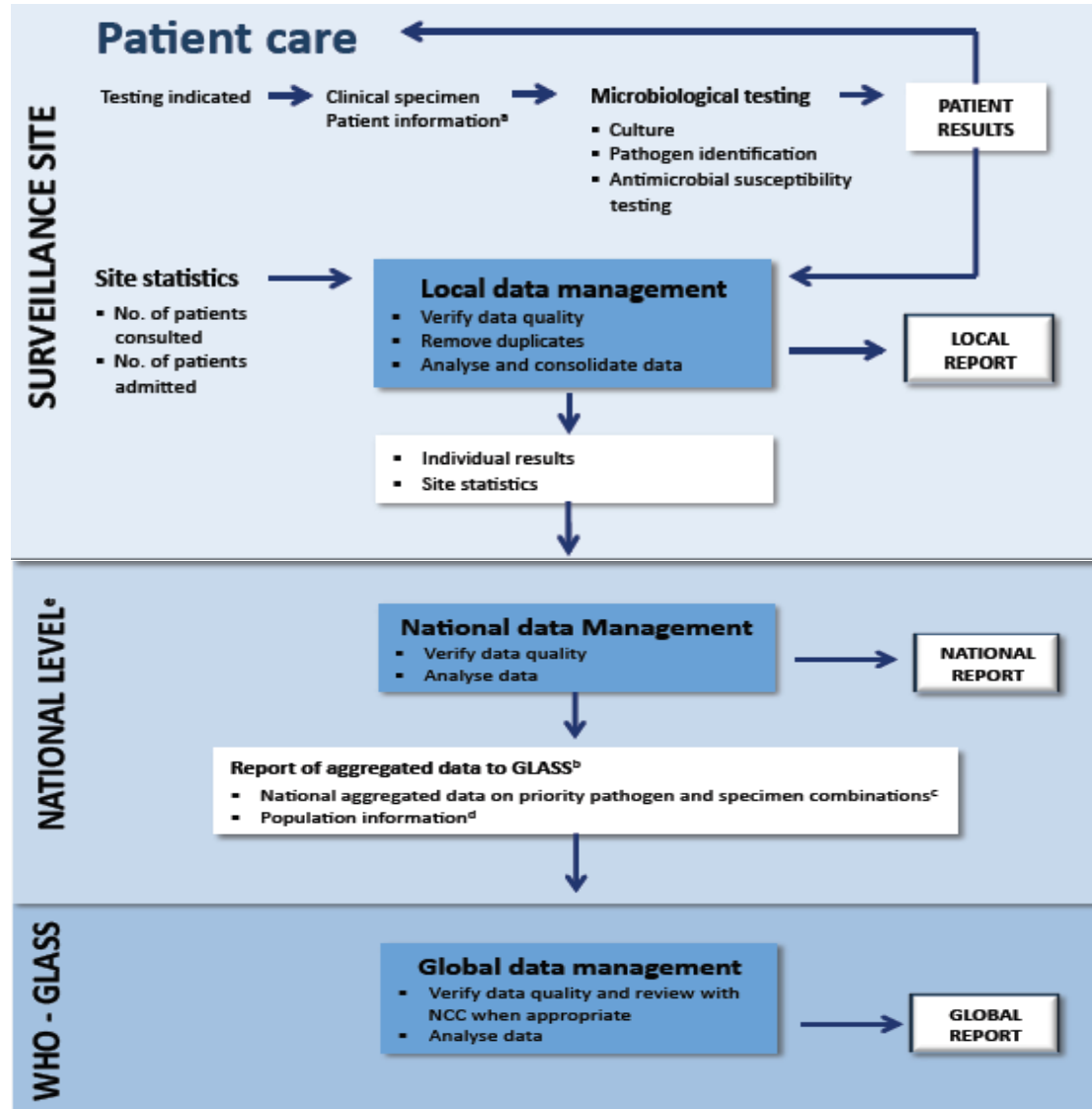
Core components for National AMR Surveillance Systems

Surveillance sites

National reference laboratory (NRL)
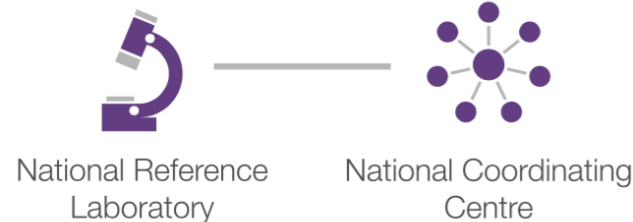
National Coordinating Centre (NCC), reporting to the national body in charge of strategies to contain AMR

Abu Dhabi Emirate AMR Surveillance System (since 2010)

Abu Dhabi Emirate

Hospital columns: KM MQ RH CH AA TW MZ LW MI DL SA GH AHS NM NR NA CC DA

Labs: KM MZ DPS

SEHA
صحة
شركة أبوظبي للخدمات الصحية ش.م.ع
Abu Dhabi Health Services Co.P.J.S.C

Private sector

دائـــــرة الـصـحـة
DEPARTMENT OF HEALTH
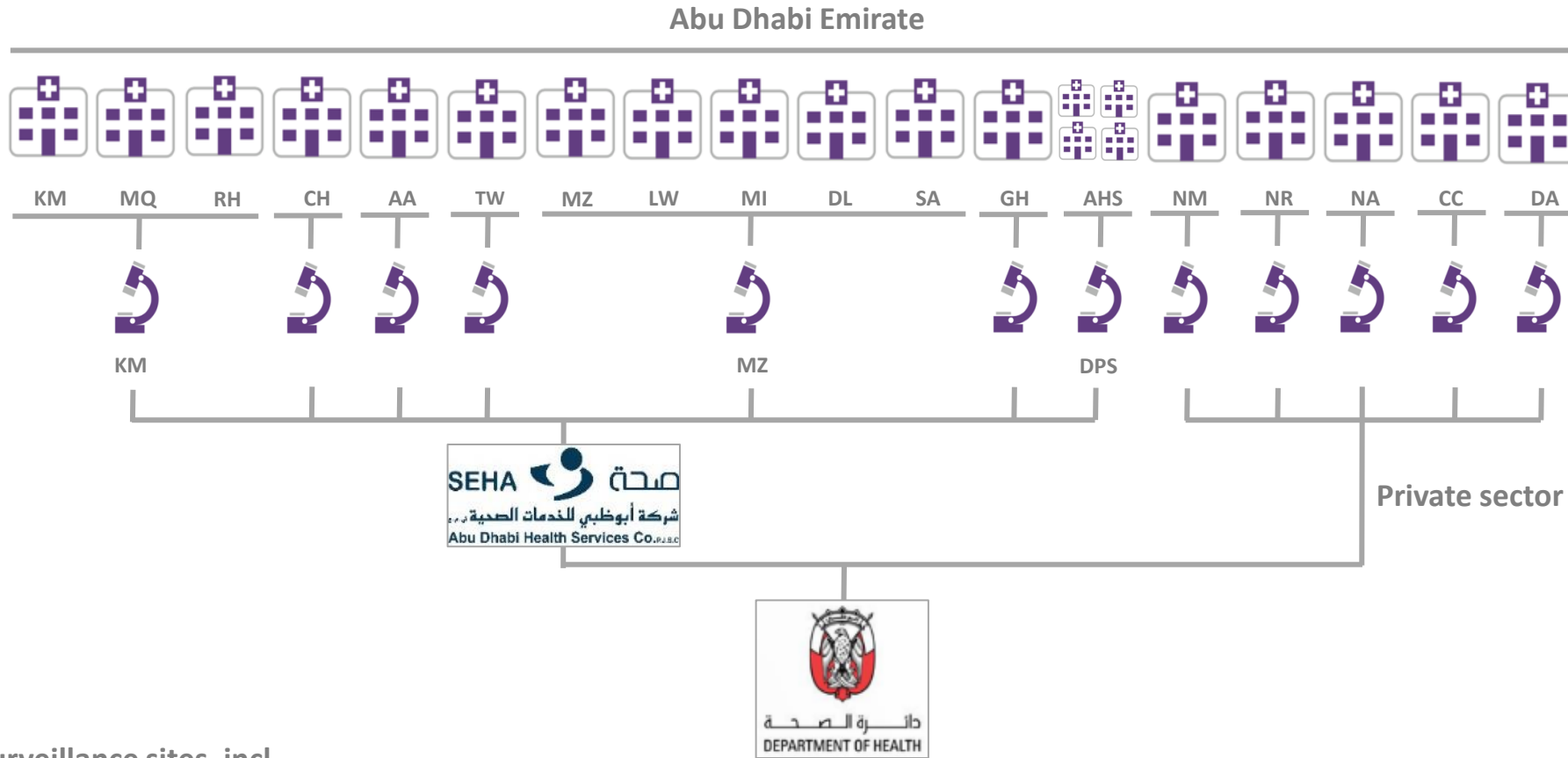
96 Surveillance sites, incl.
- 17 Hospitals
- 79 Ambulatory Healthcare Centers (AHS)

12 Microbiology labs

UAE National AMR Surveillance System (2018)

110 Surveillance Site, incl.
- 31 Hospitals
- 79 Ambulatory Healthcare Centers (AHS)

25 Microbiology labs
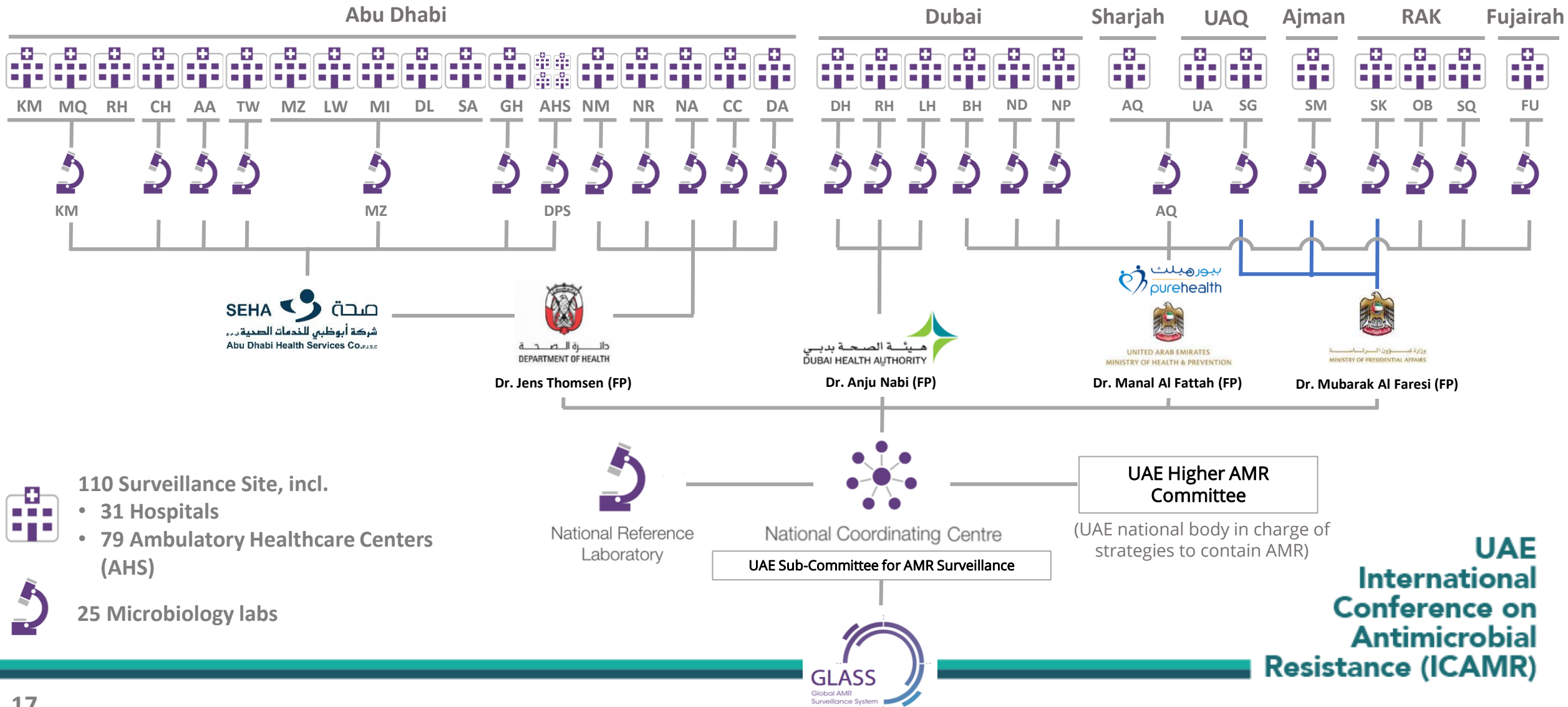
UAE National AMR Surveillance Sites: Geographical coverage
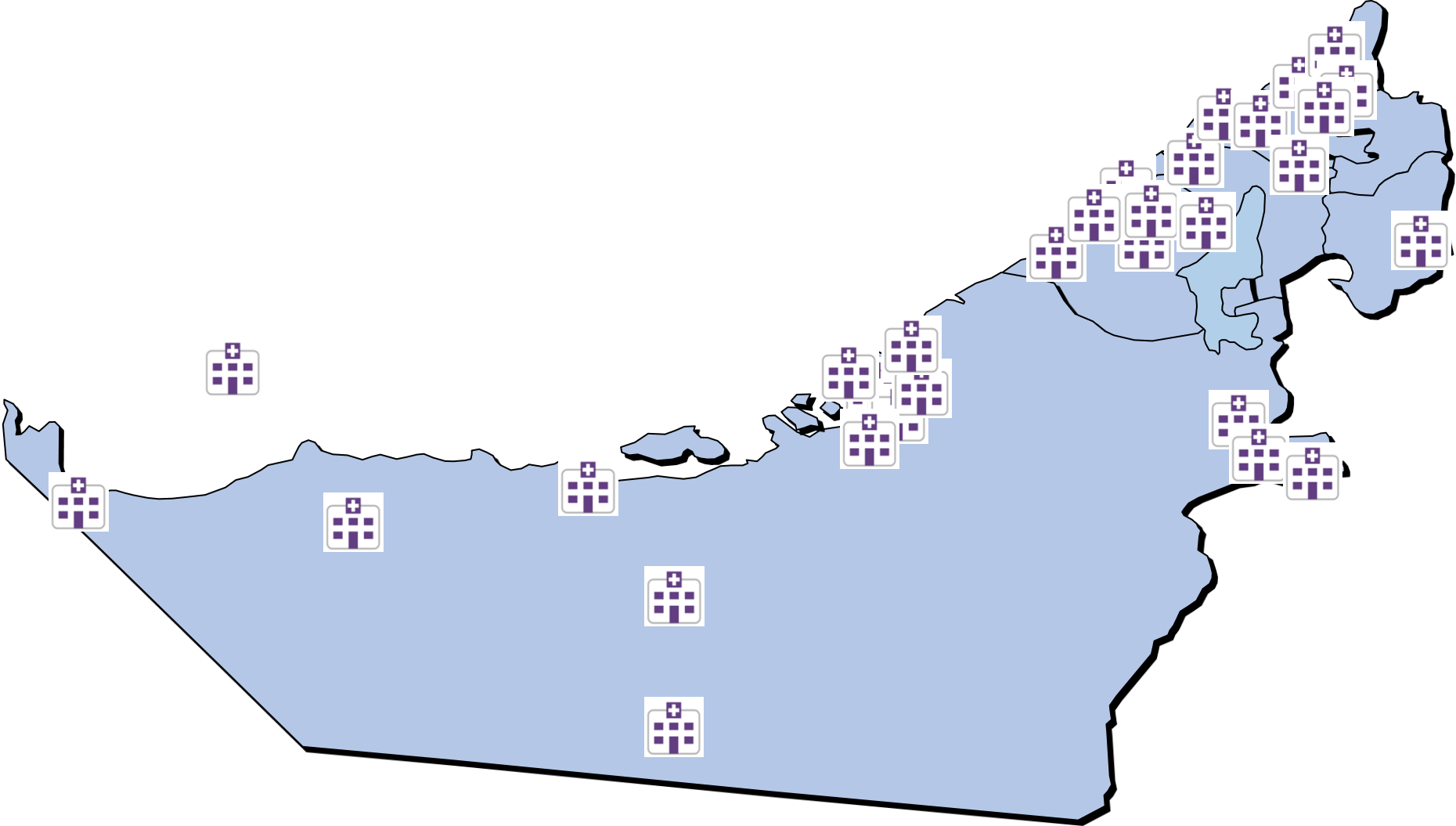
Which organisms to focus on? What are the Threats?

ANTIBIOTIC RESISTANCE THREATS in the United States, 2013
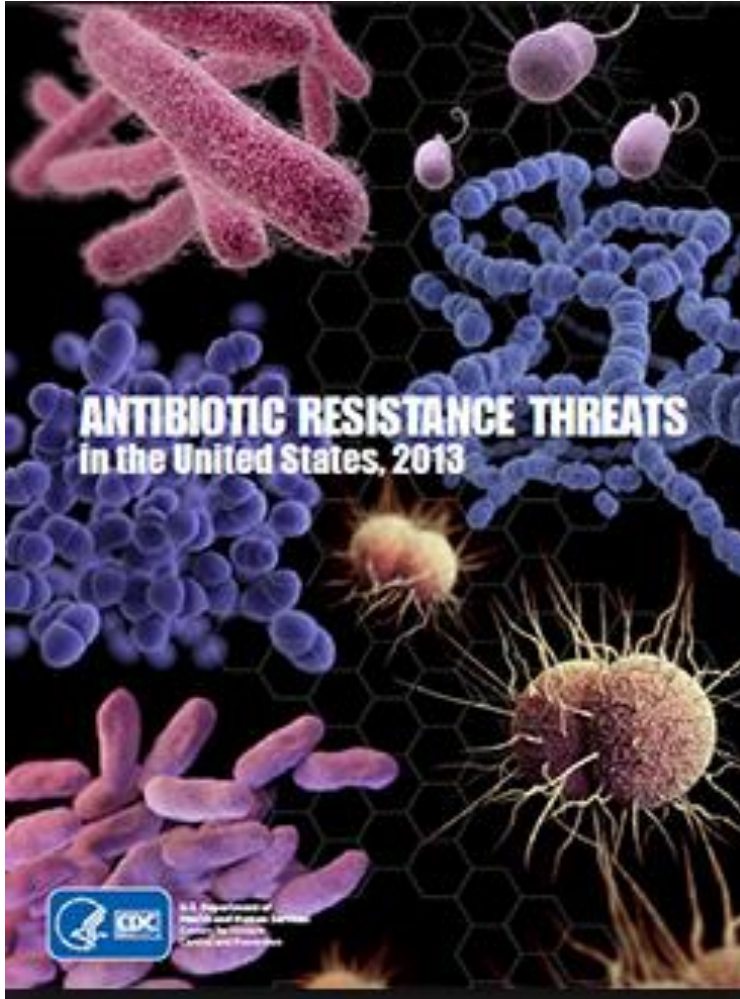
CDC, USA, 2013

Priority 1: URGENT THREATS

- *Clostridium difficile*
- Carbapenem-resistant Enterobacteriaceae (CRE)
- Drug-resistant *Neisseria gonorrhoeae*

Priority 2: SERIOUS THREATS

- Multidrug-resistant *Acinetobacter*
- Drug-resistant *Campylobacter*
- Fluconazole-resistant *Candida* (a fungus)
- Extended spectrum β-lactamase producing Enterobacteriaceae (ESBLs)
- Vancomycin-resistant *Enterococcus* (VRE)
- Multidrug-resistant *Pseudomonas aeruginosa*
- Drug-resistant Non-typhoidal *Salmonella*
- Drug-resistant *Salmonella* Typhi
- Drug-resistant *Shigella*
- Methicillin-resistant *Staphylococcus aureus* (MRSA)
- Drug-resistant *Streptococcus pneumoniae*
- Drug-resistant tuberculosis

Priority 2: CONCERNING THREATS

- Vancomycin-resistant *Staphylococcus aureus* (VRSA)
- Erythromycin-resistant Group A *Streptococcus*
- Clindamycin-resistant Group B *Streptococcus*

What are the AMR Threats?

Prioritization of pathogens to guide discovery, research and development of new antibiotics for drug resistant bacterial infections, including tuberculosis

PRIORITIZATION OF PATHOGENS TO GUIDE DISCOVERY, RESEARCH AND DEVELOPMENT OF NEW ANTIBIOTICS FOR DRUG-RESISTANT BACTERIAL INFECTIONS, INCLUDING TUBERCULOSIS

World Health Organization

Priority 1: CRITICAL

Acinetobacter baumannii, carbapenem-resistant

Pseudomonas aeruginosa, carbapenem-resistant

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

Priority 2: HIGH

Enterococcus faecium, vancomycin-resistant

Staphylococcus aureus, methicillin-resistant, vancomycin intermediate and resistant

Helicobacter pylori, clarithromycin-resistant

Campylobacter, fluoroquinolone-resistant

Salmonella spp., fluoroquinolone-resistant

Neisseria gonorrhoeae, 3rd generation cephalosporin-resistant, fluoroquinolone-resistant

Priority 3: MEDIUM

Streptococcus pneumoniae, penicillin-non-susceptible

Haemophilus influenzae, ampicillin-resistant

Shigella spp., fluoroquinolone-resistant

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WHO, 2017 (WHO/EMP/IAU/2017.2) [5]

UAE National AMR Surveillance System: Priority Pathogens

Gram positive

S. aureus*

S. pneumoniae*
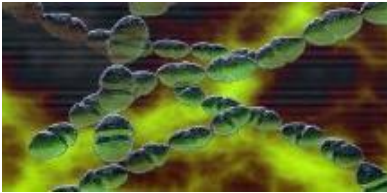
Gram negative

E. coli*

K. pneumoniae*

Salmonella spp.*
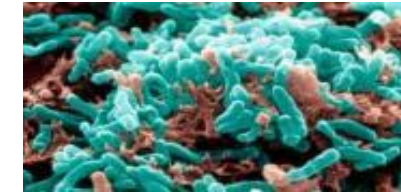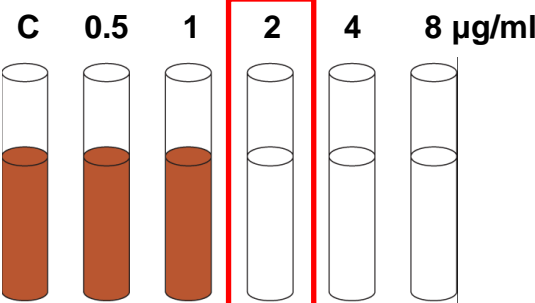
Shigella spp.*

P. aeruginosa

A. baumannii*
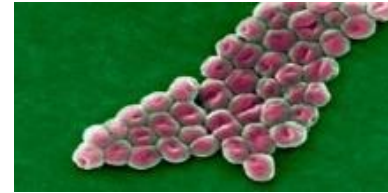
N. gonorrhoeae*

Other

M. tuberculosis

* Eight priority pathogens for WHO-GLASS (Global AMR Surveillance System)
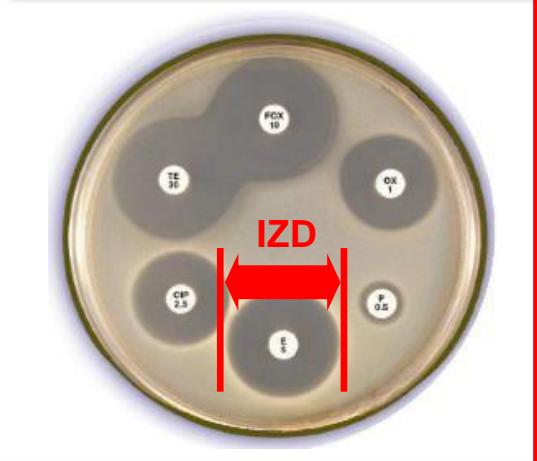
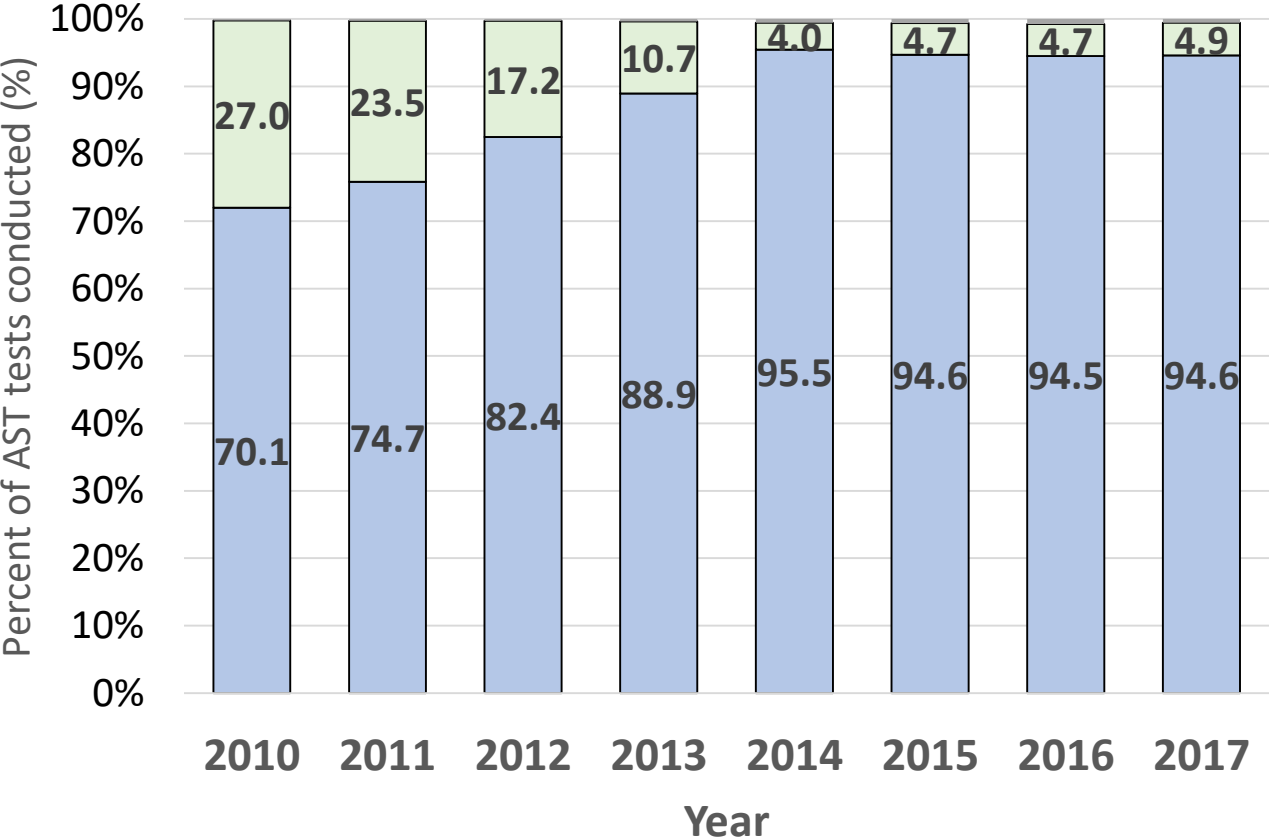UAE National AMR Surveillance

Methods: Data collection

Methods for Antimicrobial Susceptibility Testing (AST)

(Micro-) Broth dilution	Semi-automated breakpoint testing	Agar Disk Diffusion (Kirby-Bauer)	Agar dilution: E-Test

Test Frequency (% of all AST conducted)

Not routinely conducted by clinical labs	95.5%	4.0%	< 1%

Test Measurement (Unit)

Minimal Inhibitory Concentration/MIC (µg/ml)	Minimal Inhibitory Concentration/MIC (µg/ml)	Inhibition zone diameter/IZD (mm)	Minimal Inhibitory Concentration/MIC (µg/ml))

Data used for UAE National AMR Surveillance

Test Result (requires an interpretation standard, e.g. CLSI (US) or EUCAST (Europe)

S / I / R (Susceptible / Intermediate / Resistant)

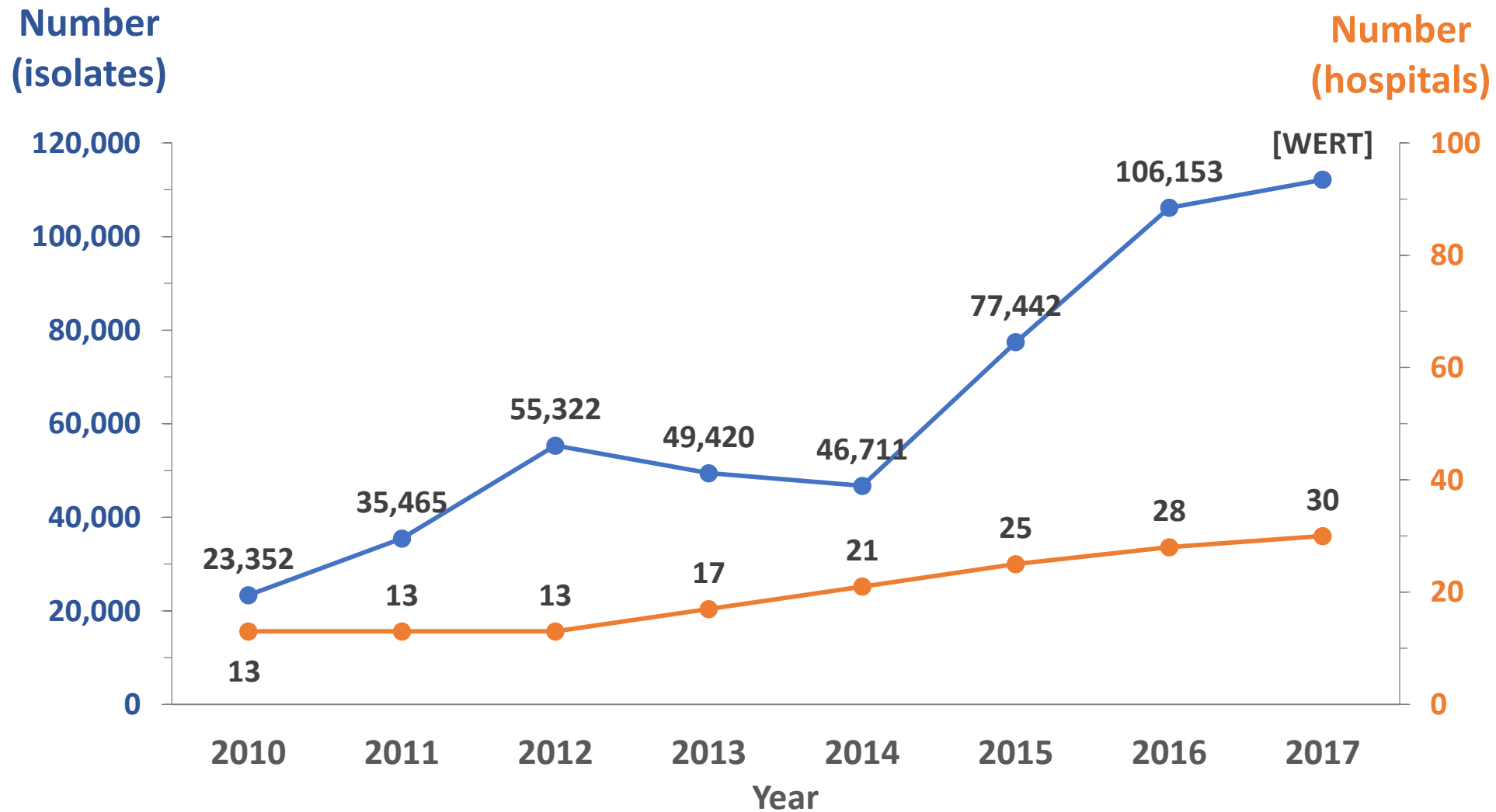# Availability of MIC Microbiology Data for AMR Surveillance

Antibiotic Susceptibility Test Methods (AST)
Abu Dhabi (SEHA), Trend 2010-2017 (%)
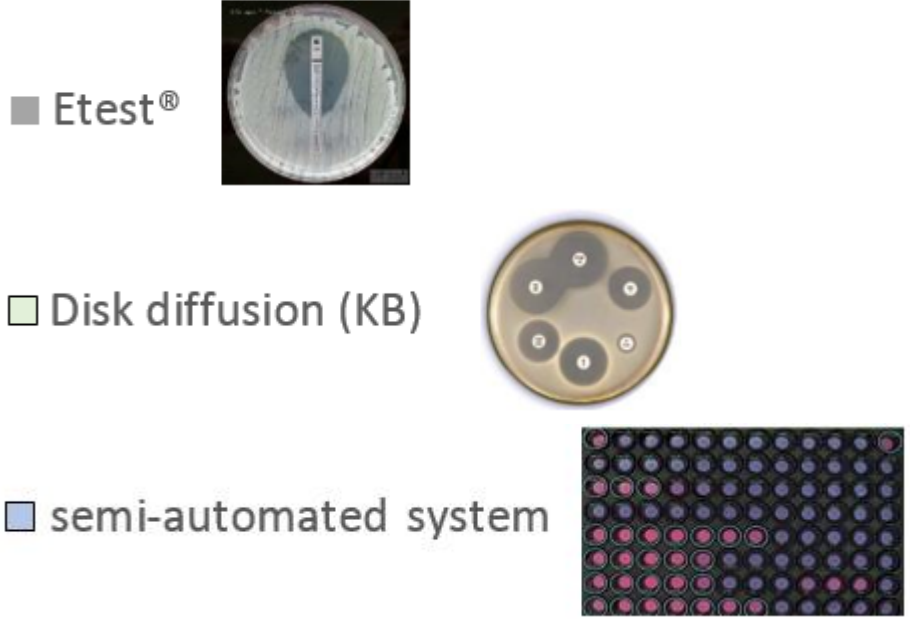
UAE National AMR Surveillance System:
Number of Hospitals submitting Data, and Number of Isolates submitted

UAE National AMR Surveillance System: Number of clinical isolates and participating hospitals

Surveillance Site	Code	Nr.	Emirate	Authority	2010	2011	2012	2013	2014	2015	2016	2017	2010-2017
SKMC	SKM	1	Abu Dhabi	DoH	23,352	35,465	55,322	44,985	33,415	42,896	40,690	43,195	319,320
Al Mafraq	MQH	1											
Al Rahba	RAH	1											
Corniche	COH	1											
Al Ain	AAH	1											
Tawam	TAW	2											
Al Gharbia	AGH	6											
AHS	AHS	79											
Cleveland Clinic Abu Dabi	CCAD	1			—	—	—	—	—	May to Dec?	17,917	6,593	24,510
DAEH	DAE	1											0
NMC SH Abu Dhabi	NSAD	1								requested	requested	5,230	5,230
NMC RH KCA	NRYH	1									1,076	9,598	10,674
NMC SH Al Ain	NSAA	1			—	—	—	—	—	3,488	4,425	3,739	11,652
NMC Specialty Al Nahda	NSAN	1	Dubai	DHA						requested	requested	1,755	1,755
NMC DIP Dubai	NDIP	1			—	—	—	—	—	194	290	1,178	1,662
Dubai hospital	DH	1			—	—	—	—	—	3,436	7,359	7,682	18,477
Rashid hospital	RH	1			—	—	—	—	—	5,660	10,015	7,177	22,852
Latifa hospital	LH	1			—	—	—	—	421	5,422	5,236	4,134	15,213
Al Baraha	ABH	1		MOHAP	—	—	—	904	1,952	2,410	2,184	2,209	9,659
Qassimi	AQH	1	Sharjah		—	—	—		2,912	3,881	3,003	5,606	15,402
SKMC Ajman	SKAJM	1	Ajman	MOPA						requested	requested	1,051	1,051
SKGH UAQ	SKUAQ	1	UAQ		—	—	—	—	1,444	2,501	2,551	2,830	9,326
Um Al Qwain	UAQH	1		MOHAP	—	—	—	416	1,125	1,256	1,162	1,538	5,497
SKSH RAK	SKRAK	1		MOPA	—	—	—	—	—	256	2,814	received	3,070
Obaidullah (IBHO)	IBHO	1	RAK		—	—	—	1,606	2,841	2,729	3,364	4,111	14,651
Saqr hospital	SAQR	1		MOHAP	—	—	—	1,509	2,558	2,180	2,005	2,110	10,362
Fujairah	FUJ	1	Fujairah		—	—	—	—	43	1,133	2,062	2,418	5,656
N (isolates)		111	7	4	23,352	35,465	55,322	49,420	46,711	77,442	106,153	112,154	506,019
N (hospitals) subm. data					13	13	13	17	21	25	28	30	

UAE National AMR Surveillance:

Methodology - Data analysis

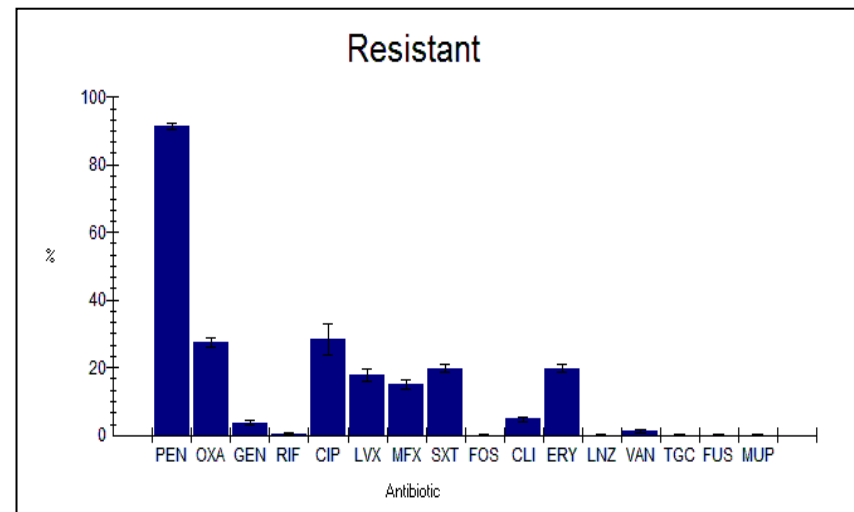# UAE uses WHONET as Database Software for National AMR Surveillance

Rationale:

- WHONET is a specialized software for AMR surveillance

- Widely used: > 2,300 laboratories in > 120 countries

- Endorsed by WHO

- Easy to use

- Free of charge

Challenges:

- Training / Capacity building
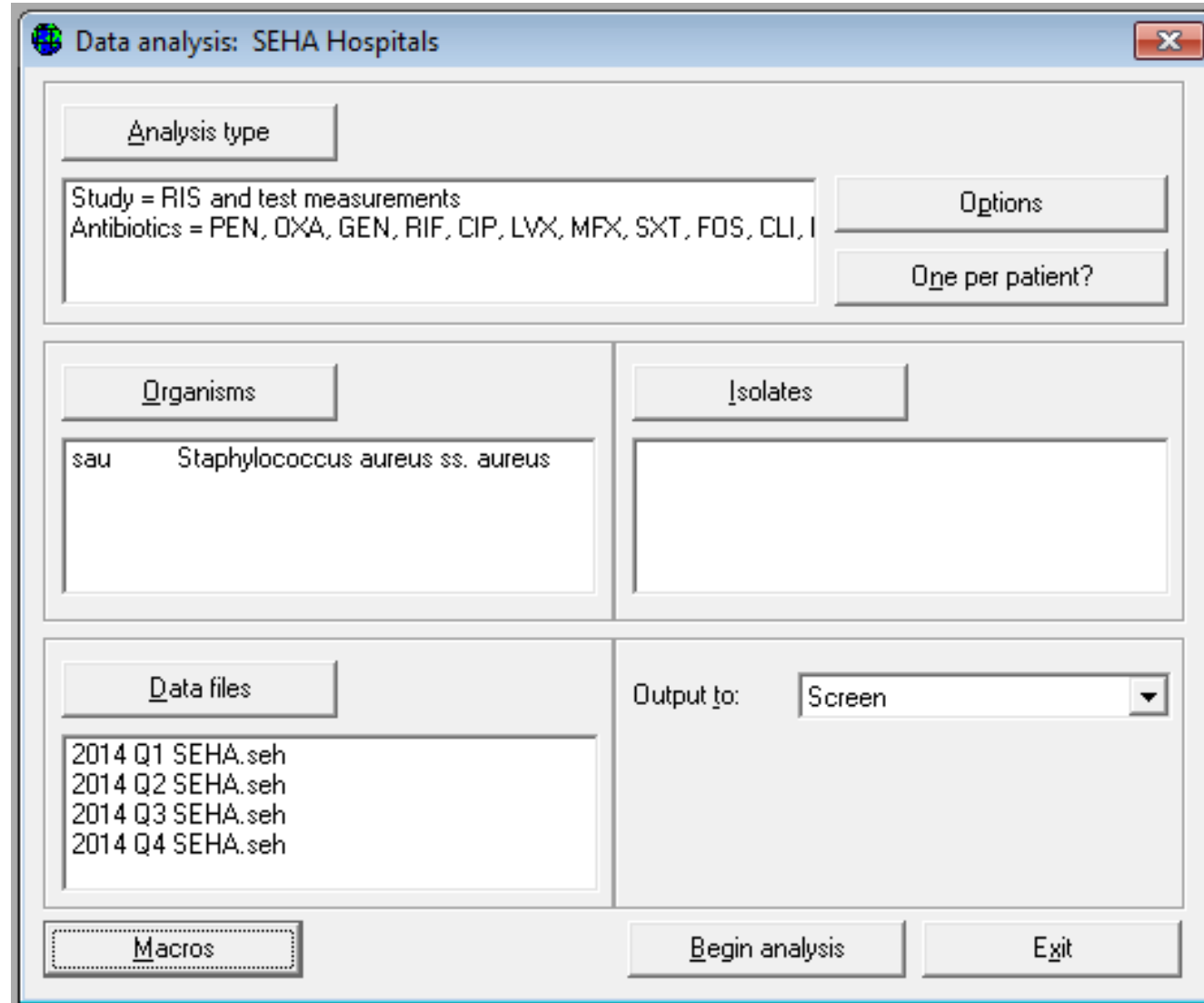
- Importing AMR data into WHONET

WHONET
SUPPORTING GLOBAL SURVEILLANCE OF INFECTIOUS DISEASES

Resistant

UAE International Conference on Antimicrobial Resistance (ICAMR)

Running a Data Analysis in WHONET: Example: Staph aureus, %RIS Profile

Select **type of analysis & Antimicrobials** →

Select **organism** of interest →

Select data file (**time period**) →

Example: Staph aureus, %RIS Profile

	Code	Antibiotic name	Breakpoints	Number	%R	%I	%S	%S?	%NS	%R 95%C.I.	MIC50	MIC90	Geom.Mean	MIC Range	Number
	PEN_NM	Penicillin G	S<=.125 R>=.25	3112	92.2	0	7.6	0.1		91.2-93.1	.5	.5	0.415	0.03 - 0.5	2882
	OXA_NM	Oxacillin	S<=2 R>=4	3539	33.8	0	66.1	0.1		32.2-35.4	.5	4	0.839	0.25 - 4	3531
	GEN_NM	Gentamicin	S<=4 R>=16	3526	5	1	94.1			4.3-5.8	.5	.5	0.628	0.5 - 16	3526
	RIF_NM	Rifampin	S<=1 R>=4	3526	0.3	0.3	99.4			0.2-0.6	.5	.5	0.508	0.5 - 32	3526
	CIP_NM	Ciprofloxacin	S<=1 R>=4	368	26.6	1.4	72			22.2-31.5	.5	8	1.099	0.25 - 8	368
	LVX_NM	Levofloxacin	S<=1 R>=4	1198	21.1	0.8	78.1			18.8-23.5	.25	8	0.428	0.12 - 8	1198
	MFX_NM	Moxifloxacin	S<=.5 R>=2	3528	20	5	74.9			18.7-21.4	.25	2	0.417	0.25 - 8	3528
	SXT_NM	Trimethoprim/Sulfamethoxazole	S<=2 R>=4	3527	18.7	0	81.3			17.4-20.0	.5	16	0.94	0.5 - 16	3527
	FOS_NM	Fosfomycin	S<=64 R>=256	1228	0.1	0	99.3		0.7	0.4-1.5	8	8	8.585	8 - 256	1228
	CLI_NM	Clindamycin	S<=.5 R>=4	3528	11.8	0.2	87.9			10.8-12.9	.25	.25	0.266	0.25 - 8	3528
	ERY_NM	Erythromycin	S<=.5 R>=8	3528	22.4	3	74.7			21.0-23.8	.25	8	0.569	0.25 - 8	3528
	LNZ_NM	Linezolid	S<=4 R>=8	3512	0.1	0	99.9			0-0.3	2	2	1.983	0.5 - 8	3512
	VAN_NM	Vancomycin	S<=2 R>=16	3519	0.2	0	99.8			0.1-0.4	.5	1	0.721	0.5 - 32	3519
	TGC_NM	Tigecycline	S<=.5 R>=1	3526	0	0	100			0.0-0.1	.125	.125	0.123	0.12 - 1	3526
	FUS_NM	Fusidic acid	S<=1 R>=2	1228	16.6	0	83.4			14.6-18.8	.5	16	0.884	0.5 - 32	1228
	MUP_NM	Mupirocin	S<=.5 R>=512	981	0	0.1	0	99.8	0.1	0-0.7	2	2	2.004	2 - 8	981
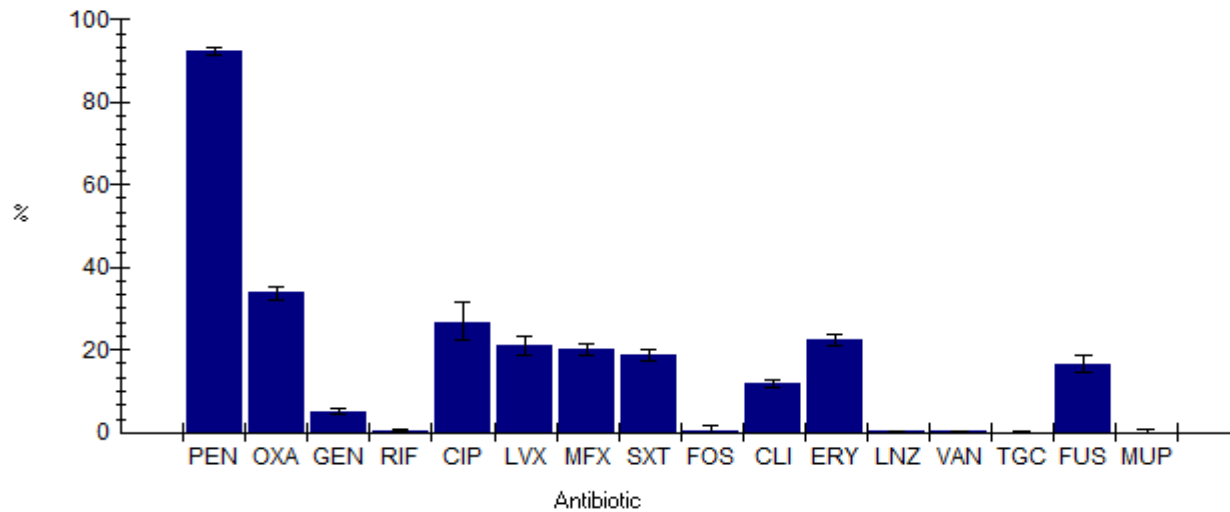
WHONET Tutorials are a great Help to learn WHONET

WHONET

Getting Started

WHO Collaborating Centre for
Surveillance of Antimicrobial Resistance
Boston, Massachusetts
June 2006

- BacLink 1.Getting started
- BacLink 2.Excel, text files, other applications
- BacLink 3.Laboratory information systems
- BacLink 4.LIS Cerner Classic
- BacLink 5.LIS Meditech Magic
- BacLink 6.AST Microscan.LabPro Export
- BacLink 6.AST MicroScan.LabPro Interface
- BacLink 7.AST Vitek 1
- BacLink 8.AST Vitek 2.English
- BacLink 9.AST Vitek Observa
- BacLink 10.AST BD EpiCenter and BD Phoenix
- BacLink 11.LIS Sunquest SQL template
- WHONET 1.Getting started
- WHONET 2.Laboratory configuration
- WHONET 3.Data entry
- WHONET 4.Data analysis 1
- WHONET 5.Data analysis 2
- WHONET 6.Expert system
- WHONET 7.Macros and Excel reports
- WHONET 8.Cluster detection and SaTScan
- WHONET for GLASS

**UAE
International
Conference on
Antimicrobial
Resistance (ICAMR)**

WHONET Training Courses in Dubai and Abu Dhabi: >100 Healthcare Professionals trained in 2017

WHONET Training Abu Dhabi

WHONET Training Dubai

Friday, 16th March 2018

Le Meridien Dubai Hotel (Airport) & Conference Centre, United Arab Emirates

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Workshop
WHONET – Software for Antimicrobial Resistance Surveillance
(for participants from the UAE)

Target audience

Healthcare and IT professionals from UAE, with an interest in antimicrobial resistance surveillance and antimicrobial stewardship (ASP), in particular:
- Hospital epidemiologists
- Microbiologists
- Microbiology/pathology laboratory staff
- Infectious Disease (ID) physicans and Intensivists
- Pharmacists
- Infection prevention and control
- Healthcare quality
- Health information system (IT) professionals

Objectives:

To demonstrate principles and concepts of WHONET (Software for AMR surveillance) and BacLink (tool for AMR data import), and enable users to use the WHONET software to support local, subnational, and national AMR monitoring and surveillance efforts

Course faculty

Dr. Jens Thomsen
Department of Health, Abu Dhabi, UAE. Chair, UAE Sub-Committee for AMR Surveillance & UAE focal point for WHO-GLASS

Dr. John Stelling
Brigham and Women's Hospital, Boston, USA. Director, WHO Collaborating Center for Surveillance of Antimicrobial Resistance, Boston, USA

UAE International Conference on Antimicrobial Resistance (ICAMR)

WHONET Training Course, Friday, March 16th: Agenda

Time	Session	Speaker
08:30 - 09:00	Registration	
09:00 - 09:05	Welcome note and Introduction	
09:05 - 09:30	WHONET – An overview	Jens Thomsen
09:30 - 10:00	WHONET – Laboratory Configuration	Jens Thomsen
10:00 - 10:15	WHONET – Manual data entry	Jens Thomsen
10:15 - 10:40	Coffee Break	
10:40 - 11:15	WHONET – Data Analysis 1	Jens Thomsen
11:15 - 12:00	WHONET – Data Analysis 2	Jens Thomsen
12:00 - 13:00	Lunch Break	
13:00 - 13:20	WHONET – Cluster detection and SaTScan	John Stelling
13:20 - 13:40	WHONET – Web-based version	John Stelling
13:40 - 14:30	BacLink – Introduction and concepts	John Stelling
14:30 - 15:00	Coffee Break	
15:00 - 16:00	BacLink – Import of AMR data from AST/LIS/HIS	John Stelling
16:00 - 16:15	Q & A, Course Evaluation	Jens Thomsen

Presentation outline & Learning objectives

To describe:

- The UAE National AMR Surveillance System
  - Development and implementation
  - Current status
  - Next steps
- Antimicrobial Resistance patterns and trends in UAE
  - Preliminary results and findings from eight years of AMR surveillance in Abu Dhabi and the UAE

UAE AMR Surveillance: Results and Findings (2016)

Priority 1: CRITICAL

Acinetobacter baumannii, carbapenem-resistant

Pseudomonas aeruginosa, carbapenem-resistant

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

Priority 2: HIGH

Enterococcus faecium, vancomycin-resistant

Staphylococcus aureus, methicillin-resistant, vancomycin intermediate and resistant

Helicobacter pylori, clarithromycin-resistant

Campylobacter, fluoroquinolone-resistant

Salmonella spp., fluoroquinolone-resistant

Neisseria gonorrhoeae, 3rd generation cephalosporin-resistant, fluoroquinolone-resistant

Priority 3: MEDIUM

Streptococcus pneumoniae, penicillin-non-susceptible

Haemophilus influenzae, ampicillin-resistant

Shigella spp., fluoroquinolone-resistant

AMR Surveillance (United Arab Emirates): #1: CRITICAL			
Organism	Antibiotic	N (isolates)	%R
A. baumannii	IPM or MEM	1,099	47.6
P. aeruginosa	IPM or MEM	3,836	25.0
Enterobacteriaceae	IPM or MEM	22,457	5.4
Enterobacteriaceae	ESBL	13,870	29.6

AMR Surveillance (United Arab Emirates): #2 HIGH			
Organism	Antibiotic	N (isolates)	%R
Enterococcus faecium	Vancomycin	200	7.5
S. aureus	MRSA	6,745	34.1
Helicobacter pylori	Clarithromycin	No data	
Campylobacter spp.	Fluoroquinolones	5	40
Salmonella spp.	Fluoroquinolones	470	10.9
Neisseria gonorrhoeae	3rd gen. Cephalosp.	29	0
Neisseria gonorrhoeae	Fluoroquinolones	50	78.0

AMR Surveillance (United Arab Emirates): #3: MEDIUM			
Organism	Antibiotic	N (isolates)	%R
S. pneumoniae	Penicillin non-susc.	369	61.8
H. influenzae	Ampicillin	666	13.8
Shigella spp.	Fluoroquinolones	42	21.4

WHO, 2017, http://www.who.int/medicines/publications/global-priority-list-antibiotic-resistant-bacteria/en/. [5]

Multiple-, Extensively-, and Pan-drug-resistant Organisms are increasing

MDR
Multidrug-resistant

p<0.001 (trend)

%: 30.8, 32.5, 37.3, 35.9, 42.4, 49.1, 52.4
N: 3,333, 5,440, 6,720, 6,737, 7,977, 9,232, 9,839

XDR
Extensively drug-resistant

p<0.001 (trend)

%: 2.2, 1.5, 2.0, 2.2, 2.8, 3.5, 4.0
N: 241, 258, 361, 404, 522, 653, 750

PDR
Pan-drug-resistant

p<0.001 (trend)

%: 0.03, 0.03, 0.03, 0.09, 0.37, 0.42, 0.34
N: 3, 5, 6, 17, 69, 79, 64
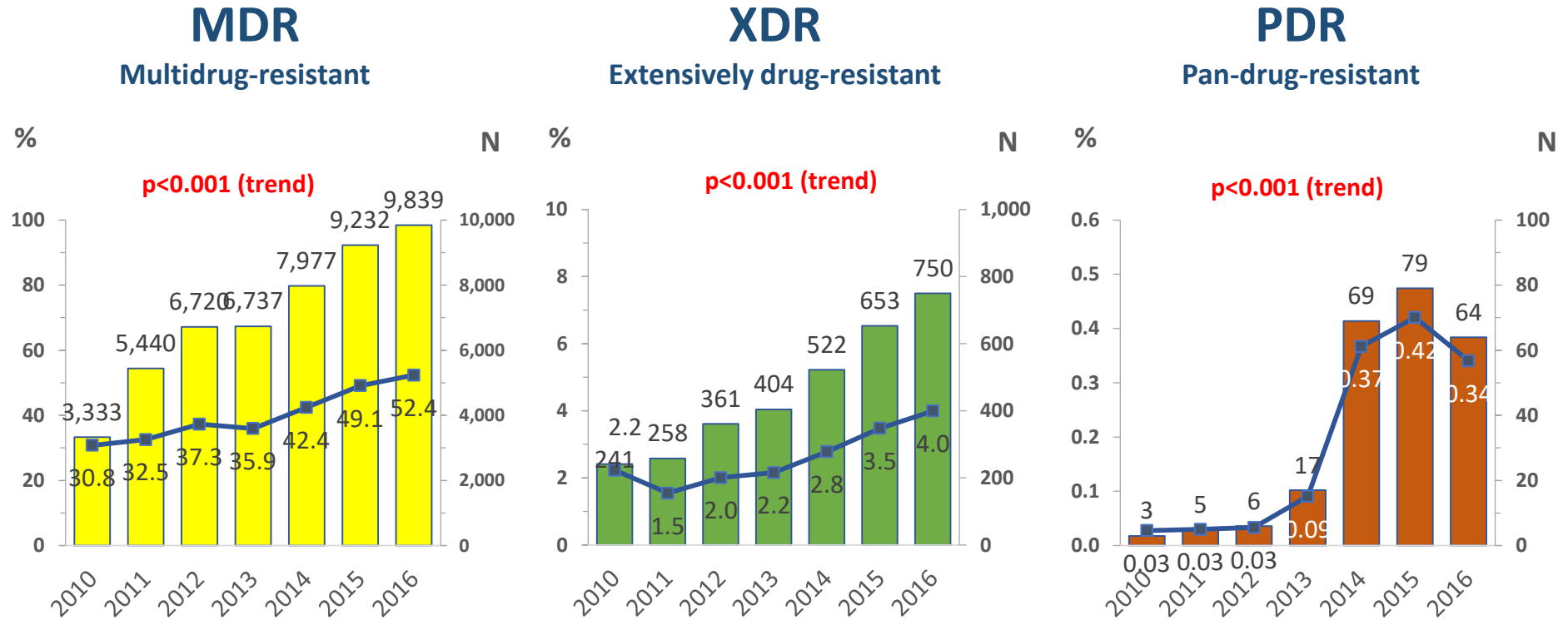
- Multidrug-resistant (MDR) and extensively-drug-resistant (XDR) pathogens are common and show increasing trends
- Pan-drug-resistant (PDR) pathogens are still rare, but showing an increasing trend since 2010, peaking in 2015

Abu Dhabi AMR Surveillance, Department of Health, 2010-2017

Multiple-, Extensively-, and Pan-drug-resistant (MDR/XDR/PDR) Organisms, Abu Dhabi, 2010-2016

MDR
Multidrug-resistant

- E. coli, 50%
- S. aureus, 16%
- 16%
- 11%
- 4%
- 2%
- 1%
- 0%
- 0%
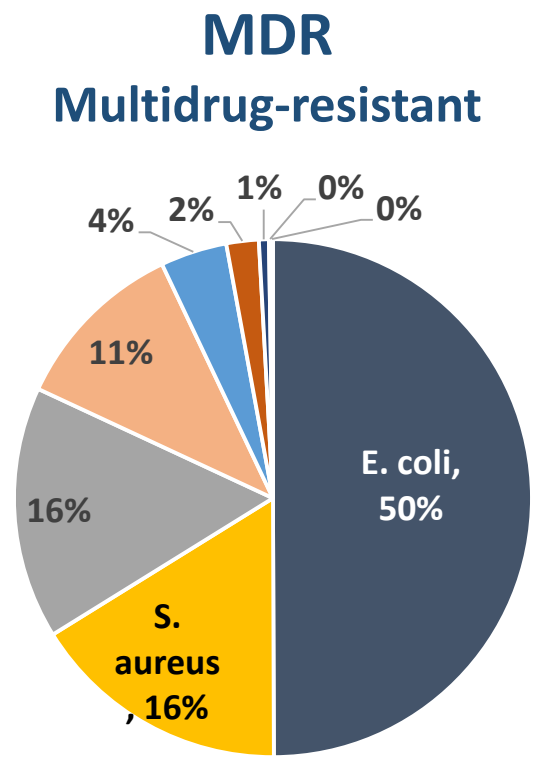
Legend:
- E. coli
- S. aureus
- P. aeruginosa
- K. pneumoniae
- A. baumannii
- S. maltophilia
- Salmonella spp.
- Shigella spp.
- M. tuberculosis

XDR
Extensively drug-resistant

- E. coli, 36%
- 21%
- 18%
- 16%
- 9%
- 0%
- 0%

Legend:
- E. coli
- P. aeruginosa
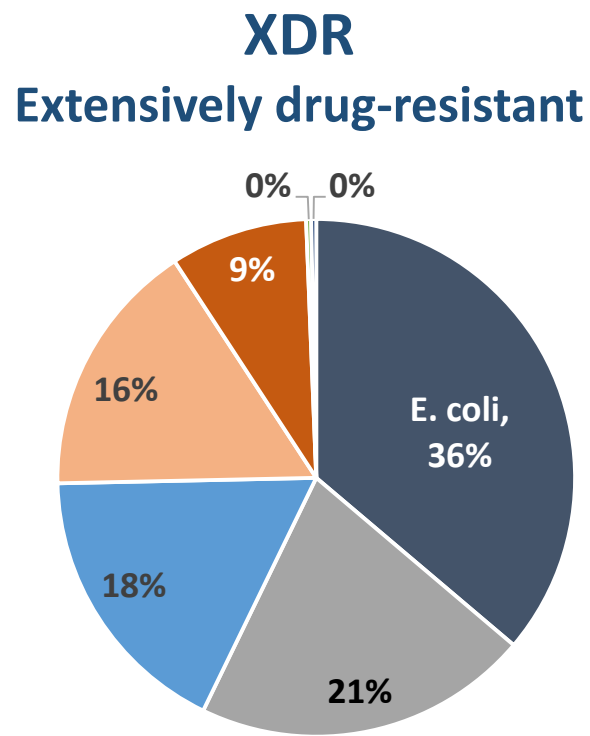- A. baumannii
- K. pneumoniae
- S. maltophilia
- S. aureus
- M. tuberculosis

PDR
Pan-drug-resistant

- K. pneumoniae, 84%
- 6%
- 5%
- 2%
- 3%
- 0%
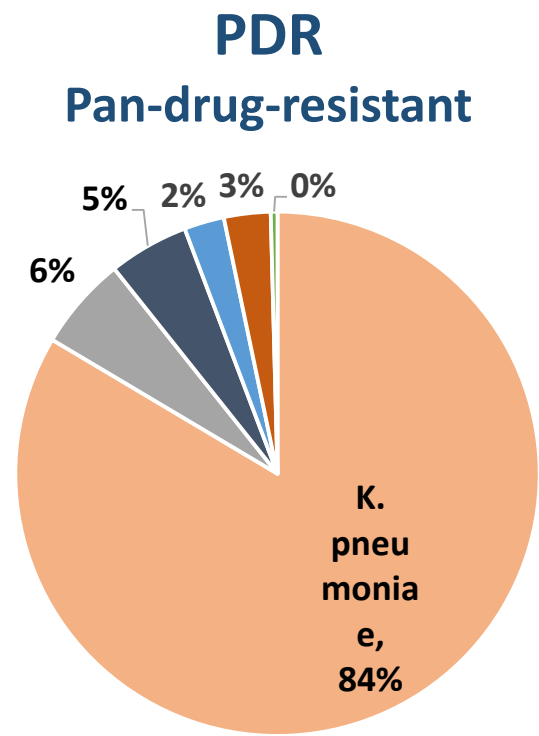
Legend:
- K. pneumoniae
- P. aeruginosa
- E. coli
- A. baumannii
- S. maltophilia
- M. tuberculosis

Abu Dhabi AMR Surveillance, Department of Health, 2010-2017

Carbapenem-resistant *Enterobacteriaceae* (CRE) are emerging in the UAE

CRE, 6-Year Trend

% CRE

N (CRE

p<0.001

Year	N	%
2010	20	0.27
2011	50	0.45
2012	83	0.67
2013	197	1.50
2014	329	2.50
2015 (Est)	480	2.95

CRE – by Organism

- 48% K. pneumoniae
- 21% E. coli
- 21% Enterobacter spp.
- 5% Serratia spp.
- 3% Citrobacter spp.
- 1% Salmonella spp.
- 1% Proteus spp.
- Morganella spp.
- Providencia spp.
- Pantoea spp.
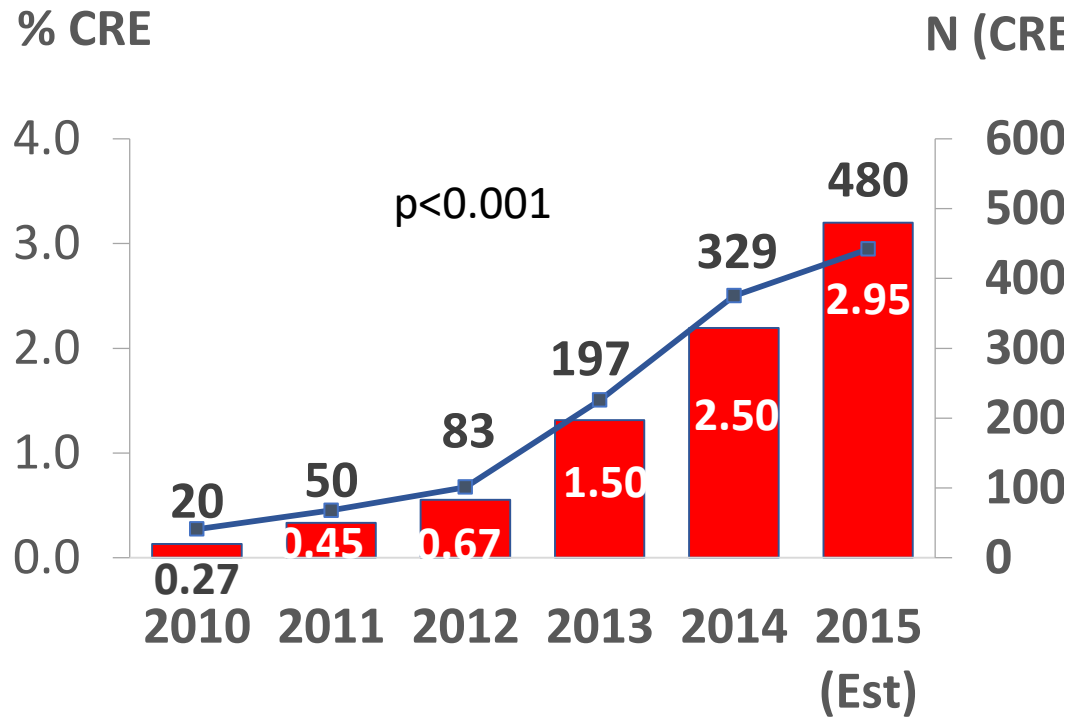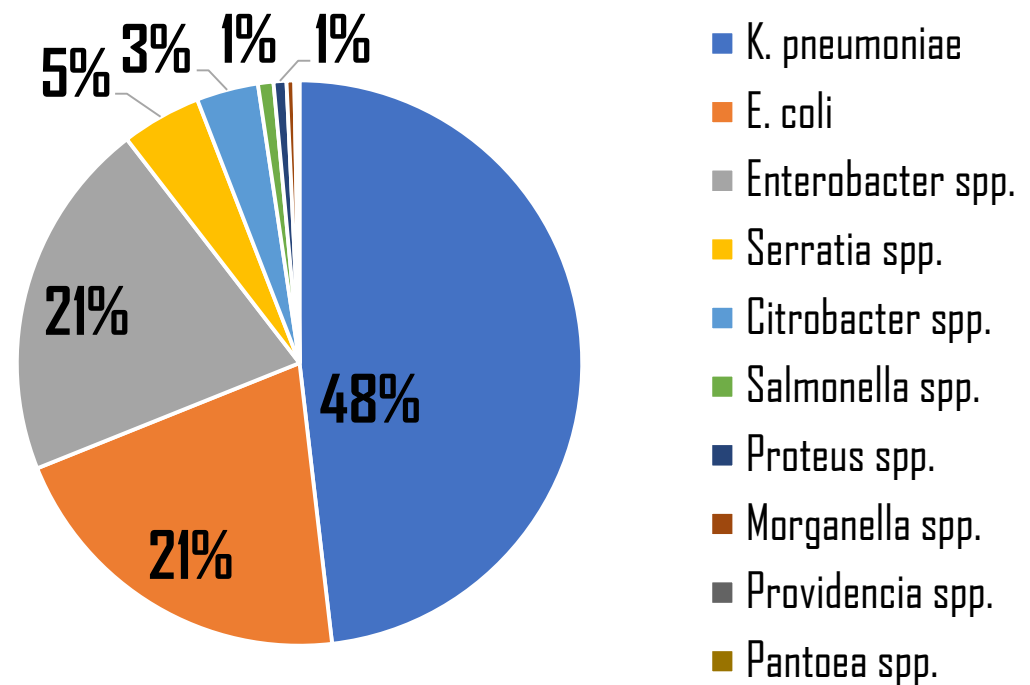
- Carbapenem-resistant *Enterobacteriaceae* (CRE) are emerging globally, and in Gulf countries, including **UAE/Abu Dhabi**

Abu Dhabi AMR Surveillance System, Department of Health (2010-2015)

Abu Dhabi AMR Surveillance Data is published quarterly in the DoH Communicable Disease Bulletin (since Q1/2017)

Department of Health

Communicable Diseases Bulletin

Quarterly Summary Report
First Quarter 1- 2017 (Jan-Mar)
Volume 8; Issue Number 1; 2017

www.haad.ae

Klebsiella pneumoniae

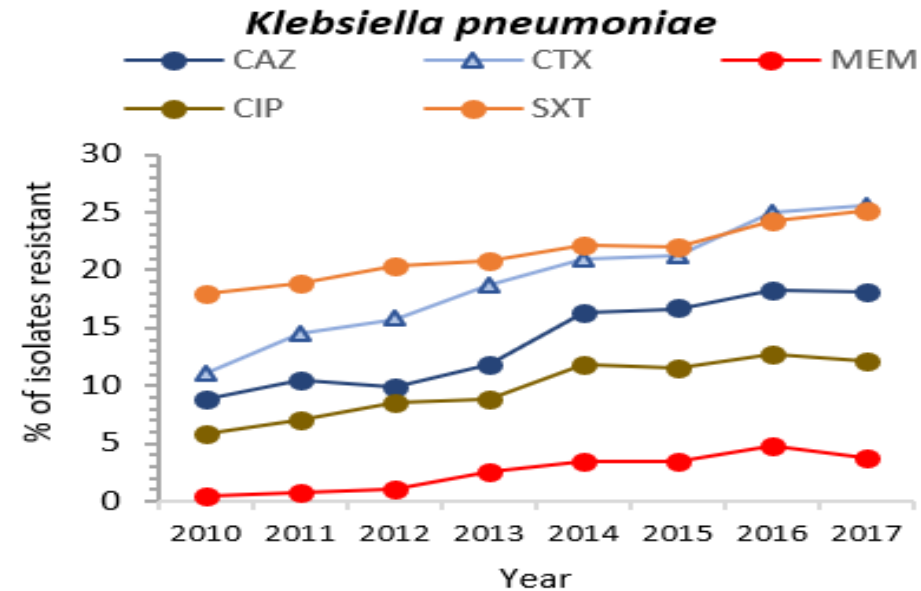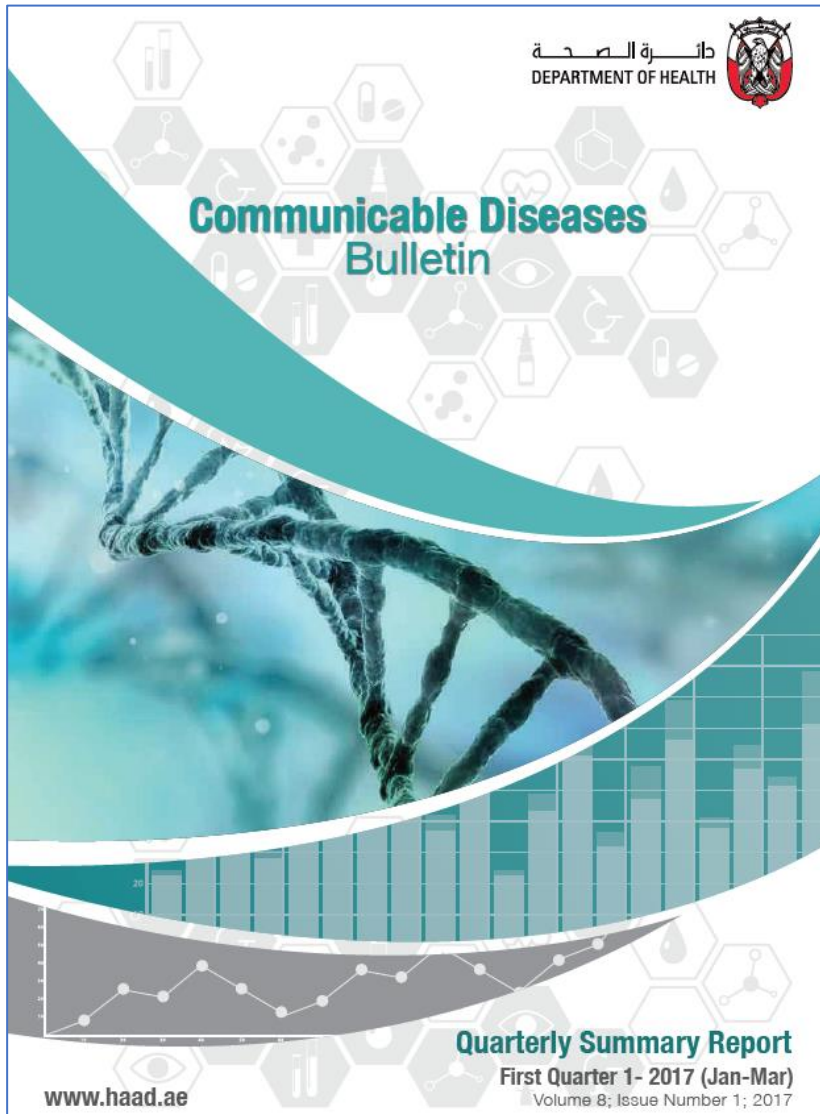Legend: CAZ, CTX, MEM, CIP, SXT — % of isolates resistant by Year (2010–2017)

ABX	Percent (%) of isolates resistant, by year								Trend 2010-2017
	2010	2011	2012	2013	2014	2015	2016	2017	
AMC	8.1	6.5	7.8	10.7	13.5	14.6	13.9	15.5	↑↑
CAZ	8.9	10.5	9.9	11.9	16.3	16.7	18.3	18.1	↑↑
CTX	11.1	14.5	15.8	18.7	20.9	21.3	25.0	25.6	↑↑
FEP	2.0	5.5	5.2	7.0	7.0	9.4	9.5	10.6	↑↑
ETP	–	–	0.0	4.5	3.8	3.9	4.9	4.7	↑
IPM	0.4	0.7	1.4	1.6	2.9	2.4	3.4	2.3	↑
MEM	0.5	0.7	1.0	2.5	3.5	3.4	4.8	3.7	↑
CIP	5.8	7.1	8.5	8.8	11.8	11.5	12.8	12.1	↑↑
SXT	17.9	18.8	20.3	20.8	22.2	22.0	24.2	25.2	↑↑
NIT	22.8	31.6	34.1	32.9	32.8	31.1	20.2	21.2	–
ESBL	–	–	23.8	25.8	21.5	22.2	23.1	22.4	–
N	1,433	2,042	2,316	2,441	2,454	3,117	2,937	3,240	19,980

Priority 1: CRITICAL

Acinetobacter baumannii, carbapenem-resistant

Pseudomonas aeruginosa, carbapenem-resistant

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

http://www.who.int/medicines/publications/global-priority-list-antibiotic-resistant-bacteria/en/

Acinetobacter baumannii : Resistance to Carbapenems

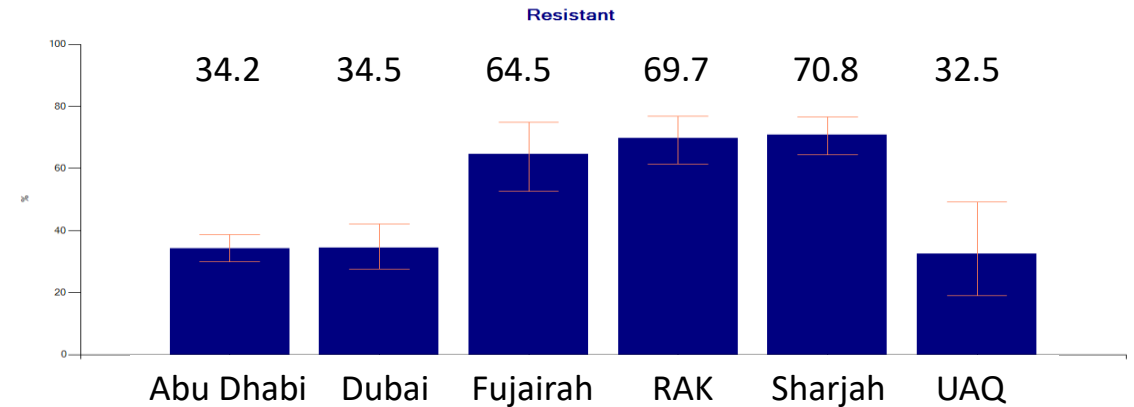Percent of **A. baumannii** Isolates, resistant to **carbapenems** (%R), UAE, 2016 (n=1,293 isolates):

- Imipenem: 47.2 %R
- Meropenem: 47.9 %R
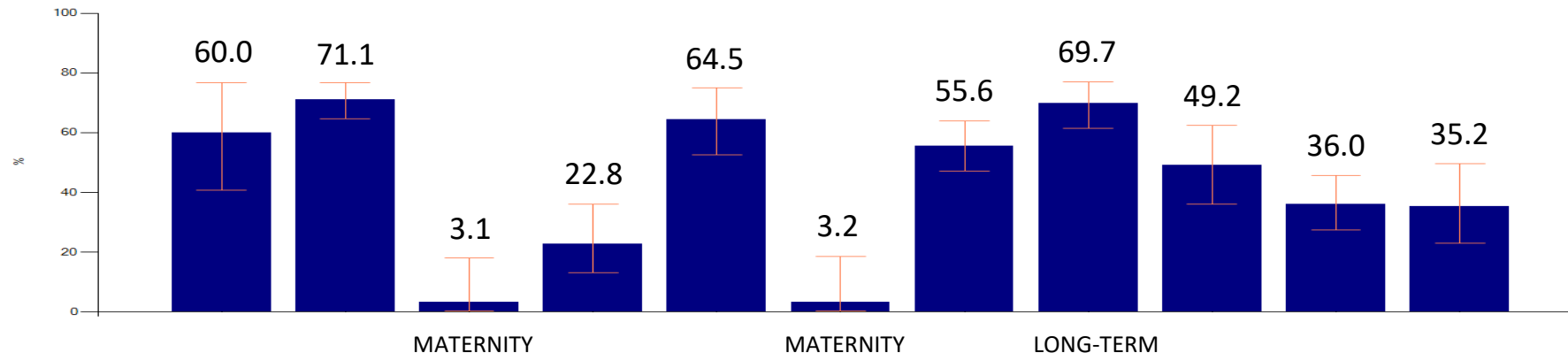- Imipenem <u>or</u> Meropenem: 47.6 %R

Carbapenems (%Resistant) - UAE:
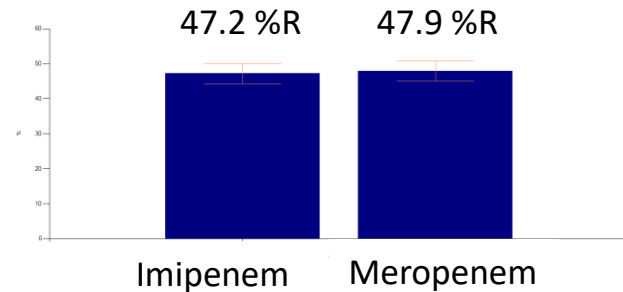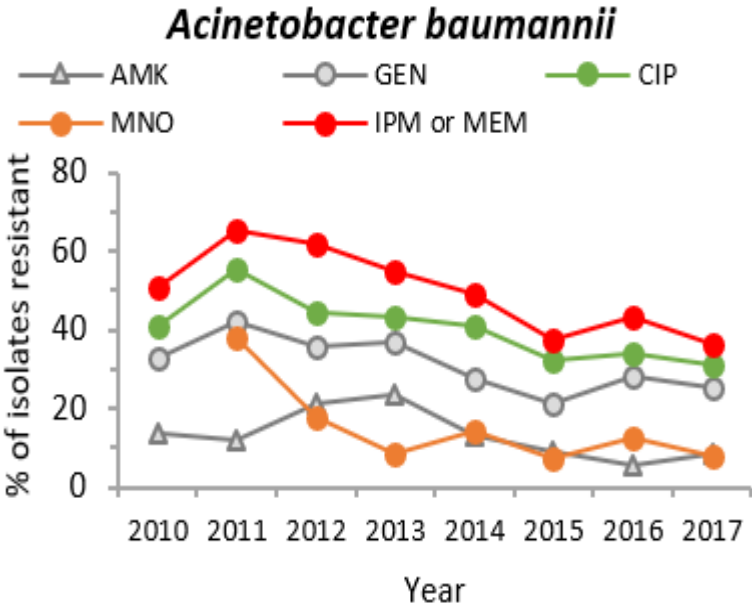

Meropenem (%Resistant) – By Emirate:

Meropenem (%Resistant) – By Hospital:

UAE National AMR Surveillance System, 2016 (not yet published)

Acinetobacter baumannii : Annual Trends (% Resistant), 2010-2017

Acinetobacter baumannii

ABX	Percent (%) of isolates resistant, by year								Trend 2010-2017
	2010	2011	2012	2013	2014	2015	2016	2017	
IPM	39.3	51.8	45.4	43.9	39.8	28.5	33.9	28.9	↓↓
MEM	45.6	51.9	53.3	47.2	41.2	28.2	34.6	29.4	↓↓
AMK	13.5	12.1	21.5	23.4	13.0	8.9	5.7	7.7	↓↓
GEN	33.0	42.4	36.0	36.9	27.9	21.0	28.4	24.7	↓↓
CIP	41.2	55.2	44.6	43.1	40.9	32.2	33.9	30.9	↓↓
MNO	–	38.1	17.7	8.5	14.3	7.5	12.5	8.0	↓↓
TCY	36.2	47.5	41.8	37.1	43.5	30.4	32.1	35.9	–
IPM or MEM	51.0	65.2	62.1	55.1	48.8	37.4	43.4	28.9	↓↓
N	357	538	553	588	455	572	464	511	4,038

Acinetobacter baumannii:

Increasing resistance:

- None

Decreasing trends of resistance:

- Carbapenems (IPM or MEM↓↓)
- Aminoglycosides (AMK ↓↓, GEN ↓↓)
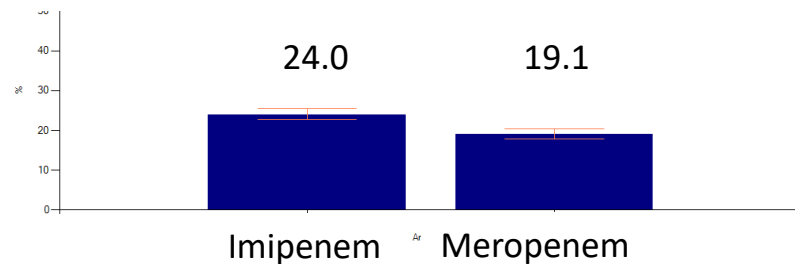- Fluoroquinolones (CIP↓↓)
- Tetracyclines (MNO ↓↓)

Communicable Disease Bulletin, Q4/2017, Department of Health, Abu Dhabi (DoH 2018) [6]

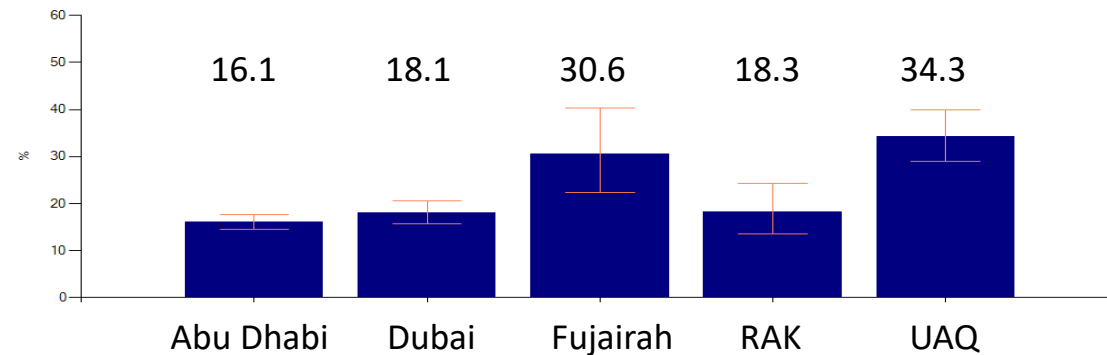# *Pseudomonas aeruginosa*: Resistance to Carbapenems

Percent of **P. aeruginosa** Isolates, resistant to **Carbapenems** (%R), UAE, 2016 (n=4,280 isolates):

- Imipenem: 24.0 %R
- Meropenem: 19.1 %R
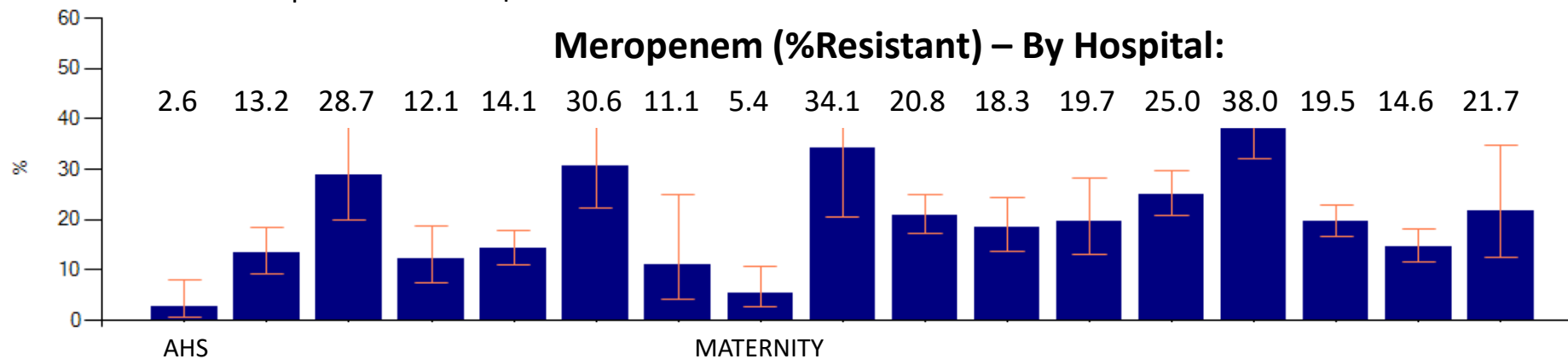- Imipenem or Meropenem: 25.0 %R

Carbapenems (% Resistant) - UAE:

	Imipenem	Meropenem
%R	24.0	19.1

Meropenem (%Resistant) – By Emirate:

Abu Dhabi	Dubai	Fujairah	RAK	UAQ
16.1	18.1	30.6	18.3	34.3

Meropenem (%Resistant) – By Hospital:

2.6 13.2 28.7 12.1 14.1 30.6 11.1 5.4 34.1 20.8 18.3 19.7 25.0 38.0 19.5 14.6 21.7

AHS   MATERNITY

UAE National AMR Surveillance System. Not yet published

Pseudomonas aeruginosa : Annual Trends (% Resistant), 2010-2017

Pseudomonas aeruginosa
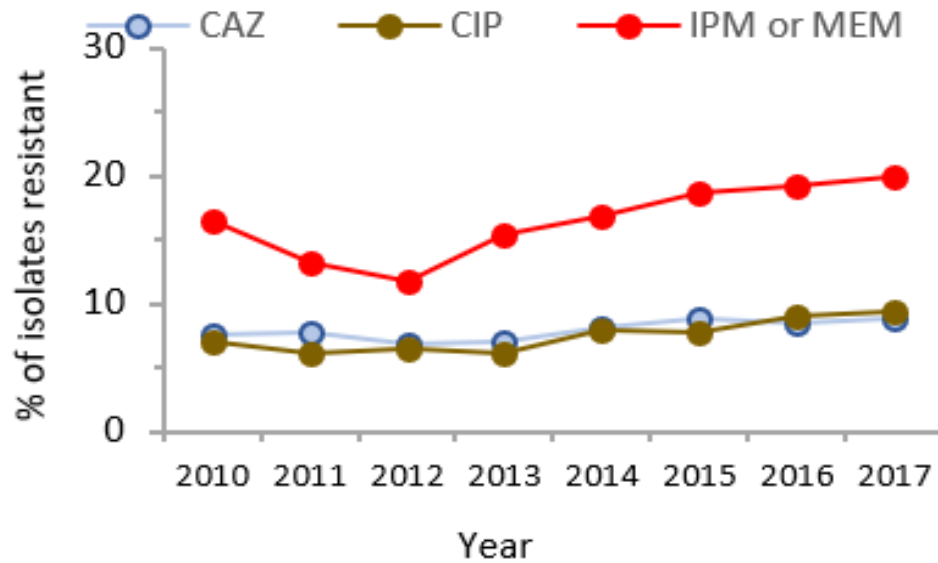
ABX	Percent (%) of isolates resistant, by year								Trend 2010-2017
	2010	2011	2012	2013	2014	2015	2016	2017	
TZP	9.6	10.1	10.9	7.6	9.5	10.5	9.9	7.4	
CAZ	7.5	7.7	6.9	7.0	8.1	8.9	8.4	10.4	↑
FEP	6.0	6.8	5.4	5.1	5.3	6.2	5.9	8.0	↑
IPM	12.8	11.1	10.0	14.7	16.2	17.4	18.3	21.6	↑↑
MEM	13.6	10.1	9.4	11.4	12.1	13.4	13.8	16.4	↑
GEN	7.9	6.7	6.3	4.8	5.8	5.7	6.5	7.0	–
CIP	7.0	6.1	6.5	6.2	7.9	7.8	9.1	9.9	↑
IPM or MEM	16.5	13.3	11.7	15.4	16.8	18.6	19.2	22.0	↑↑
N	1,285	1,785	1,958	2,109	1,939	2,009	2,176	2,455	15,716

***Pseudomonas aeruginosa*:**

Increasing trends of resistance:

- 3rd gen. cephalosporins (CAZ↑)
- 4th gen. cephalosporins (FEP ↑)
- Carbapenems (IPM↑↑, MEM↑)
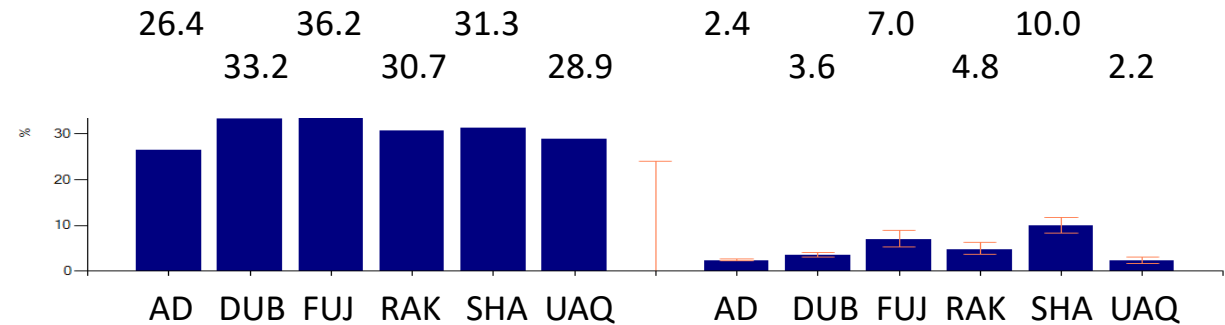- Fluoroquinolones (CIP↑)

Decreasing trends of resistance:

- None

Communicable Disease Bulletin, Q4/2017, Department of Health, Abu Dhabi (DoH 2018) [6]

Enterobacteriaceae: Resistance to Carbapenems

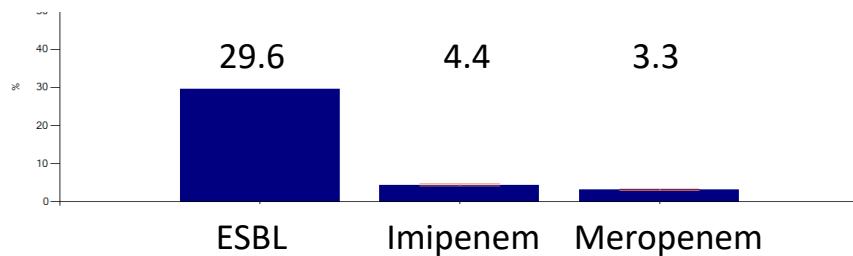***Enterobacteriaceae*: ESBL**, & **Carbapenem-resistant** (%R), UAE, 2016 (n=26,199 isolates):

- ESBL   29.6 %
- Imipenem: 4.4 %R
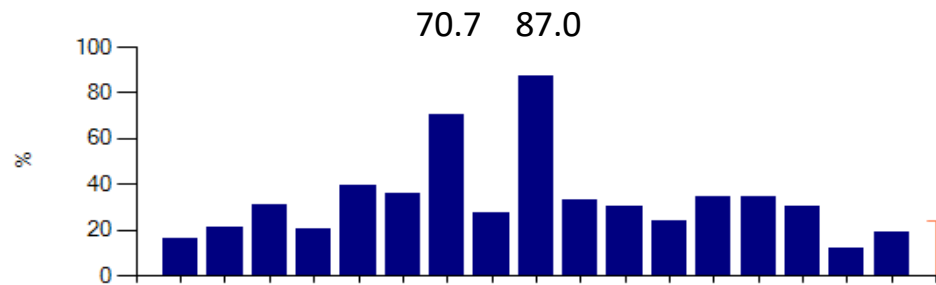- Meropenem: 3.3 %R
- Imipenem <u>or</u> Meropenem: 5.4 %R
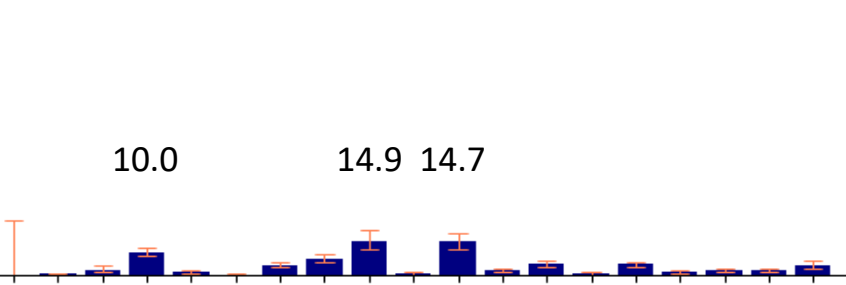
ESBL and MEM (%R) – By Emirate

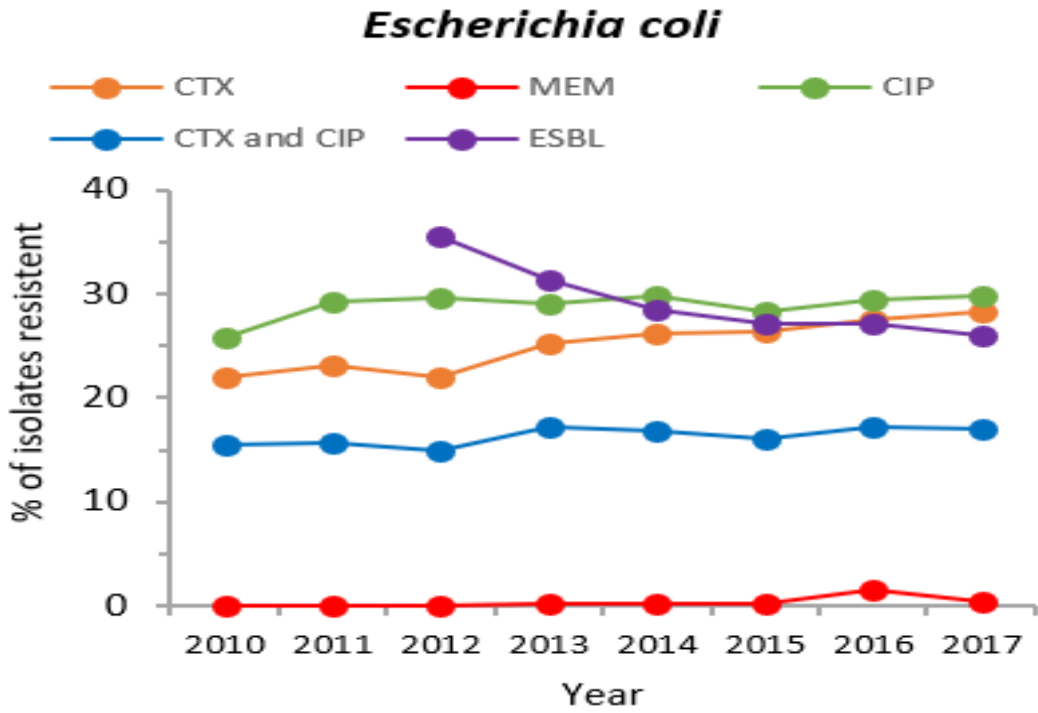**ESBL and Carbapenem (%R) - UAE**

ESBL (%Resistant) – By Hospital:

Meropenem (%Resistant) – By Hospital:

UAE National AMR Surveillance System. Not yet published.

Escherichia coli: Annual Trends (% Resistant), 2010-2017

Escherichia coli

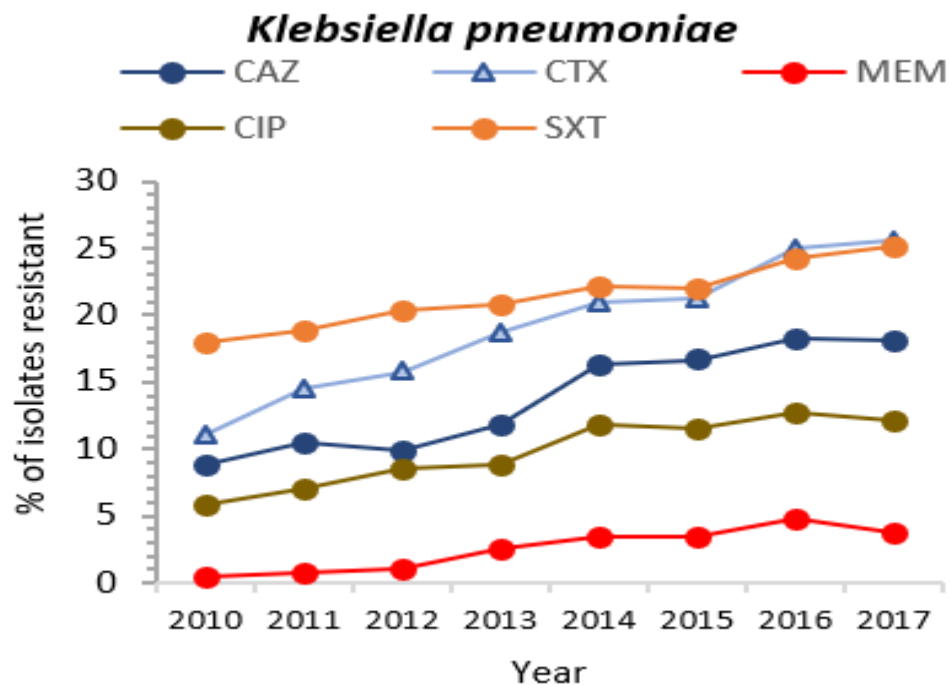| ABX	Percent (%) of isolates resistant, by year								Trend
	2010	2011	2012	2013	2014	2015	2016	2017	2010-2017
AMP	66.9	66.0	63.5	64.9	64.8	64.3	63.7	63.9	↓
AMC	13.5	12.2	8.6	10.5	12.3	11.3	10.8	11.7	–
CAZ	13.2	12.9	11.5	14.8	15.4	13.9	14.8	15.0	↑
CTX	21.9	23.2	21.9	25.3	26.2	26.4	27.6	28.8	↑
FEP	4.8	9.3	8.3	9.4	7.6	7.9	7.5	8.9	–
ETP	–	–	1.1	0.7	0.6	0.4	0.6	0.8	–
IPM	0.2	0.3	0.1	0.3	0.2	0.1	0.6	0.4	↑
MEM	0.1	0.1	0.1	0.2	0.2	0.2	1.5	0.4	↑
CIP	25.9	29.3	29.6	29.1	29.8	28.3	29.5	30.2	↑
SXT	45.5	43.5	43.5	42.9	42.2	42.7	41.1	40.1	↓
NIT	1.5	1.7	2.5	2.5	2.7	3.0	1.7	1.5	–
CTX+CIP	15.5	15.7	15.0	17.2	16.8	16.1	17.3	17.4	↑
ESBL	–	–	35.5	31.3	28.5	27.2	27.1	26.5	↓↓
N	3,914	5,907	6,485	6,972	6,925	8,200	8,021	7,861	54,285

E. coli:

Increasing trends of resistance for
- 3rd-gen. cephalosporins (CAZ ↑ , CTX ↑)
- Carbapenems (IPM ↑ , MEM ↑)
- Fluoroquinolones (CIP↑)

Decreasing trend of resistance for
- Ampicillin (AMP↓)
- Trimethoprim/Sulfamethoxazole (SXT↓)
- ESBL↓↓

Klebsiella pneumoniae

ABX	Percent (%) of isolates resistant, by year								Trend 2010-2017
	2010	2011	2012	2013	2014	2015	2016	2017	
AMC	8.1	6.5	7.8	10.7	13.5	14.6	13.9	15.5	↑↑
CAZ	8.9	10.5	9.9	11.9	16.3	16.7	18.3	18.1	↑↑
CTX	11.1	14.5	15.8	18.7	20.9	21.3	25.0	25.6	↑↑
FEP	2.0	5.5	5.2	7.0	7.0	9.4	9.5	10.6	↑↑
ETP	–	–	0.0	4.5	3.8	3.9	4.9	4.7	↑
IPM	0.4	0.7	1.4	1.6	2.9	2.4	3.4	2.3	↑
MEM	0.5	0.7	1.0	2.5	3.5	3.4	4.8	3.7	↑
CIP	5.8	7.1	8.5	8.8	11.8	11.5	12.8	12.1	↑↑
SXT	17.9	18.8	20.3	20.8	22.2	22.0	24.2	25.2	↑↑
NIT	22.8	31.6	34.1	32.9	32.8	31.1	20.2	21.2	–
ESBL	–	–	23.8	25.8	21.5	22.2	23.1	22.4	–
N	1,433	2,042	2,316	2,441	2,454	3,117	2,937	3,240	19,980

Increasing trends of resistance:
- All beta-lactams (↑↑), including 3rd-gen. cephalosporins (CAZ↑, CTX ↑) and carbapenems (ETP/IPM/MEM ↑)
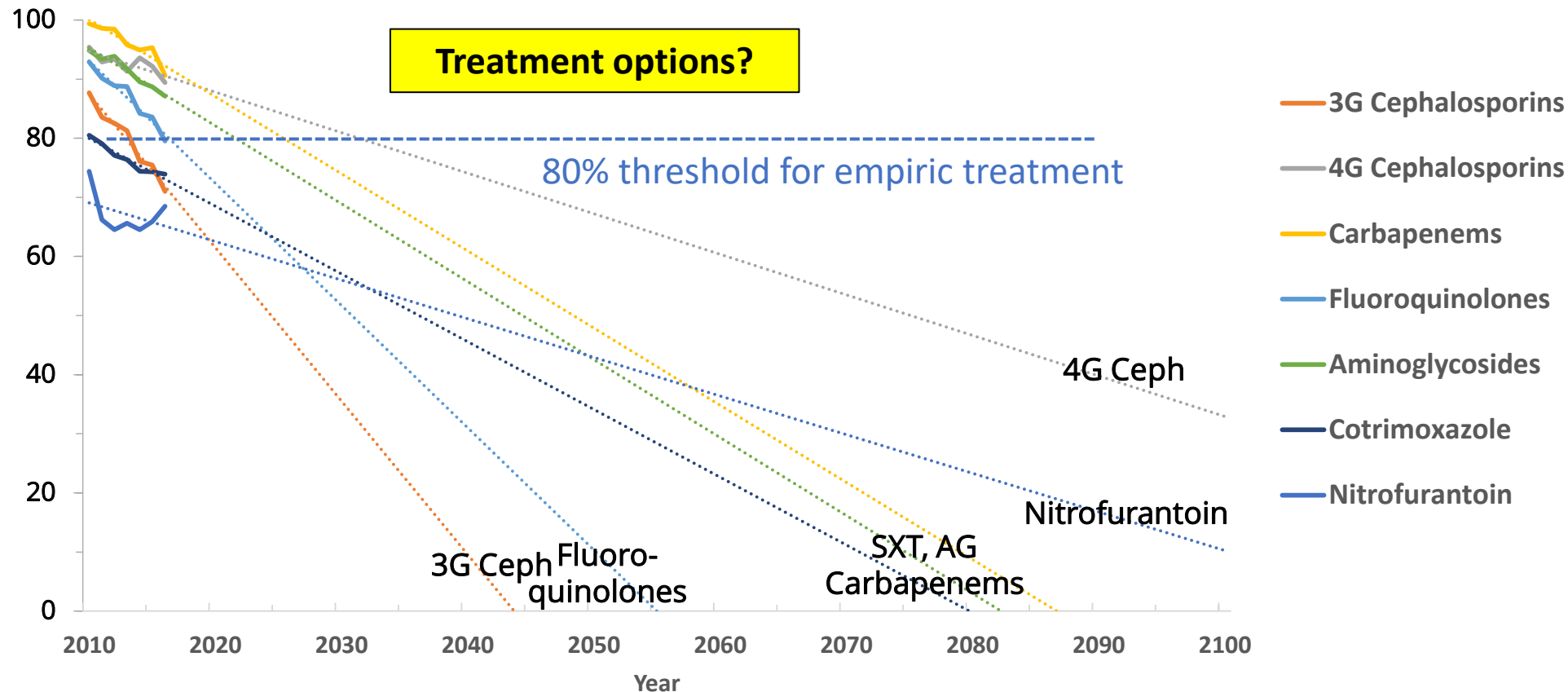- Fluoroquinolones (CIP↑↑) and
- Trimethoprim/sulfamethoxazole (SXT↑↑)

Decreasing trends of resistance:
- None

Klebsiella pneumoniae: Antimicrobial Susceptibility Trends, and Trend Predictions
Abu Dhabi Emirate, 2010-2100

Abu Dhabi AMR Surveillance, Dept. of Health

UAE AMR Surveillance: Preliminary Results

Priority 2: HIGH

Enterococcus faecium, vancomycin-resistant

Staphylococcus aureus, methicillin-resistant, vancomycin intermediate and resistant

Helicobacter pylori, clarithromycin-resistant

Campylobacter, fluoroquinolone-resistant

Salmonella spp., fluoroquinolone-resistant

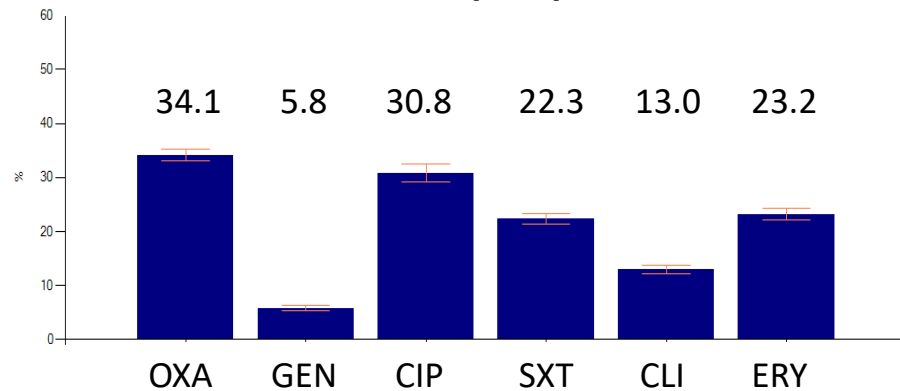*Neisseria gonorrhoeae*, 3rd generation cephalosporin-resistant, fluoroquinolone-resistant

http://www.who.int/medicines/publications/global-priority-list-antibiotic-resistant-bacteria/en/

Staph. aureus: Resistance to Oxacillin (MRSA)

Staph aureus: Oxacillin-resistant (% MRSA), UAE, 2016 (n=6,745 isolates):
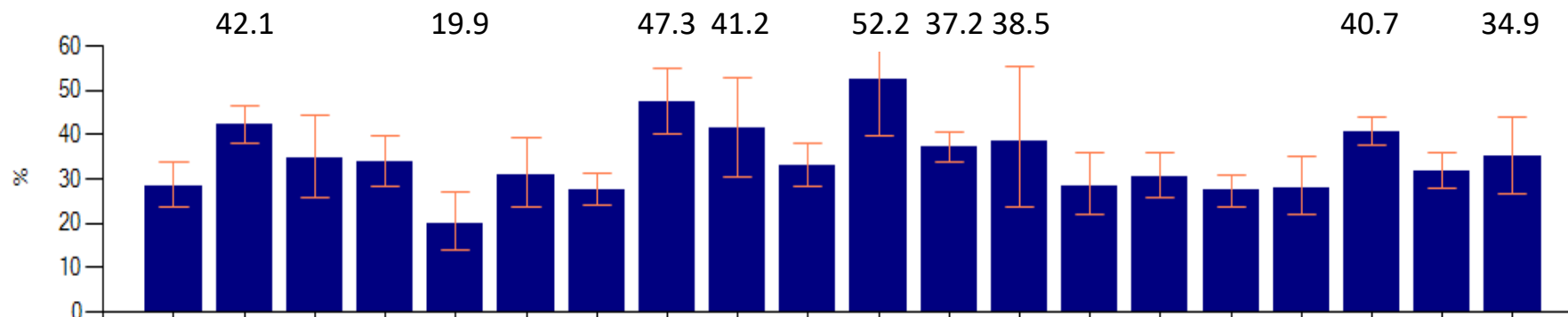
- **MRSA: 34.1 %**

S. aureus (%R) - UAE

34.1   5.8   30.8   22.3   13.0   23.2

OXA   GEN   CIP   SXT   CLI   ERY

Oxacillin (%R) – By Emirate:

36.2   29.2   47.3   28.0   33.6   30.8

AD   DUB   FUJ   RAK   SHA   UAQ
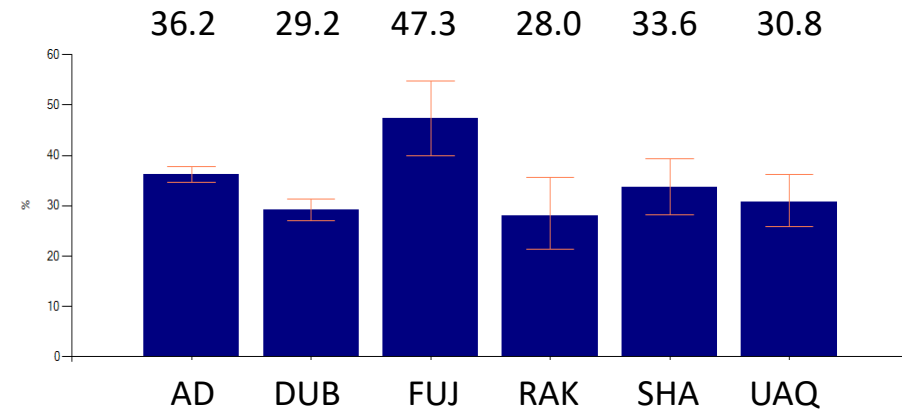
Oxacillin (%Resistant) – By Hospital:

42.1   19.9   47.3 41.2   52.2 37.2 38.5   40.7   34.9

UAE National AMR Surveillance System (not published)

Annual Trends for AMR: *Staph. aureus, 2010-2017*
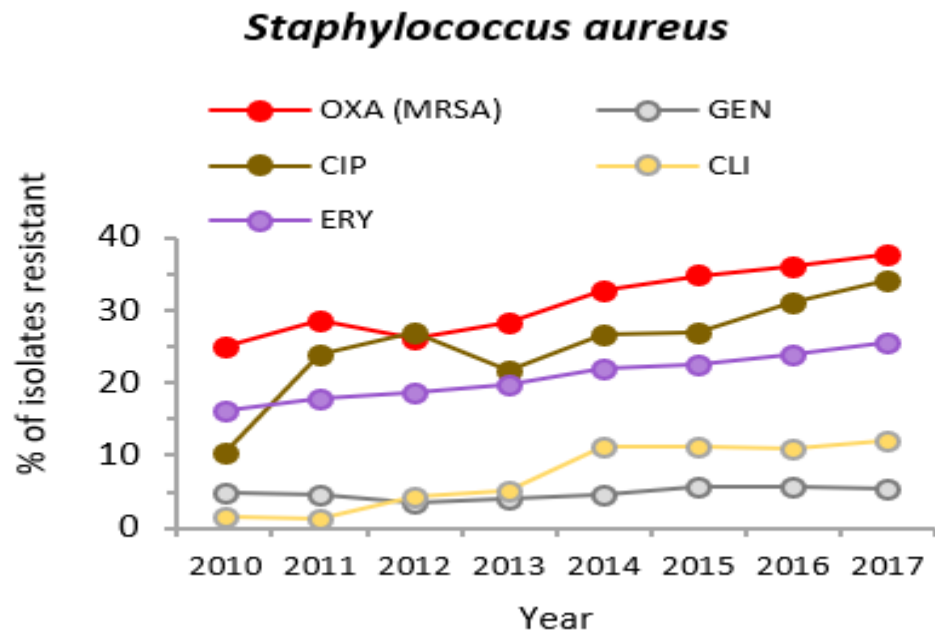
Staphylococcus aureus

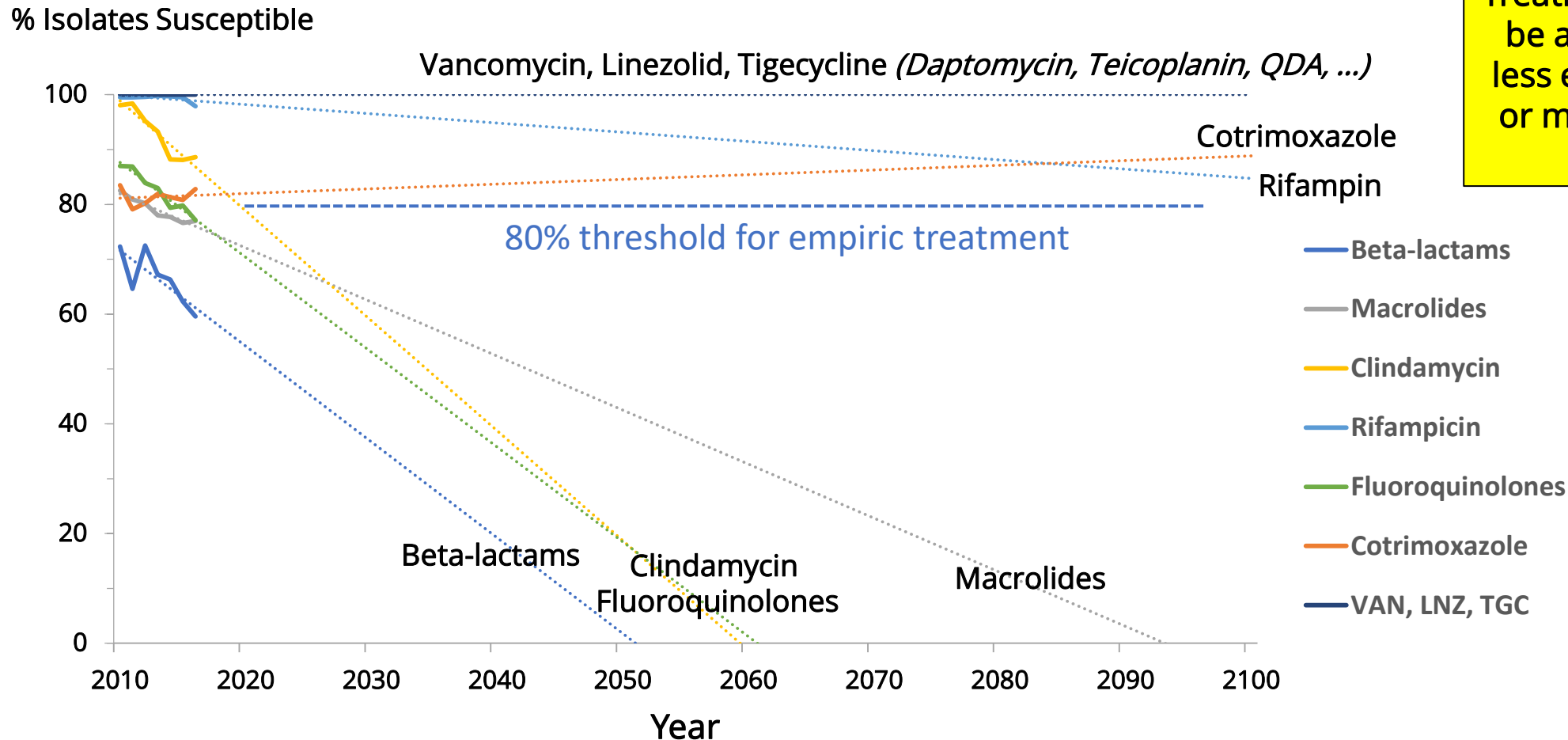| ABX	Percent (%) of isolates resistant, by year								Trend 2010-2017
	2010	2011	2012	2013	2014	2015	2016	2017	
OXA (MRSA)	24.9	28.5	26.0	28.2	32.7	34.8	36.1	37.7	↑↑
GEN	4.8	4.5	3.4	4.1	4.5	5.7	5.7	5.3	↑
CIP	10.3	23.8	27.0	21.7	26.6	26.9	31.1	34.1	↑↑
SXT	16.4	19.6	19.3	17.5	18.7	19.0	19.1	20.4	–
CLI	1.5	1.2	4.2	5.1	11.2	11.1	11.0	12.0	↑↑
ERY	16.2	17.9	18.7	19.8	21.9	22.5	24.0	25.6	↑↑
N	2,420	3,356	3,473	3,514	3,364	3,794	3,972	4,337	28,230

Increasing trends of resistance:
- All beta-lactam antibiotics (MRSA↑↑)
- Aminoglycosides (GEN↑)
- Fluoroquinolones (CIP↑↑)
- Lincosamides (CLI↑↑)
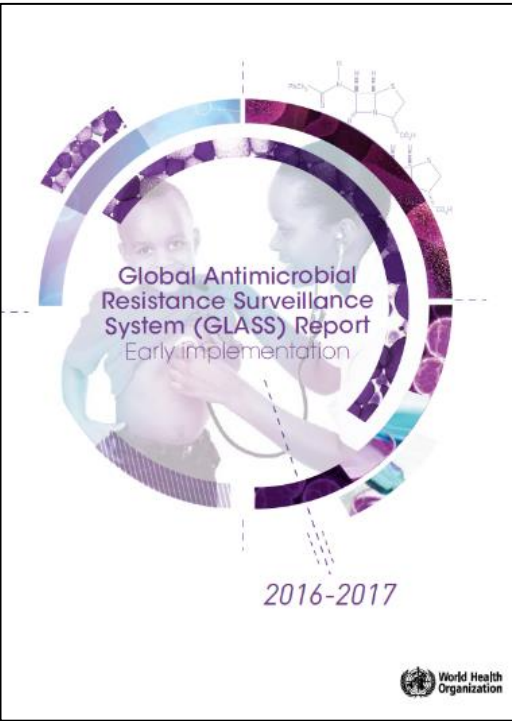- Macrolides (ERY↑↑)

Decreasing trends of resistance:
- None

Communicable Disease Bulletin, Q4/2017, Department of Health, Abu Dhabi (DoH, 2018) [6]

Staph. aureus: Antimicrobial Susceptibility Trends, and Trend Predictions
Abu Dhabi Emirate, 2010-2100

% Isolates Susceptible

Vancomycin, Linezolid, Tigecycline *(Daptomycin, Teicoplanin, QDA, ...)*

Cotrimoxazole

Rifampin

80% threshold for empiric treatment

Beta-lactams

Clindamycin
Fluoroquinolones

Macrolides

Year

Legend:
- Beta-lactams
- Macrolides
- Clindamycin
- Rifampicin
- Fluoroquinolones
- Cotrimoxazole
- VAN, LNZ, TGC

Treatment options will still be available, but will be less effective, more toxic, or more expensive, thus less desirable*

Source: DoH AMR Surveillance   *Stephens JM Clinicoecon Outcomes Res 2013; 5:447-457 [7]
**Athanasakis K. Infect Dis Ther 2014 3(2):257-68 [8]

Current Status of UAE National AMR Surveillance System, and Next Steps

GLASS Report, WHO 2018
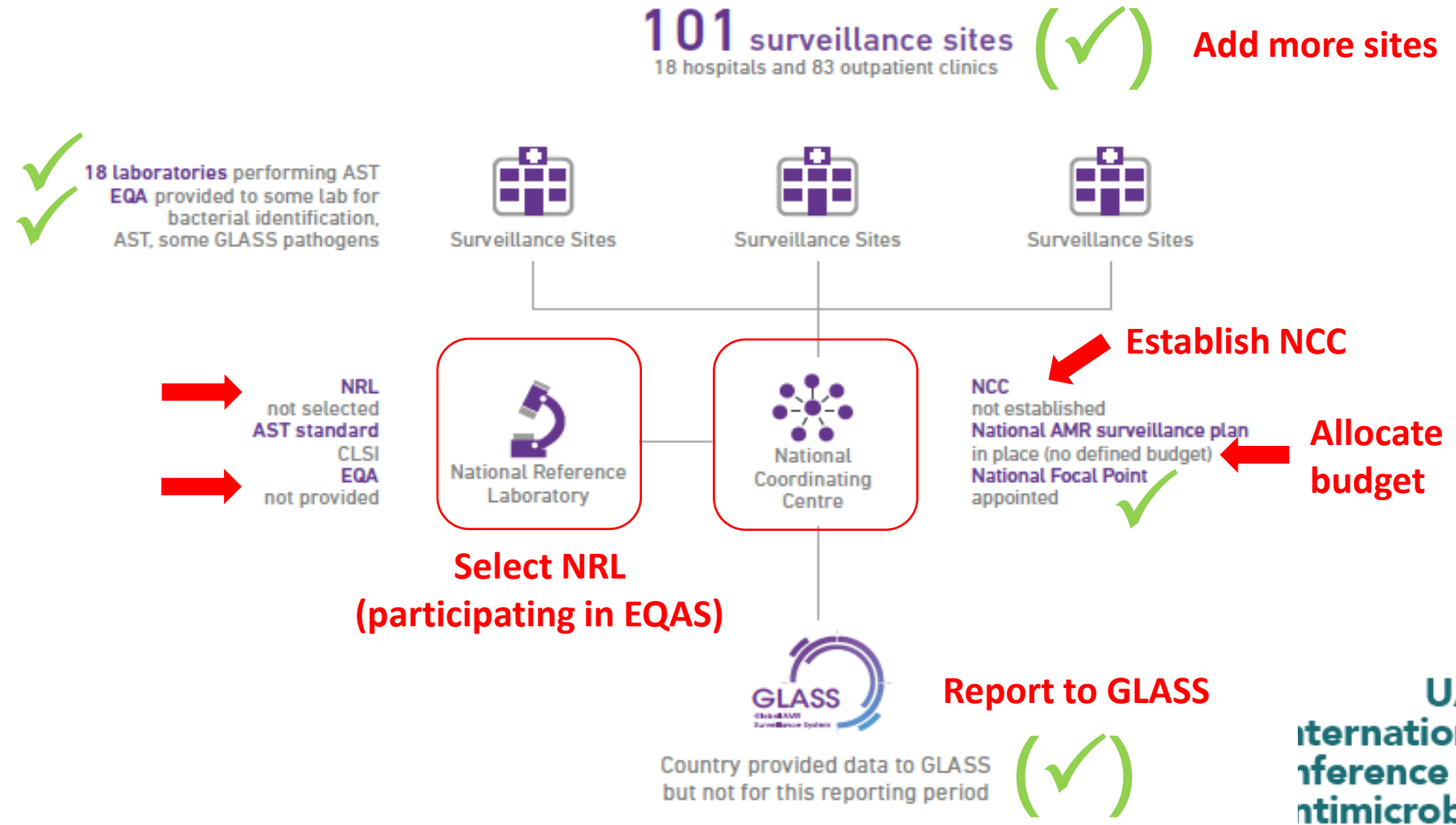
Global Antimicrobial Resistance Surveillance System (GLASS) Report, WHO 2018   **Action needed**

Example: *Staphylococcus aureus*:
Percentage of invasive isolates resistant to Methicillin (%MRSA), by country, 2016

UAE: 30.2 % MRSA

Europe: 1.2-50.5% MRSA

30.2% MRSA

Figure 3.25. *Staphylococcus aureus*. Percentage (%) of invasive isolates with resistance to meticillin (MRSA), by country, EU/EEA countries, 2016

- < 1%
- 1% to < 5%
- 5% to < 10%
- 10% to < 25%
- 25% to < 50%
- ≥ 50%
- No data reported or fewer than 10 isolates
- Not included

Non-visible countries
- Liechtenstein
- Luxembourg
- Malta
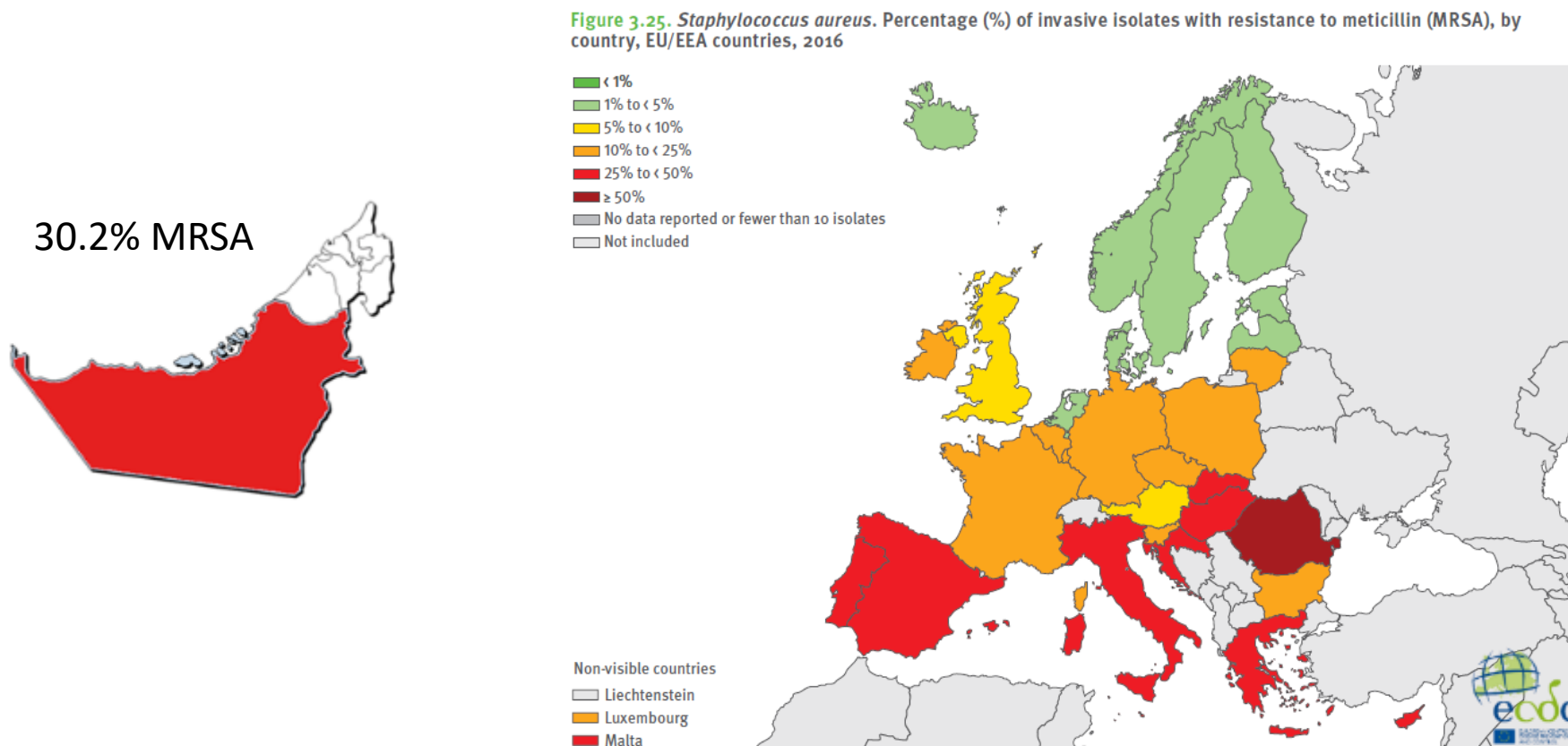
International Benchmarking:
Allows for comparing Resistance Rates and setting Targets

Example: *Staphylococcus aureus*: Percentage of invasive Isolates resistant to Methicillin (%R), By country, 2014
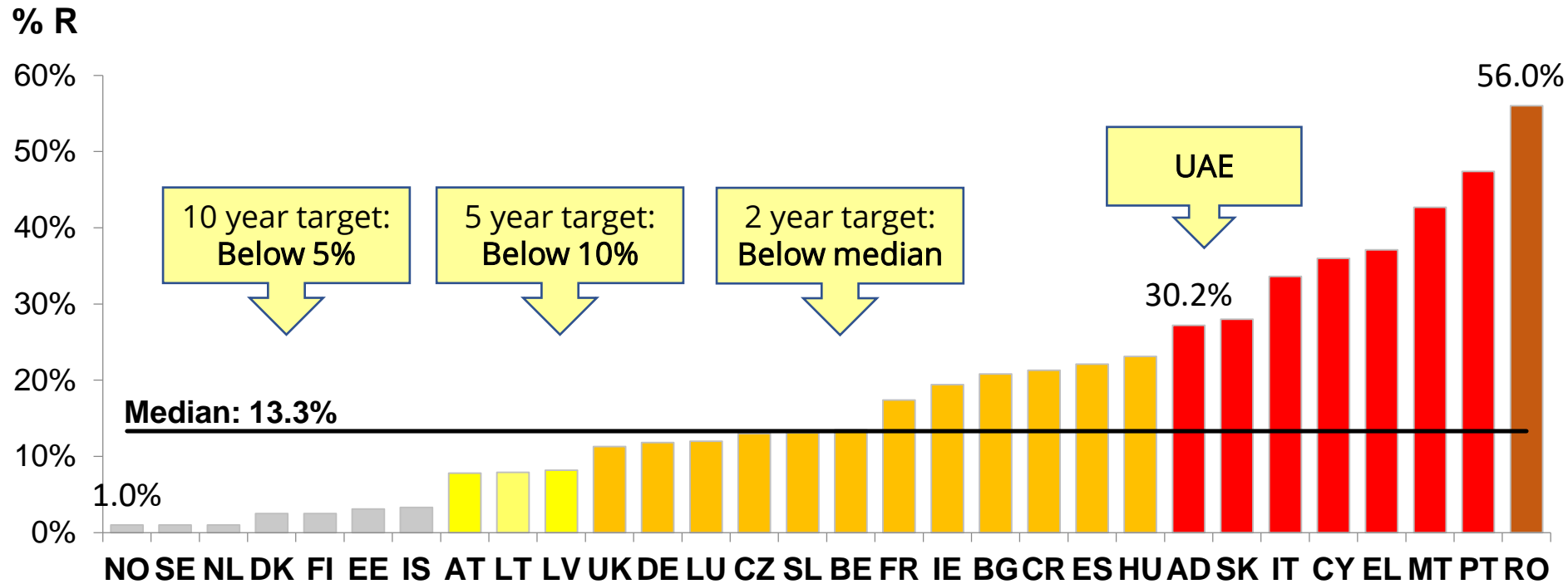
AD=Abu Dhabi, AT=Austria, BE=Belgium, BG=Bulgaria, CY=Cyprus, CZ=Czech Republic, DE=Germany, DK=Denmark, EE=Estonia, EL=Greece, ES=Spain, FI=Finland, FR=France, HU=Hungary, IE=Ireland, IS=Iceland, IT=Italy, LT=Lithuania, LU=Luxembourg, LV=Latvia, MT=Malta, NL=Netherlands, NO=Norway, PL=Poland, PT=Portugal, RO=Romania, SE=Sweden, SL=Slovenia, SK=Slovakia, UK=United Kingdom

Source: Abu Dhabi AMR Surveillance (DoH), EARS-Net (eCDC) [9]

Two out of three antimicrobial resistance rates in Abu Dhabi are higher than median European resistance rates

**Percentage of resistant (%R) invasive Isolates in International Comparison
by Country, Abu Dhabi 2013, compared to 30 EU/EEA countries, 2013**

Source: Abu Dhabi AMR Surveillance (DoH, 2013), EARS-Net (eCDC, 2013) [9]
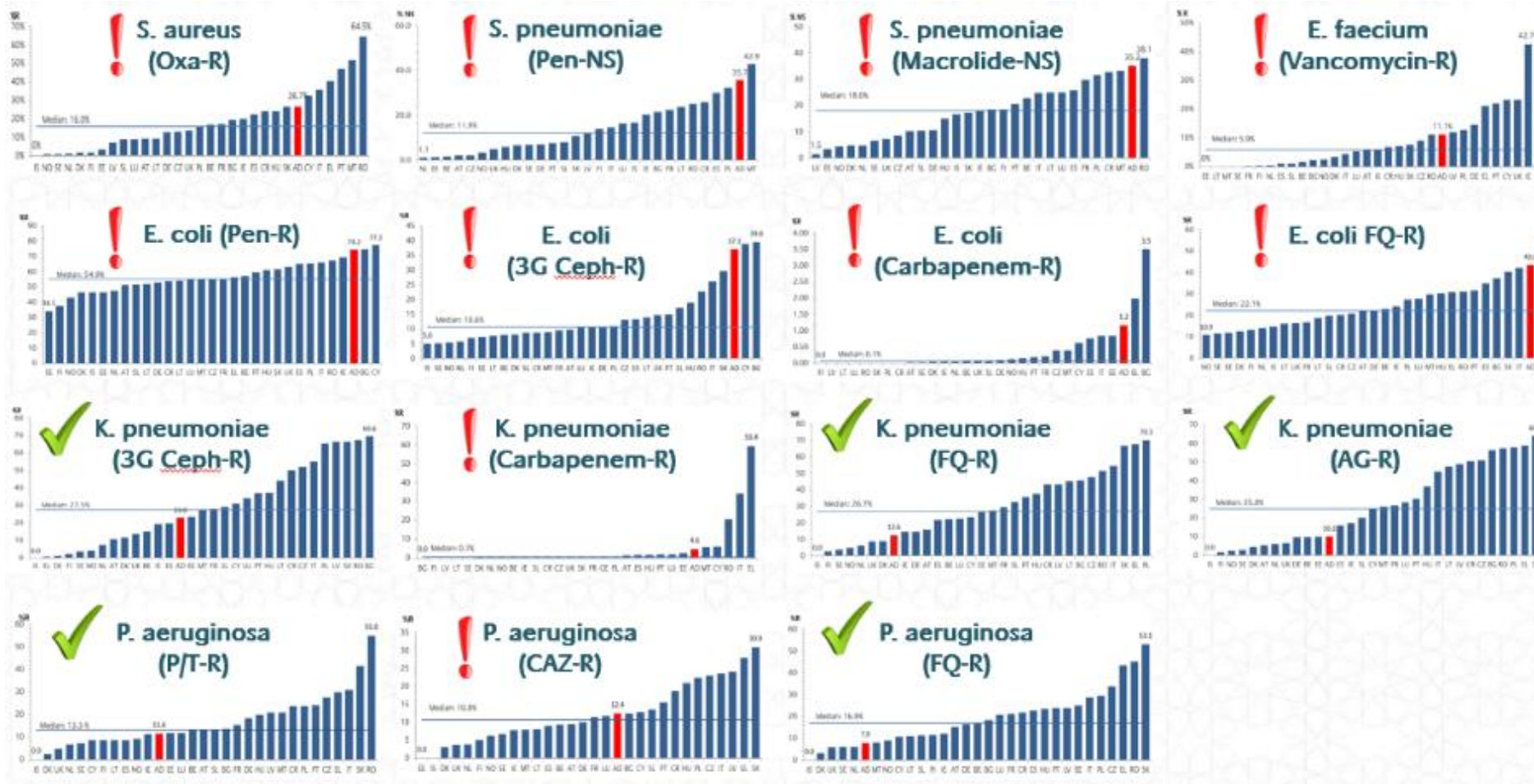
WHO-EMRO Region: 22 Member States/Territories

- Afghanistan
- Bahrain
- Djibouti
- Egypt (EMRO⬤)
- Iran
- Iraq
- Jordan
- Kuwait
- Lebanon
- Libya
- Morocco
- Palestine territory
- Oman
- Pakistan
- Qatar
- Saudi Arabia
- Somalia
- Sudan
- Syria
- Tunisia
- United Arab Emirates
- Yemen

Population: 583 m (8% of global population, 7.5b)

EMRO
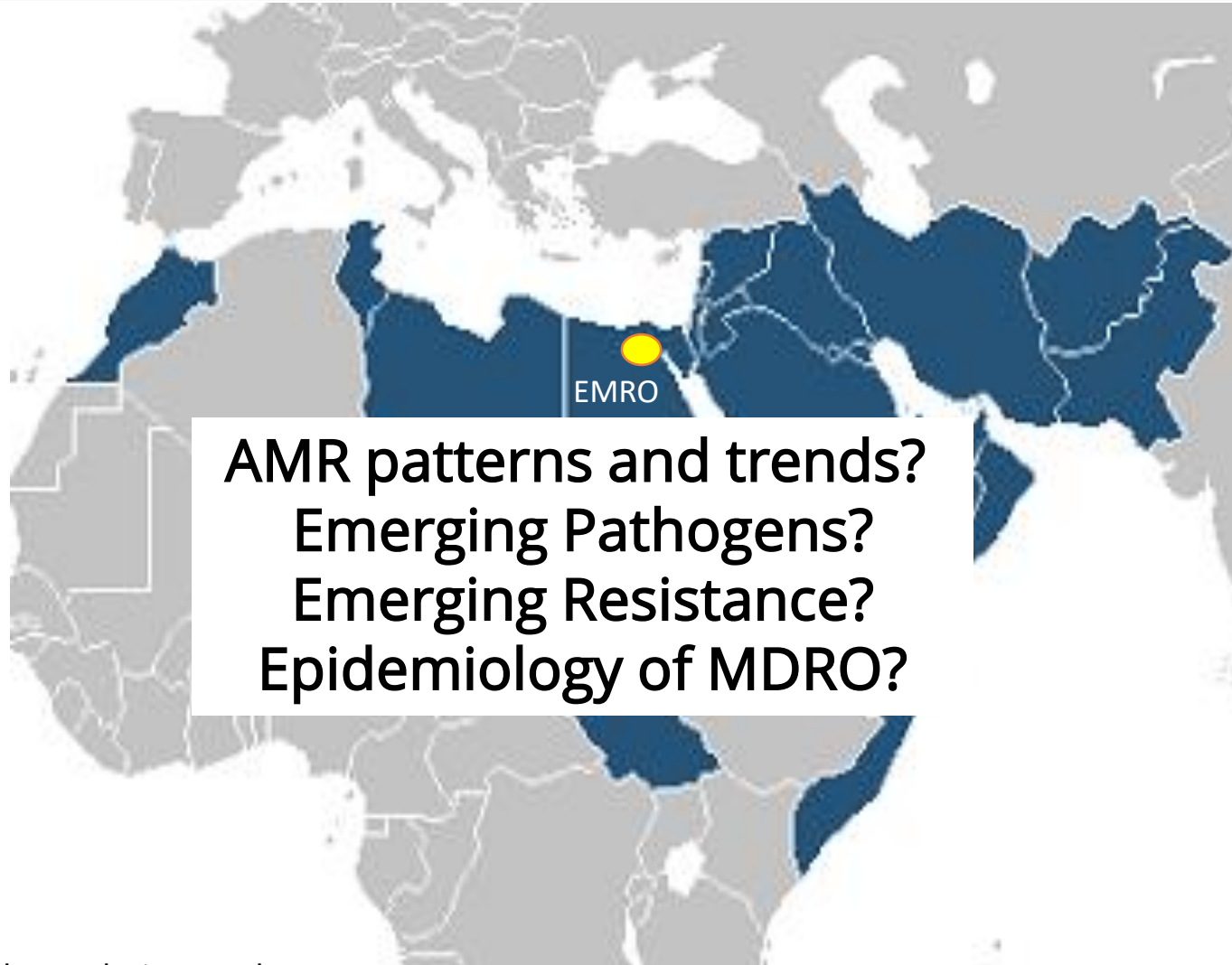
AMR patterns and trends?
Emerging Pathogens?
Emerging Resistance?
Epidemiology of MDRO?
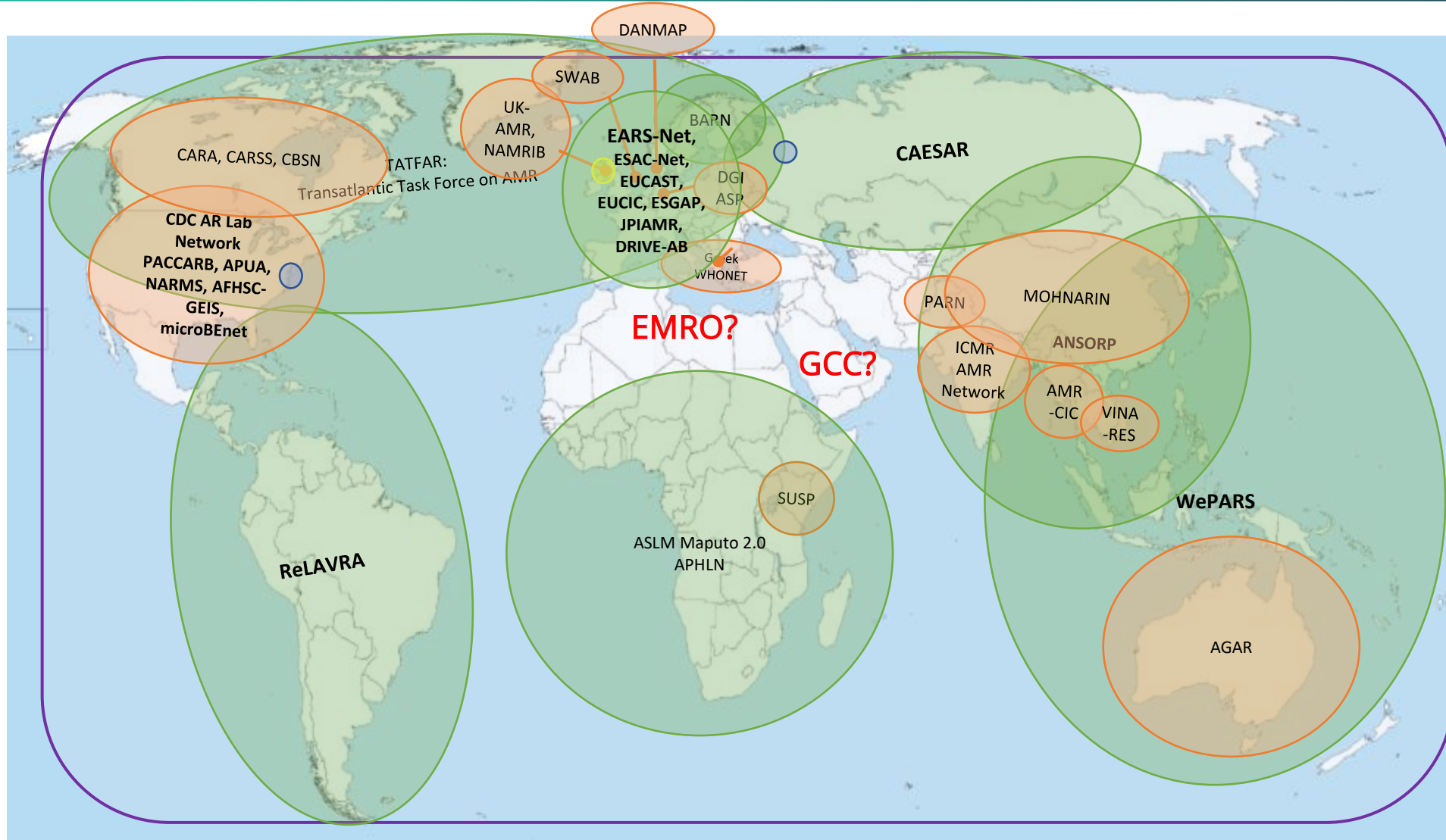
A Regional Network for AMR Surveillance is needed

Proposing **EMARS-Net**: The Eastern Mediterranean AMR Surveillance Network
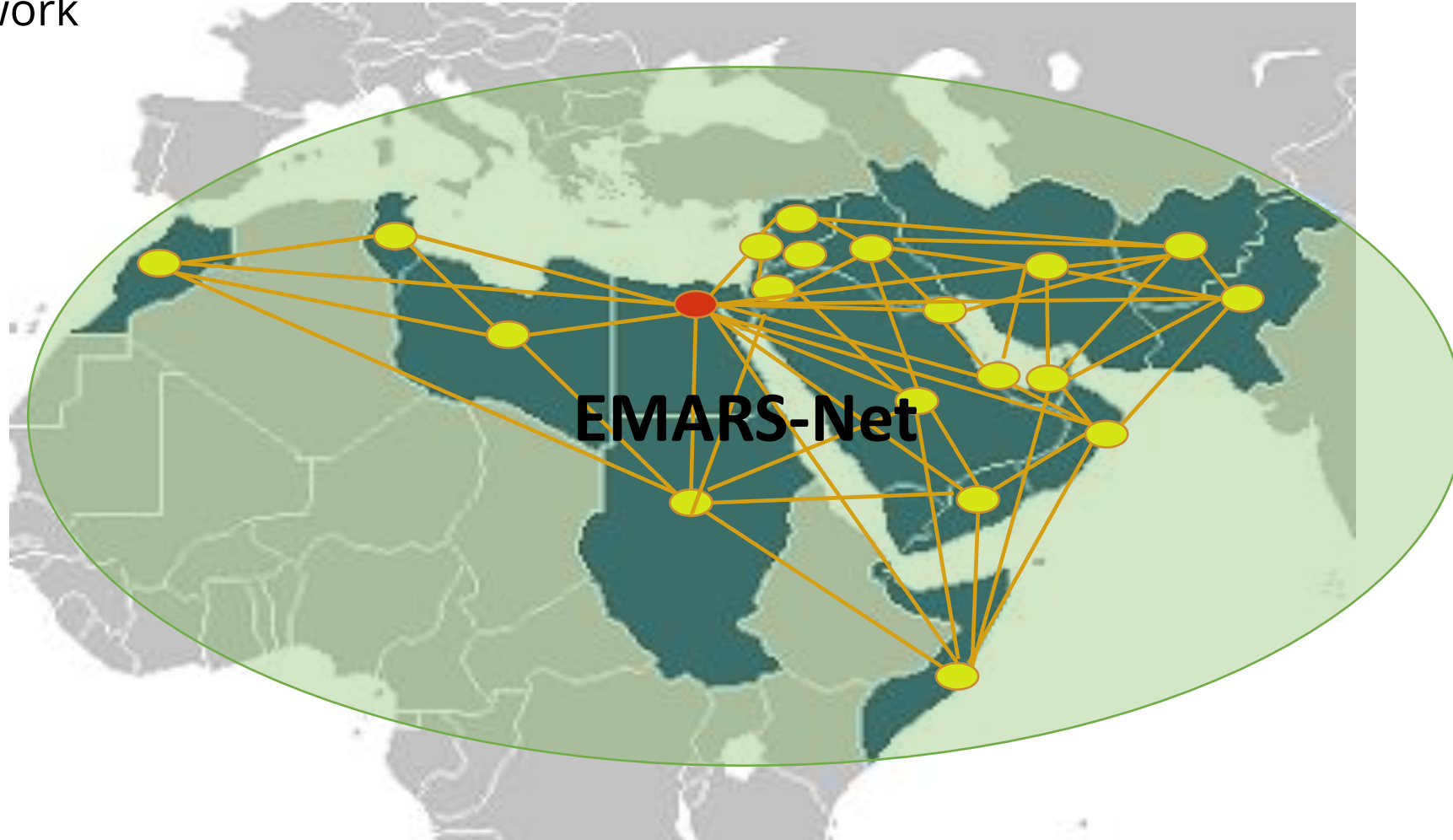
Coordinator / Facilitator (proposed):

Summary and Conclusions

- The United Arab Emirates are conducting AMR surveillance since 2010 at subnational, and since 2016 at national level

- Antimicrobial resistance (AMR) is increasing globally, and in the UAE

- Several increasing resistance trends are concerning, and suggestive for non-rational use of essential antibiotics

- More needs to be done urgently to slow down the increase of resistance!

- WHONET is a very useful tool for National AMR Surveillance

- Regional AMR Surveillance Network would be beneficial for regional benchmarking, information sharing, and cross-country collaboration

References

[1] WHO, 2018. http://www.who.int/topics/public_health_surveillance/en/

[2] WHO, 2015. Global Action Plan on Antimicrobial Resistance

[3] WHO-GLASS (2015): GLASS Manual for Early Implementation

[4] CDC (2013). Antibiotic Resistance Threats in the USA. U.S. Centers for Disease Prevention and Control

[5] WHO, 2017. WHO/EMP/IAU/2017.2

[6] DoH (2018). Communicable Diseases Bulletin, Q4/2017. https://www.haad.ae/haad/tabid/1177/Default.aspx

[7] Stephens JM. Clinicoecon Outcomes Res 2013; 5:447-457

[8] Athanasakis K. Infect Dis Ther 2014 3(2):257-68

[9] ECDC. European Center for Disease Prevention. Surveillance Report. Surveillance of Antimicrobial Resistance in Europe. 2016. https://ecdc.europa.eu/sites/portal/files/documents/AMR-surveillance-Europe-2016.pdf

[10] WHO (2018). Global Antimicrobial Resistance Surveillance (GLASS) Report. Early implementation. 2016-2017.

Thanks and Credits: UAE Subcommittee for AMR Surveillance

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