Trends of Antimicrobial Resistance in Asia

DR. MAFFIE TAYZON

Infectious Disease Specialist, Manila, Philippines

Member, Southeast Asia Antimicrobial Stewardship Working Group

Disclosure:

- No significant disclosures associated with the talk

Content

- Introduction
- SENTRY data on trends of AMR
- WHO GLASS AMR Trend
- AMR Trend in selected Asian countries
- SENTRY fungal susceptibility patterns
- Trends of Candida sp. susceptibility by ICMR

Asia-Pacific Region

AMR burden is large in Southeast Asia, a lack of standardized and comprehensive data prevents a precise quantification of AMR-associated morbidity, mortality and economic cost.

A current perspective on antimicrobial resistance in Southeast Asia
J Antimicrob Chemother 2017; 72: 2963–2972

Networks contributing to surveillance efforts for AMR in Southeast Asia

- ANSORP: Asian Network for Surveillance of Resistant Pathogens (1996)
- VINARES: Vietnam Resistance
- Asia WT-MOPs: Wellcome Trust Major Overseas Programmes
- GARP: Global Antimicrobial Resistance Partnership (2008)
- PulseNet Asia Pacific (2002)
- NARST: National Antimicrobial Resistance Surveillance Thailand (1998)
- AMRCP: Thailand AMR Containment and Prevention

J Antimicrob Chemother 2017; 72: 2963–2972

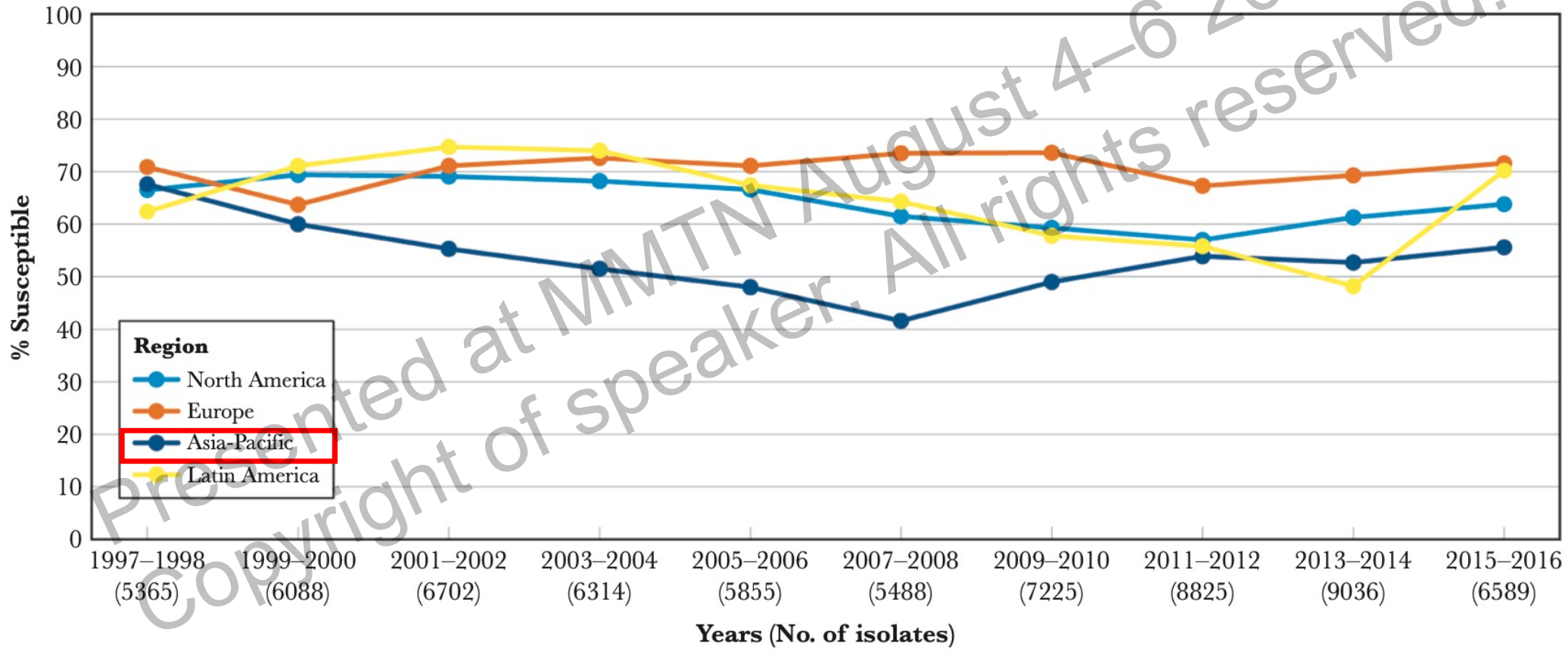
SENTRY:

Nations Surveyed and Number of Isolates Per Country Collected by the SENTRY Program (1997–2016)

No. of Isolates per Region/Country			
Asia-Pacific (7111)	Europe (19 123)	Latin America (5133)	North America (34 626)
Australia (2856)	Austria (42)	Argentina (1144)	Canada (2541)
Hong Kong (378)	Belarus (50)	Brazil (1714)	United States (32 085)
Japan (1260)	Belgium (680)	Chile (1635)	
Malaysia (169)	Czech Republic (125)	Colombia (86)	
New Zealand (688)	France (3533)	Mexico (430)	
Philippines (62)	Germany (1724)	Uruguay (26)	
Singapore (280)	Greece (510)	Venezuela (98)	
South Korea (648)	Hungary (128)		
Taiwan (585)	Ireland (900)		
Thailand (185)	Israel (740)		
	Italy (15 440)		
	The Netherlands (32)		
	Poland (1011)		
	Portugal (140)		
	Romania (19)		
	Russia (803)		
	Slovenia (89)		
	Spain (1979)		
	Sweden (1703)		
	Switzerland (619)		
	Turkey (1084)		
	United Kingdom (1431)		
	Ukraine (137)		

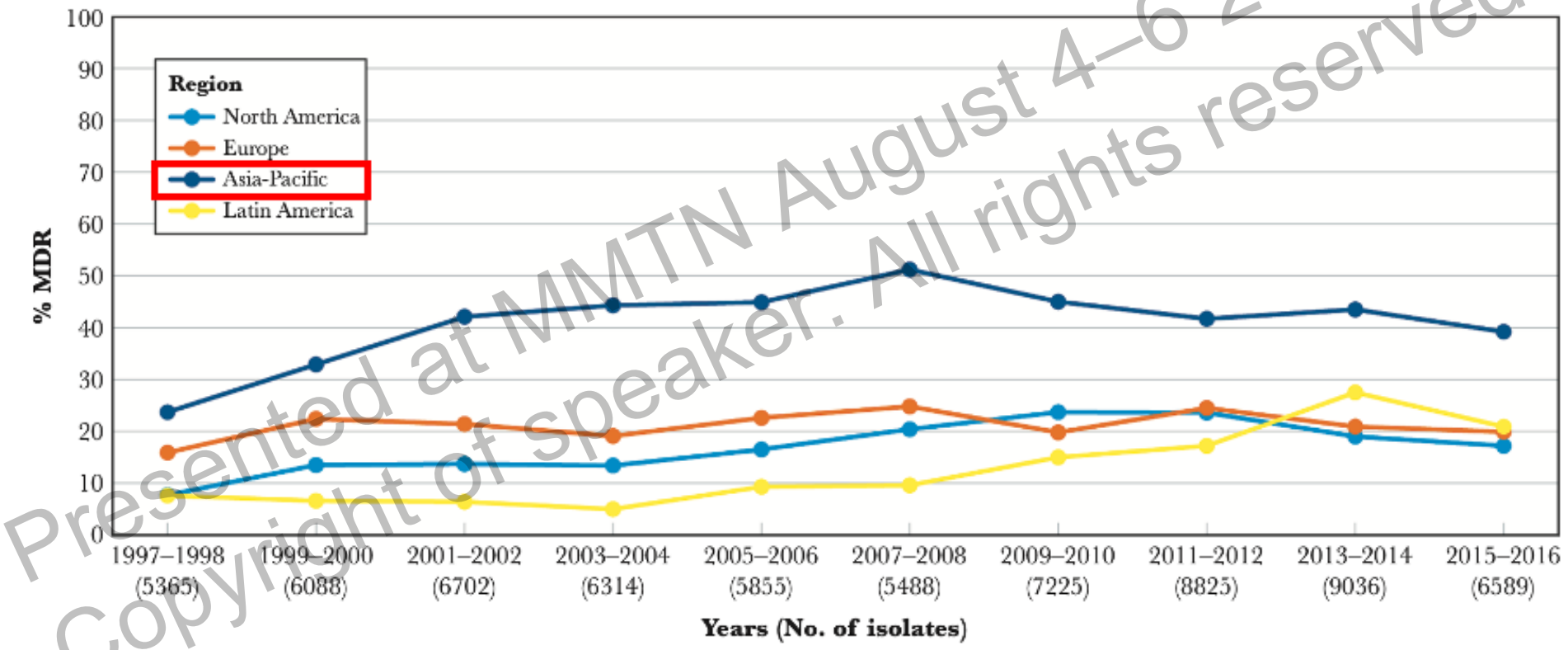
Open Forum Infectious Diseases® 2019;6(S1):S14–22

SENTRY: Susceptibility of *Streptococcus pneumoniae to Penicillin G*



Open Forum Infectious Diseases® 2019;6(S1):S14–22

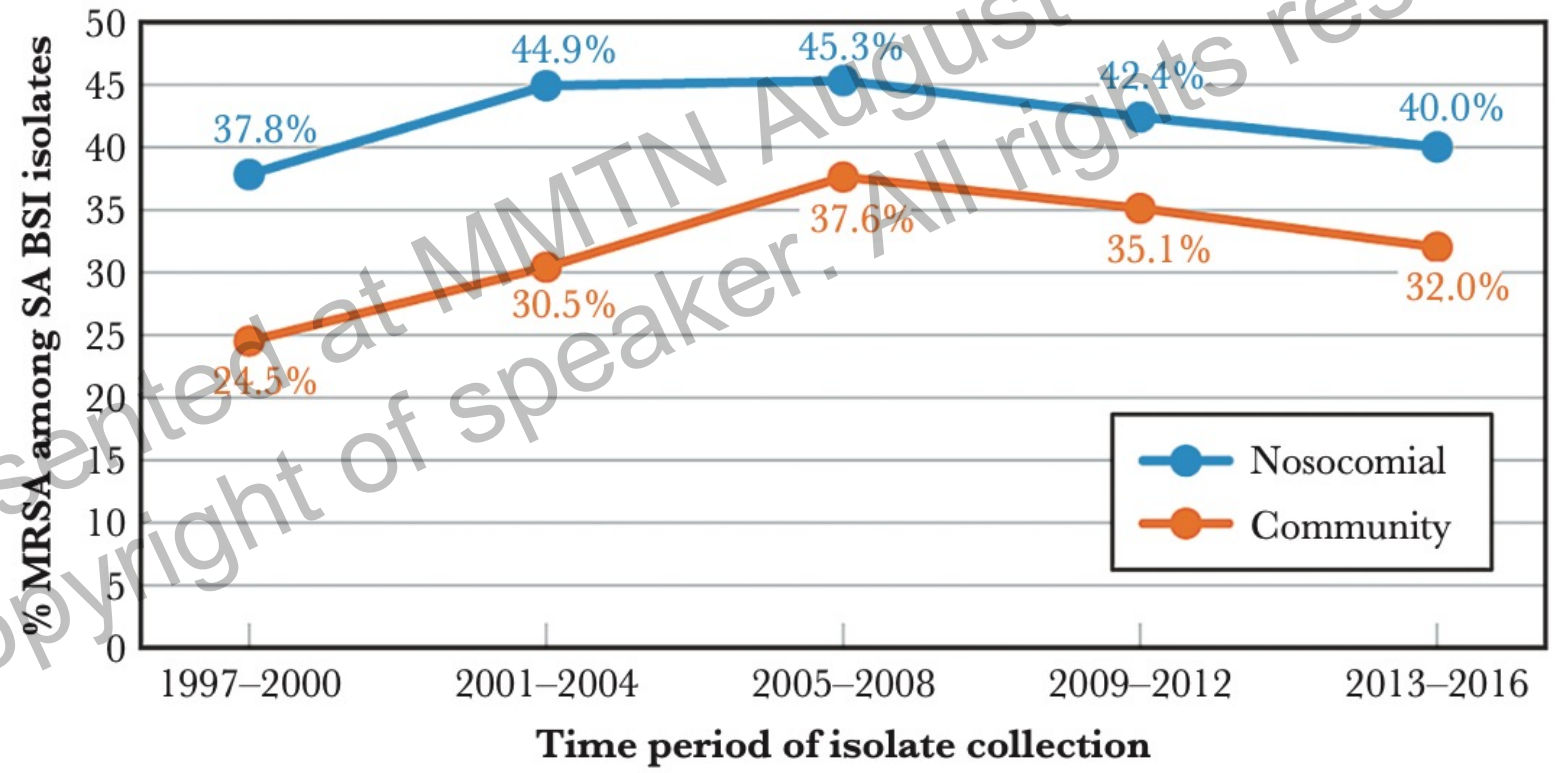
MDR Streptococcus pneumoniae stratified by region



Biennial frequency of multidrug-resistant isolates stratified by geographic region.

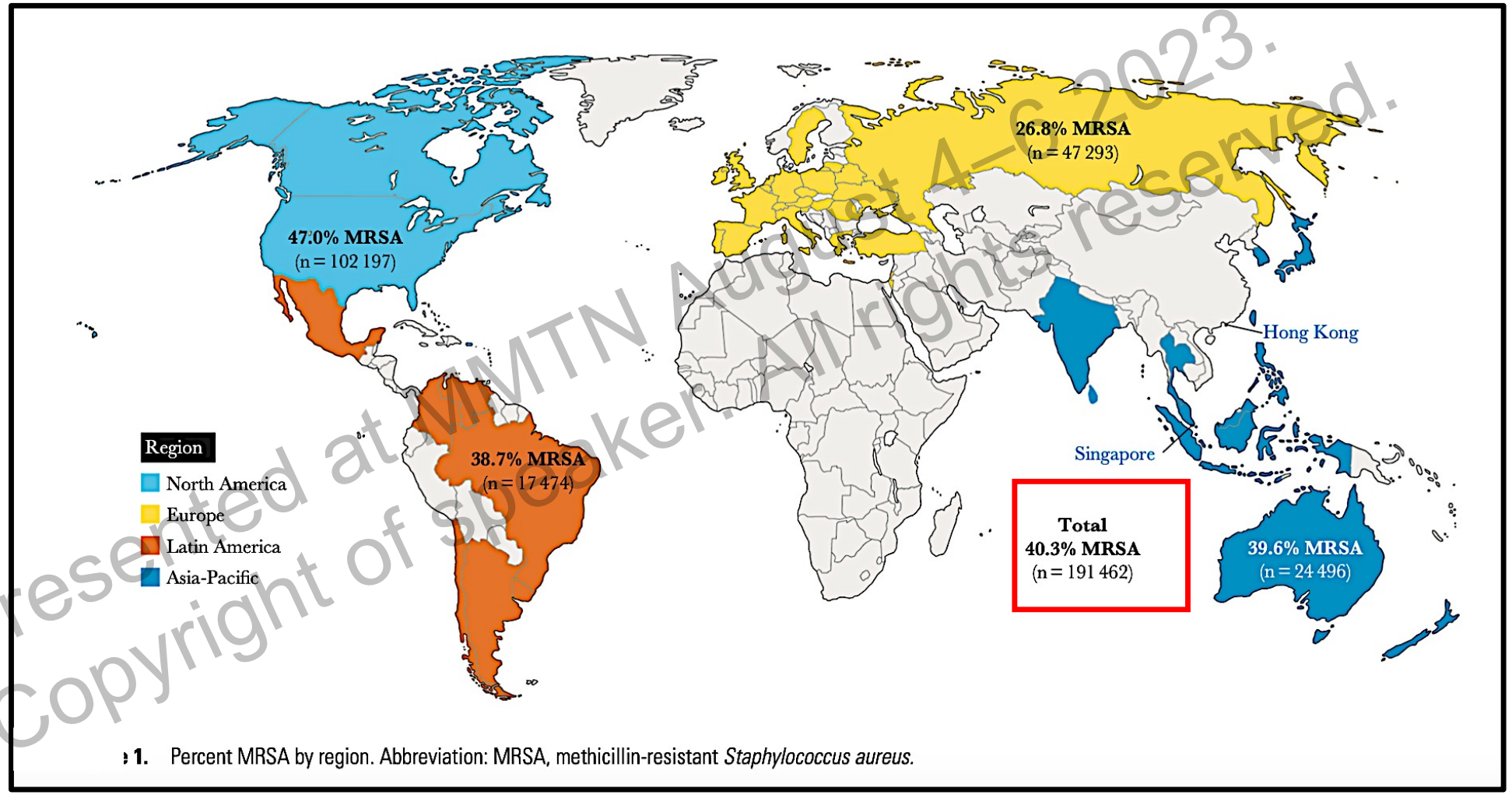
SENTRY: MRSA Trend in all continents

- SENTRY Program 20-year trends in percentage of *Staphylococcus aureus* BSI isolates that are MRSA



Open Forum Infectious Diseases® 2019;6(S1):S47–53

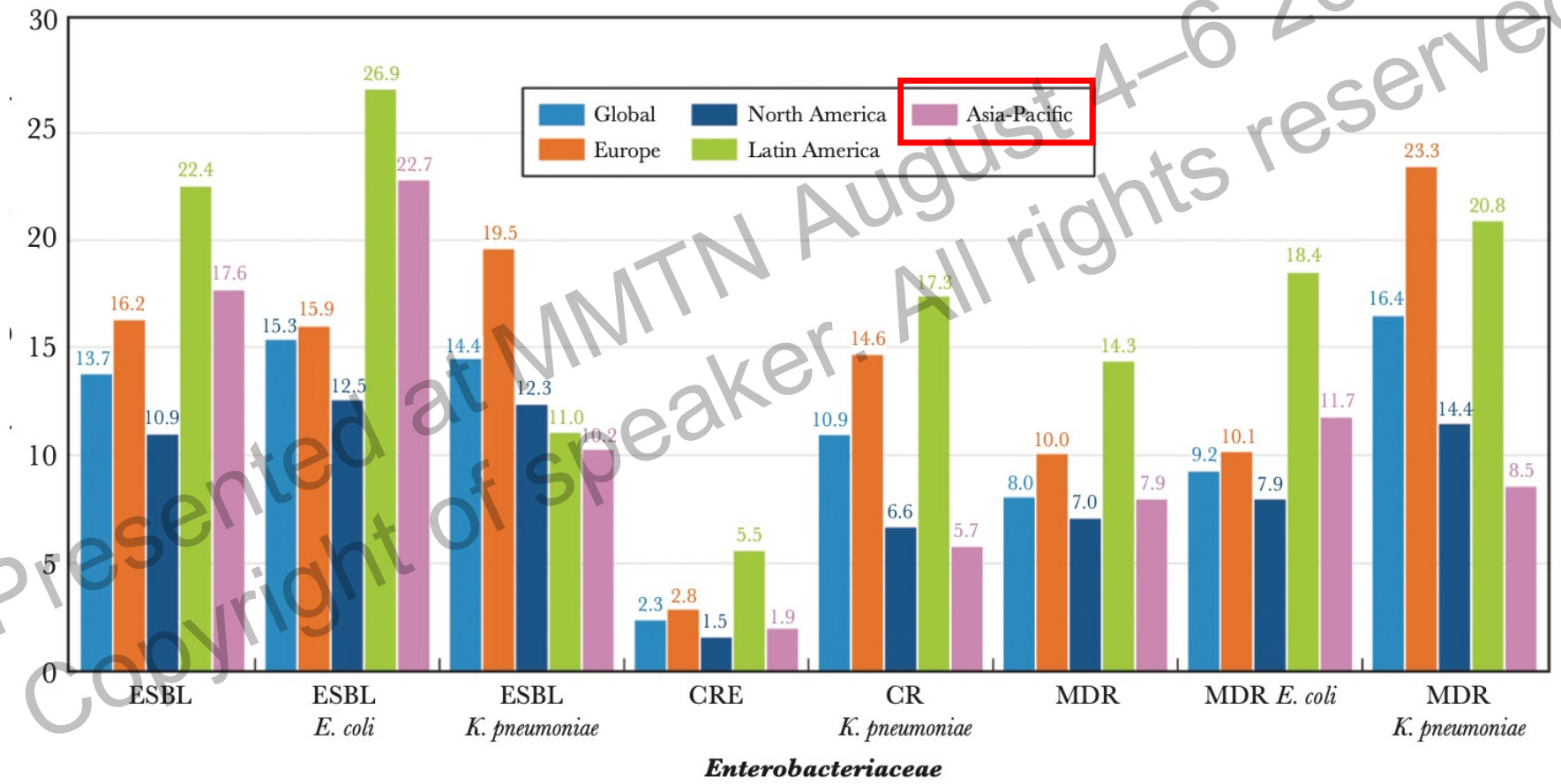
SENTRY: MRSA rate



1. Percent MRSA by region. Abbreviation: MRSA, methicillin-resistant *Staphylococcus aureus*.

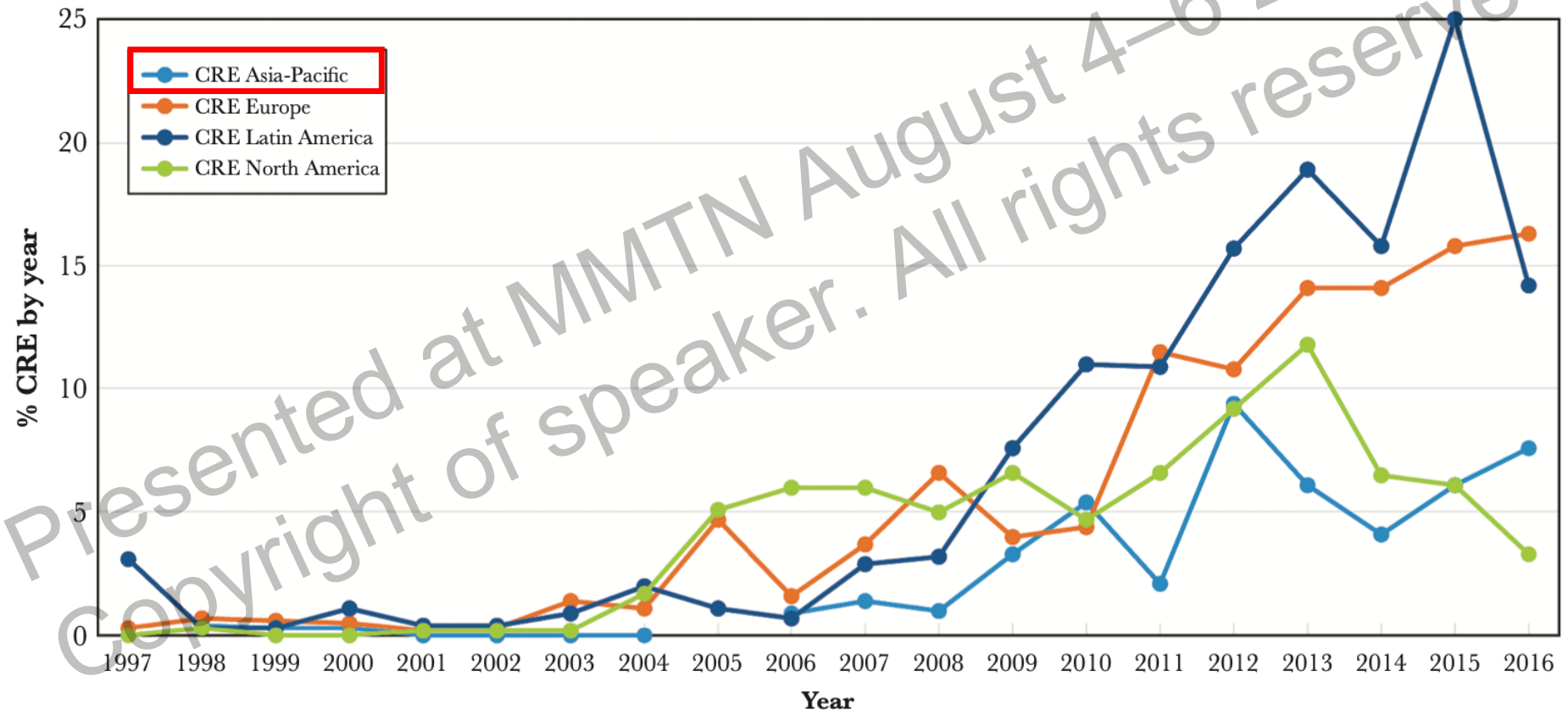
Open Forum Infectious Diseases® 2019;6(S1):S47–53

SENTRY: Antimicrobial Resistance Trends: Increase from 1997-2000 vs. 2013-2016 for all *Enterobacteriaceae* by Geographic Regions



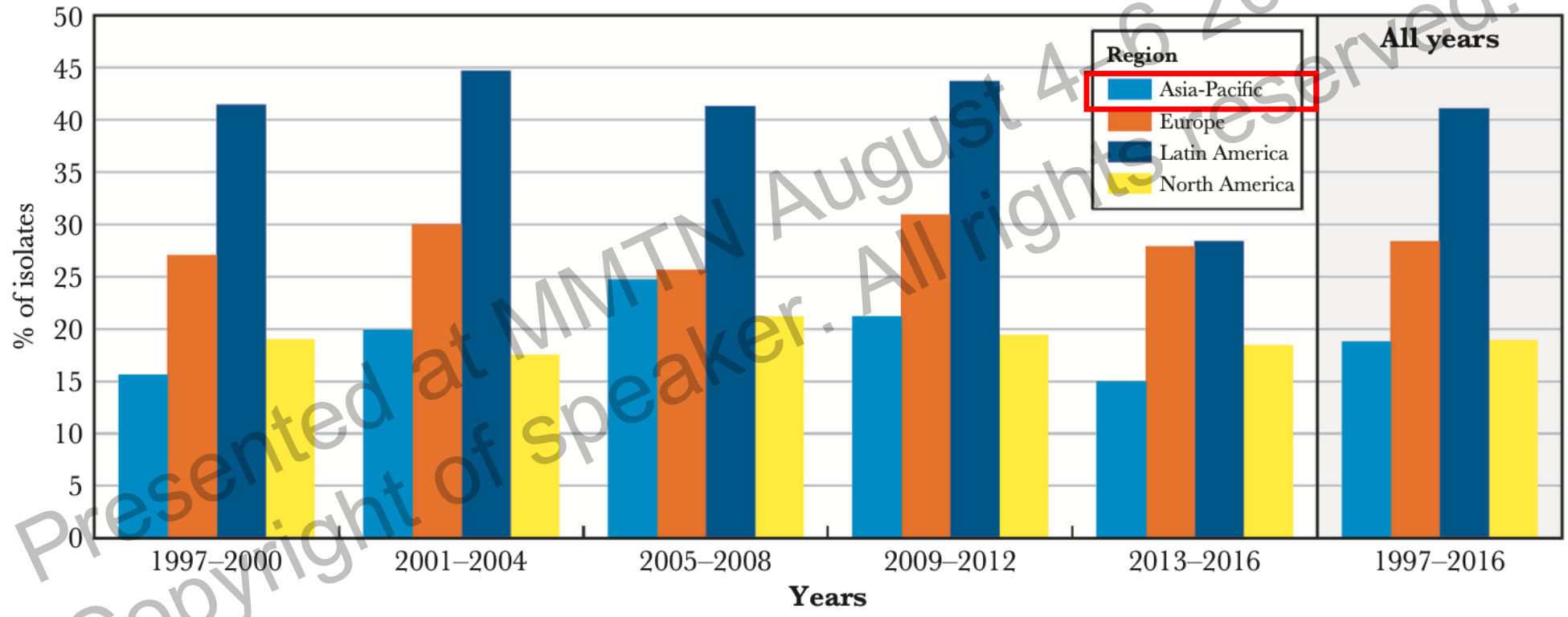
Open Forum Infectious Diseases® 2019;6(S1):S23–33

SENTRY: **Carbapenem-resistant *Enterobacteriaceae* (CRE) Trends Over Years by Region**



Open Forum Infectious Diseases® 2019;6(S1):S23–33

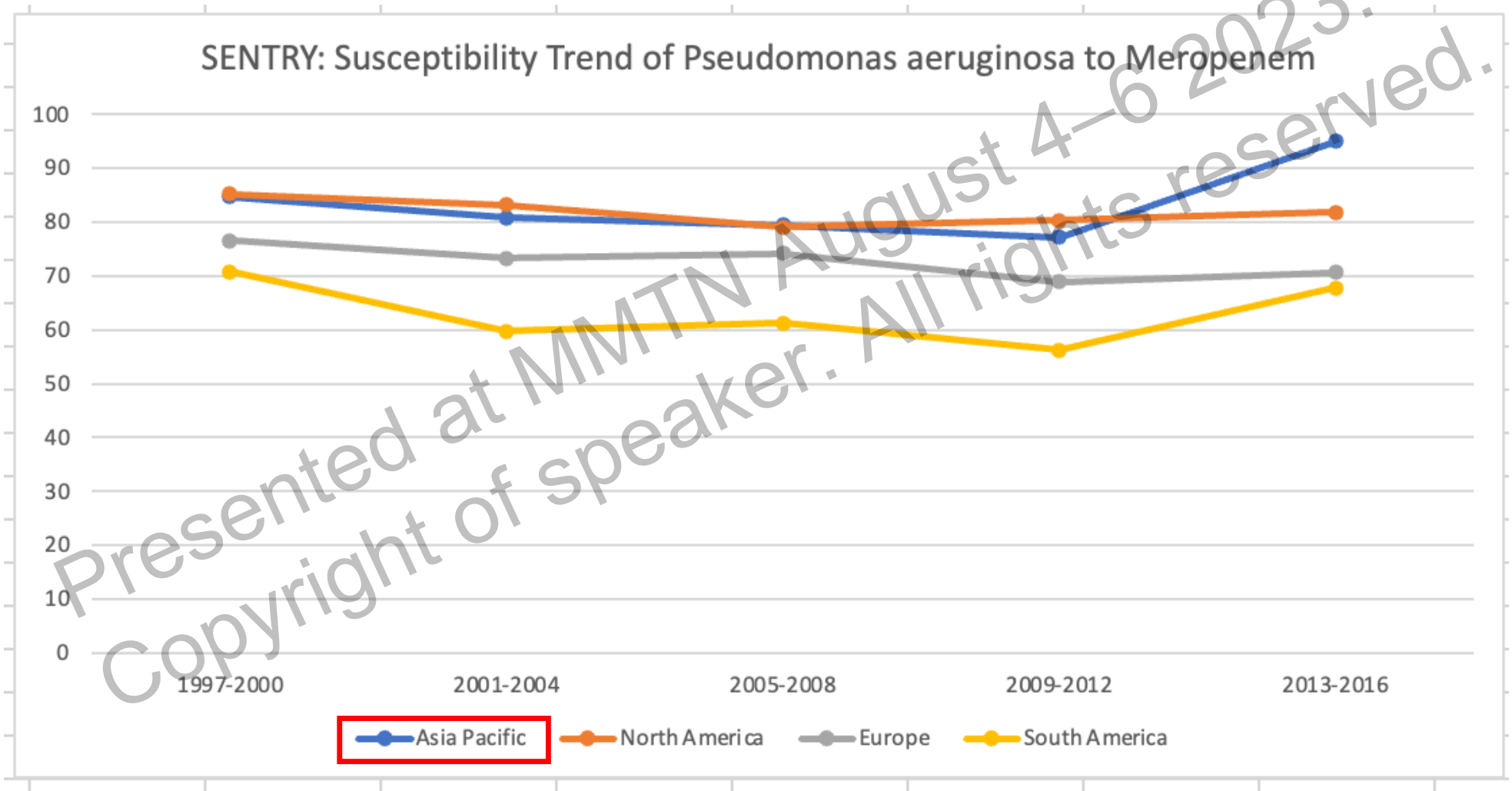
SENTRY: Trend of MDR Pseudomonas aeruginosa in 4 Regions



Percentage of multidrug-resistant *Pseudomonas aeruginosa* in 4 regions over the 20-year SENTRY Program study period.

Open Forum Infectious Diseases® 2019;6(S1):S63–8

SENTRY: Susceptibilities of *Pseudomonas aeruginosa* Isolates to Meropenem in Each 4-Year Period for 4 Regions



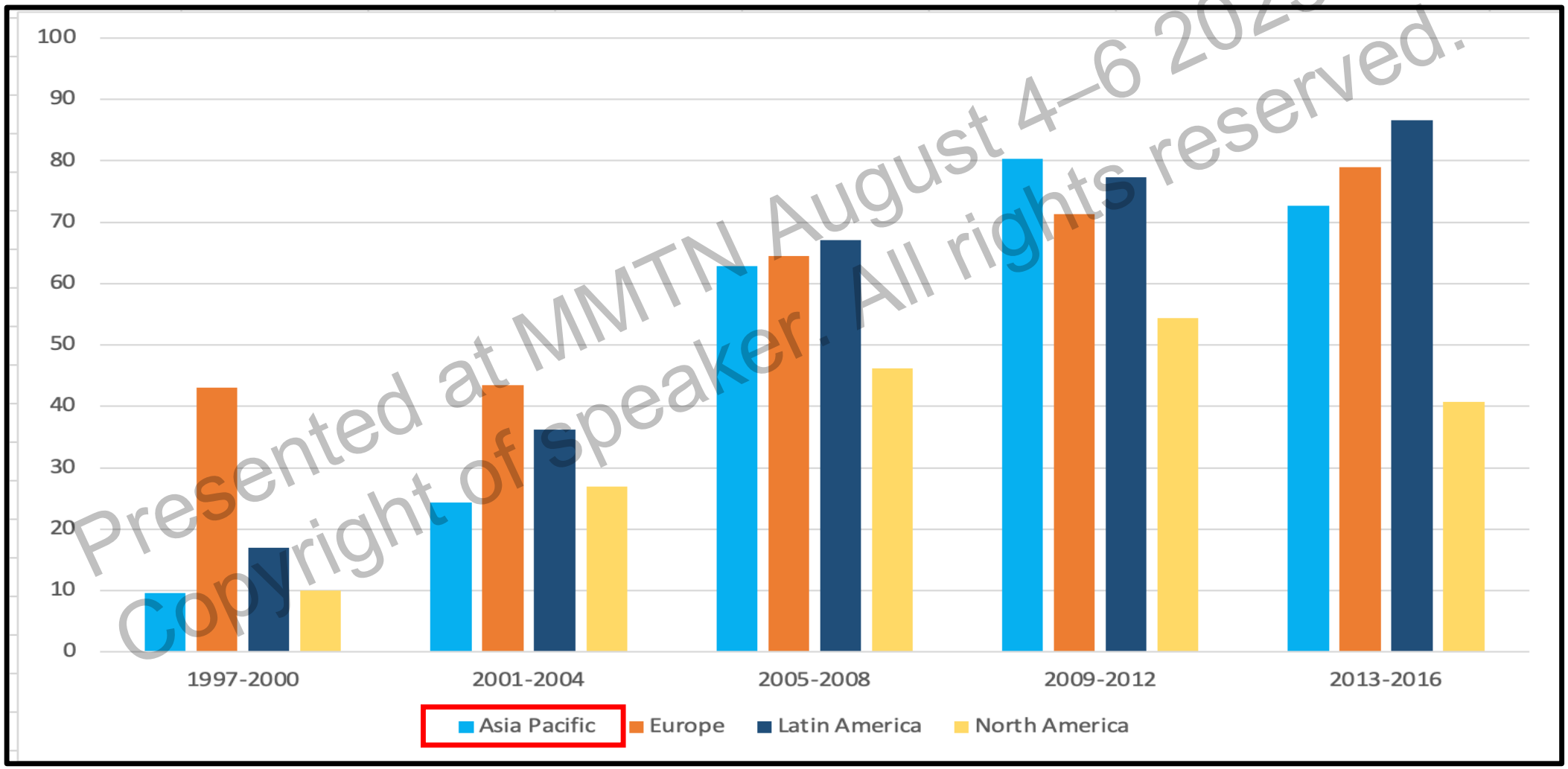
Open Forum Infectious Diseases® 2019;6(S1):S63–8

SENTRY: **Susceptibilities of *Pseudomonas aeruginosa* Isolates in Each 4-Year Period for Asia Pacific**

Region Antimicrobial Agent	Susceptibility % by Time Period[a]					
	1997–2000	2001–2004	2005–2008	2009–2012	2013–2016	Overall
Asia-Pacific (n)	(1243)	(792)	(811)	(1327)	(1236)	(5409)
Amikacin	96.5	94.4	91.6	94.2	95.0	94.5
Cefepime	84.8	82.2	77.4	79.0	86.8	82.3
Ceftazidime	81.2	81.4	75.2	77.5	81.9	79.6
Ciprofloxacin	85.8	82.1	77.3	80.8	83.6	82.2
Colistin	N/A	N/A	97.2	98.6	99.1	98.5
Meropenem	84.7	80.8	79.4	77.1	82.8	81.1
Piperacillin-tazobactam	77.7	74.2	69.4	71.8	80.2	75.1
Tobramycin	92.0	88.5	87.8	91.8	93.7	91.2

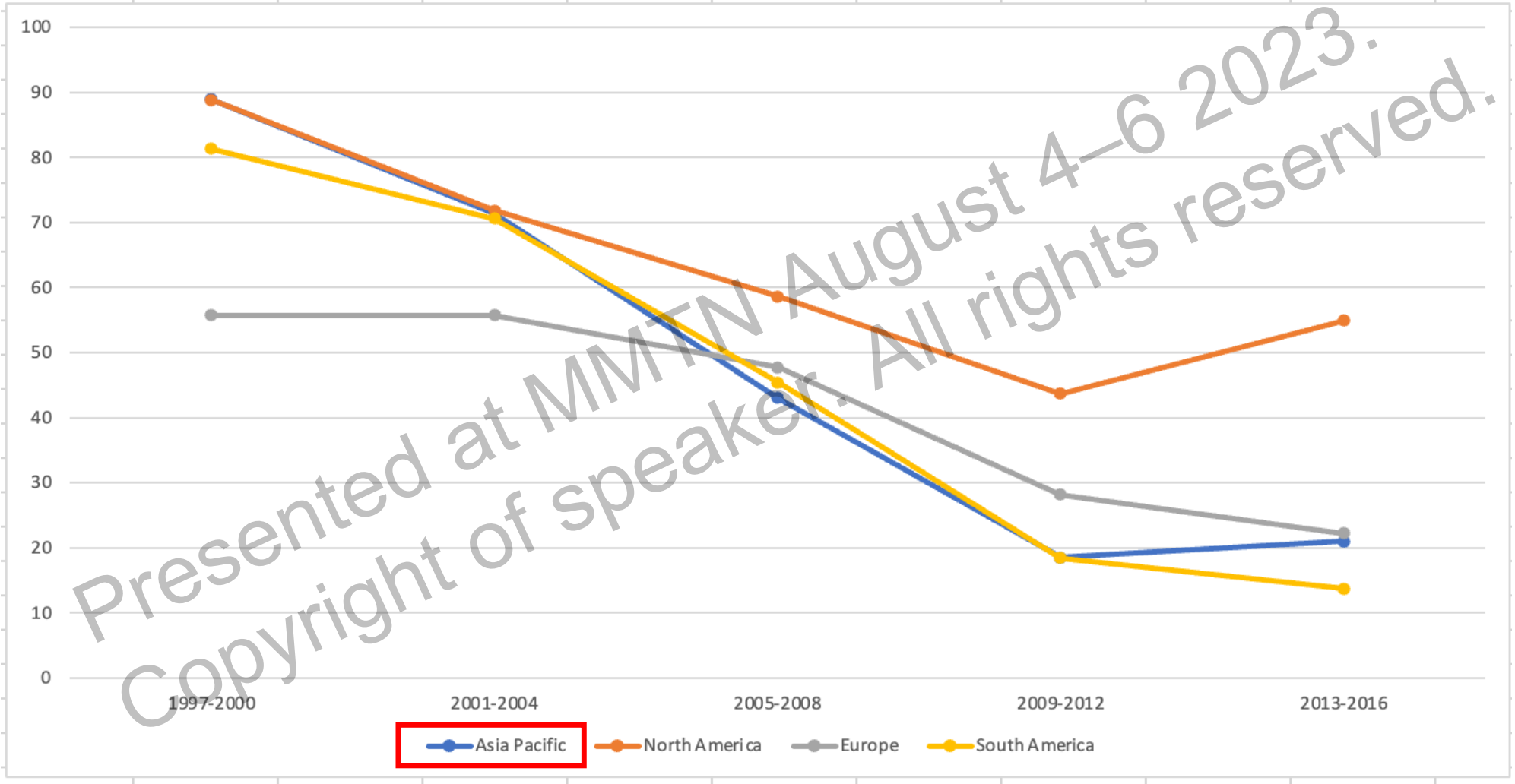
Open Forum Infectious Diseases® 2019;6(S1):S63–8

SENTRY: Trend of MDR A. baumanii complex in 4 Regions



Open Forum Infectious Diseases® 2019;6(S1):S34–46

SENTRY: Susceptibilities of *A. baumanii complex* Isolates to Meropenem in Each 4-Year Period for 4 Regions



Open Forum Infectious Diseases® 2019;6(S1):S34–46

SENTRY: **Susceptibilities of *A. baumanii complex* Isolates in Each 4-Year Period for Asia Pacific**

	% Susceptible by Time Period[a] (No. of Isolates Tested)					
Acb Complex	1997–2000	2001–2004	2005–2008	2009–2012	2013–2016	Overall
Asia-Pacific	(314)	(346)	(535)	(674)	(458)	(2327)
Amikacin	75.5	63.9	40.4	22.3	29.5	41.2
Gentamicin	64.0	51.6	32.5	18.2	26.9	34.4
Tobramycin	76.4	62.7	41.9	24.4	30.6	42.3
Levofloxacin	64.6	54.6	31.8	15.7	19.0	32.5
Ampicillin-sulbactam	NT	59.8	35.7	17.8	20.5	26.9
Ceftazidime	59.6	60.1	31.8	17.1	20.7	33.3
Imipenem	89.2	70.8	43.0	18.4	21.6	42.0
Meropenem	88.9	71.4	43.0	18.5	21.0	42.0
Minocycline	NT	100.0	84.9	79.8	74.2	80.3
Colistin	NT	NT	99.1	99.0	93.7	97.5

Open Forum Infectious Diseases® 2019;6(S1):S34–46

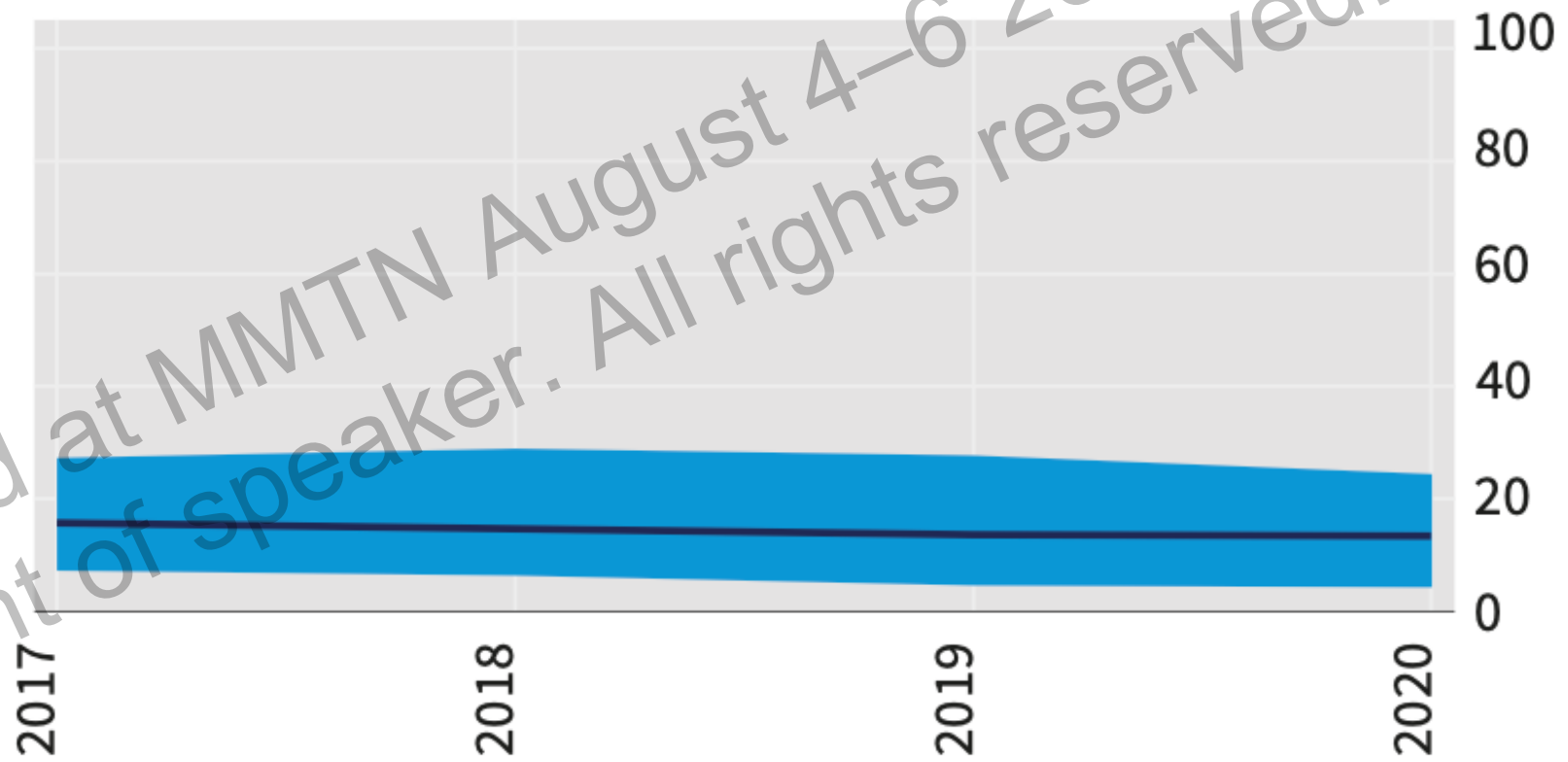
Antimicrobial Resistance Surveillance Progress

- In 2015, WHO Global AMR Surveillance System (GLASS) was established to enable the systematic collection of data globally: AMR in common bacteria and invasive fungi, and antimicrobial consumption (AMC) in humans.

Bangladesh
Brunei
Bhutan
Cambodia
India
Indonesia
Iran
Iraq
Japan
Kuwait
Laos
Lebanon
Myanman
Malaysia
Nepal
Philippines
Qatar
Saudi Arabia
Singapore
Sri Lanka
South Korea
Thailand
Timor Leste

WHO GLASS AMR: Time series of Penicillin G resistance *(S. pneumoniae)* 2017-2020

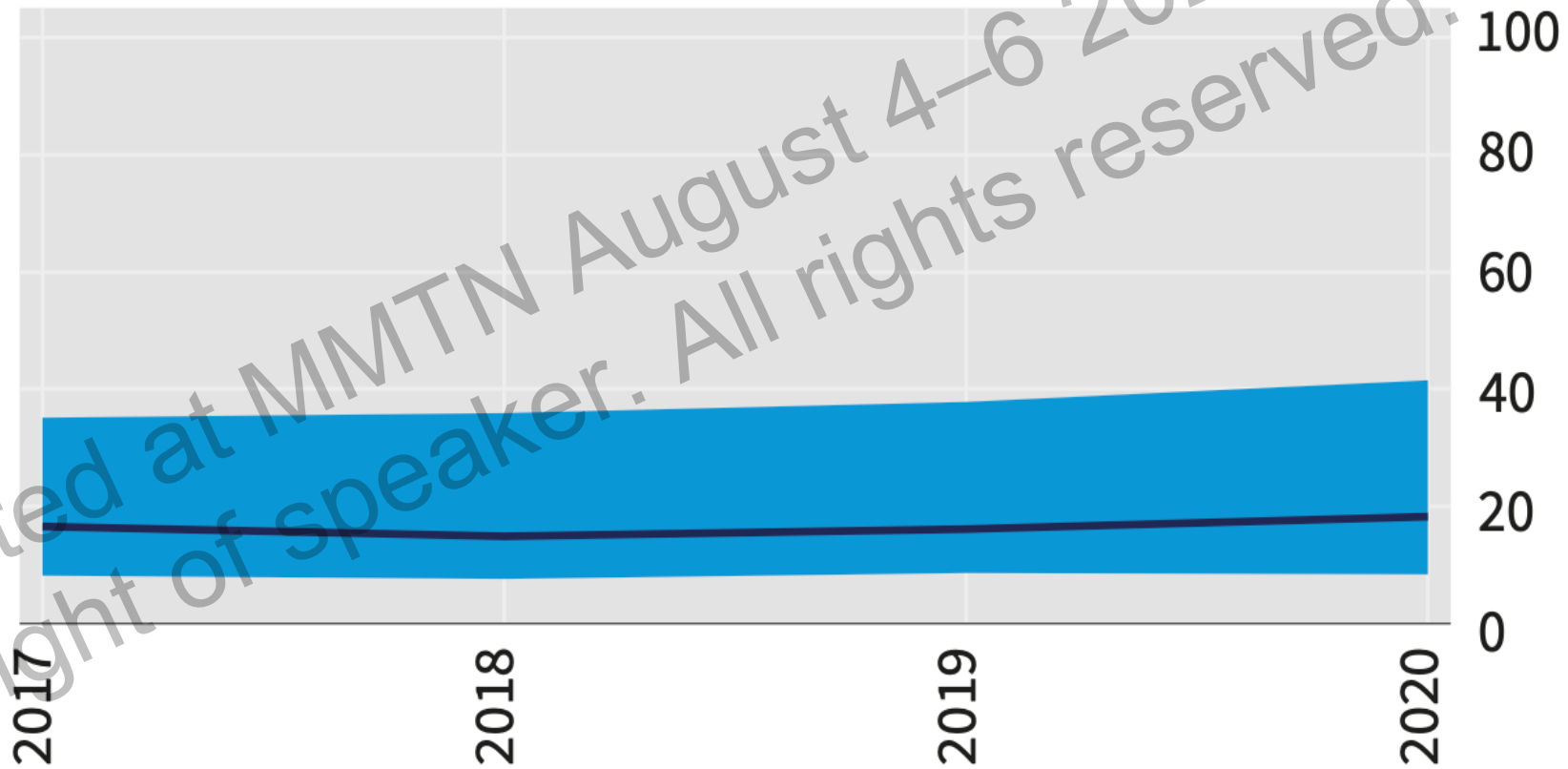
2016 Pen G resistance rate in APAC = 44%



Global antimicrobial resistance and use surveillance system (GLASS) report 2022
https://www.who.int/publications/i/item/9789240062702

WHO GLASS AMR: Time series of Methicillin resistance *(S. aureus)* 2017-2020

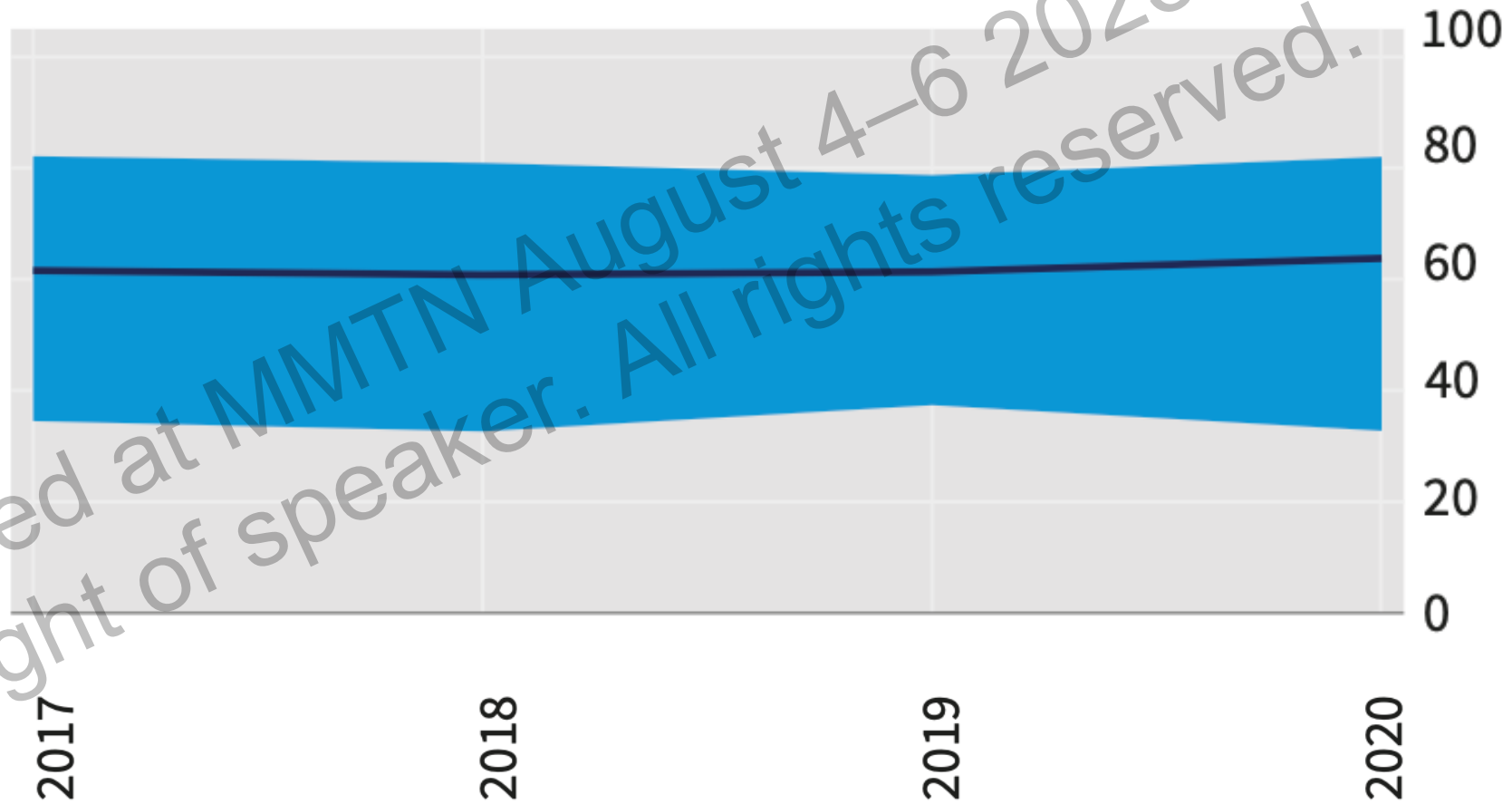
2016 MRSA rate in APAC = 40%



Global antimicrobial resistance and use surveillance system (GLASS) report 2022
https://www.who.int/publications/i/item/9789240062702

WHO GLASS AMR: Time series of Cefotaxime resistance *(K. pneumoniae)* 2017-2020

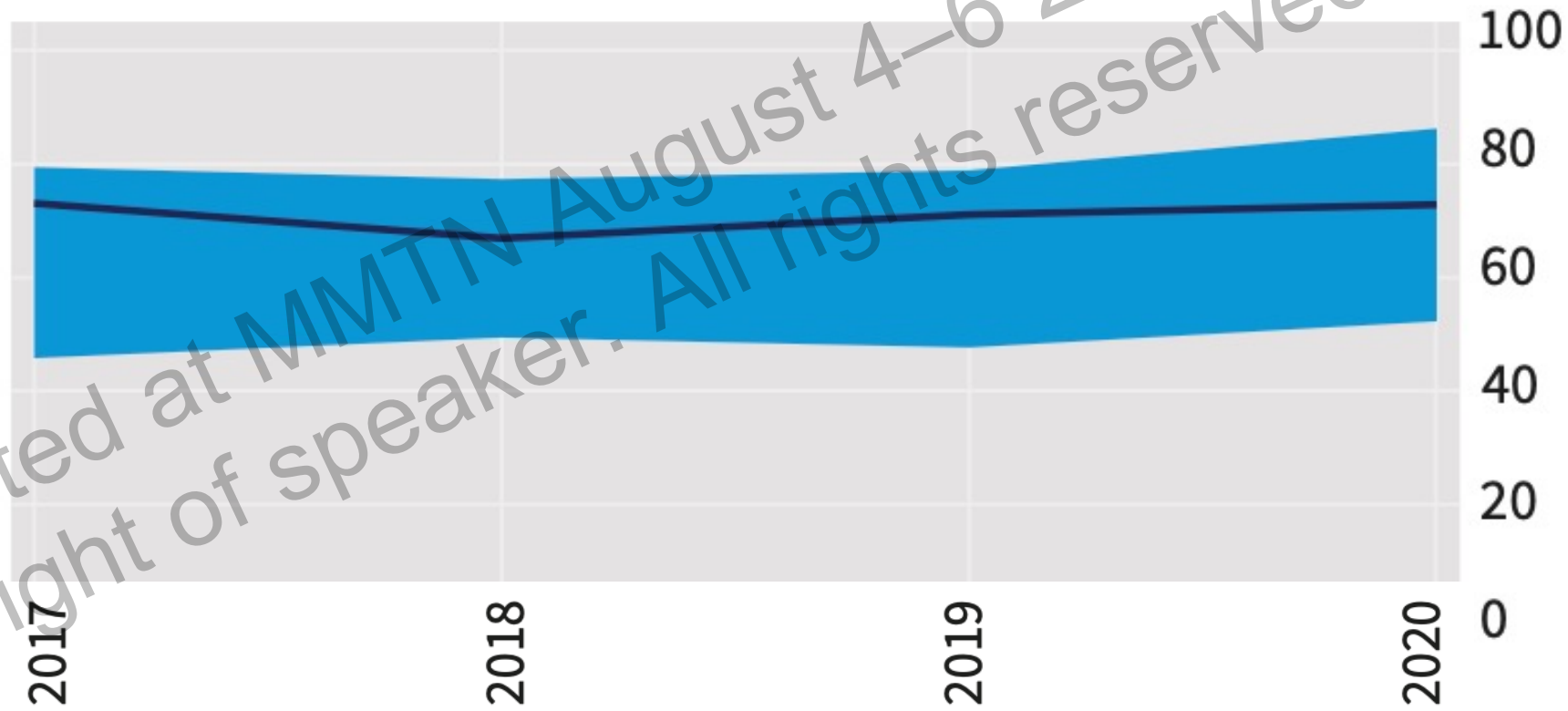
2016 ESBL
K. pneumoniae
in APAC=11.0%



Global antimicrobial resistance and use surveillance system (GLASS) report 2022
https://www.who.int/publications/i/item/9789240062702

WHO GLASS AMR: Time series of Meropenem resistance *A. baumanii,* 2017-2020

2016 MEM resistance
In APAC= 79%



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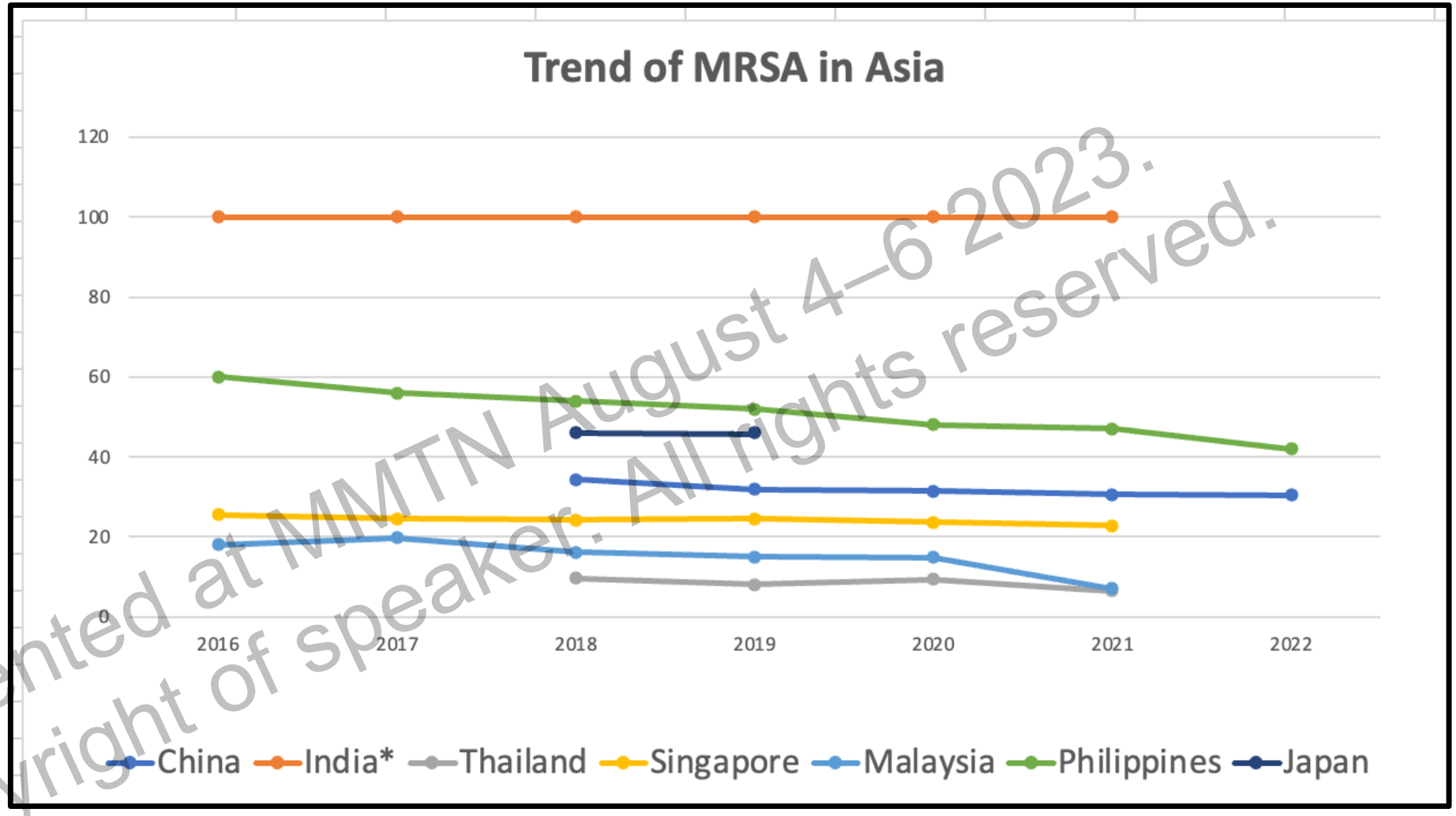
AMR Surveillance in Asia

- Indian Council of Medical Research(ICMR)-Antimicrobial Resistance Research and Surveillance Network
- China Antimicrobial Surveillance Network [CHINET]
- One Health Report on Antimicrobial Utilisation and Resistance in Singapore, 2019; A Report by the One Health Antimicrobial Resistance Workgroup
- National Antimicrobial Resistance Surveillance Thailand (NARST)
- Malaysian National Surveillance on Antimicrobial Resistance (NSAR)
- Antimicrobial Resistance Surveillance in the Philippines (ARSP)
- Nippon AMR One Health Report (NAOR) 2020

TREND OF AMR IN SELECTED ASIAN COUNTRIES:



https://pubmed.ncbi.nlm.nih.gov/31478103/
Med J Malaysia Vol 76 No 5 September 2021
https://www.mhlw.go.jp/content/10900000/000885373.pdf
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https://arsp.com.ph/arsp-2022-annual-report-data-summary-is-now-available-for-download/
https://main.icmr.nic.in/sites/default/files/upload_documents/AMR_Annual_Report_2021.pdf
https://www.moh.gov.sg/resources-statistics/reports/one-health-report-on-antimicrobial-utilisation-and-resistance-2019

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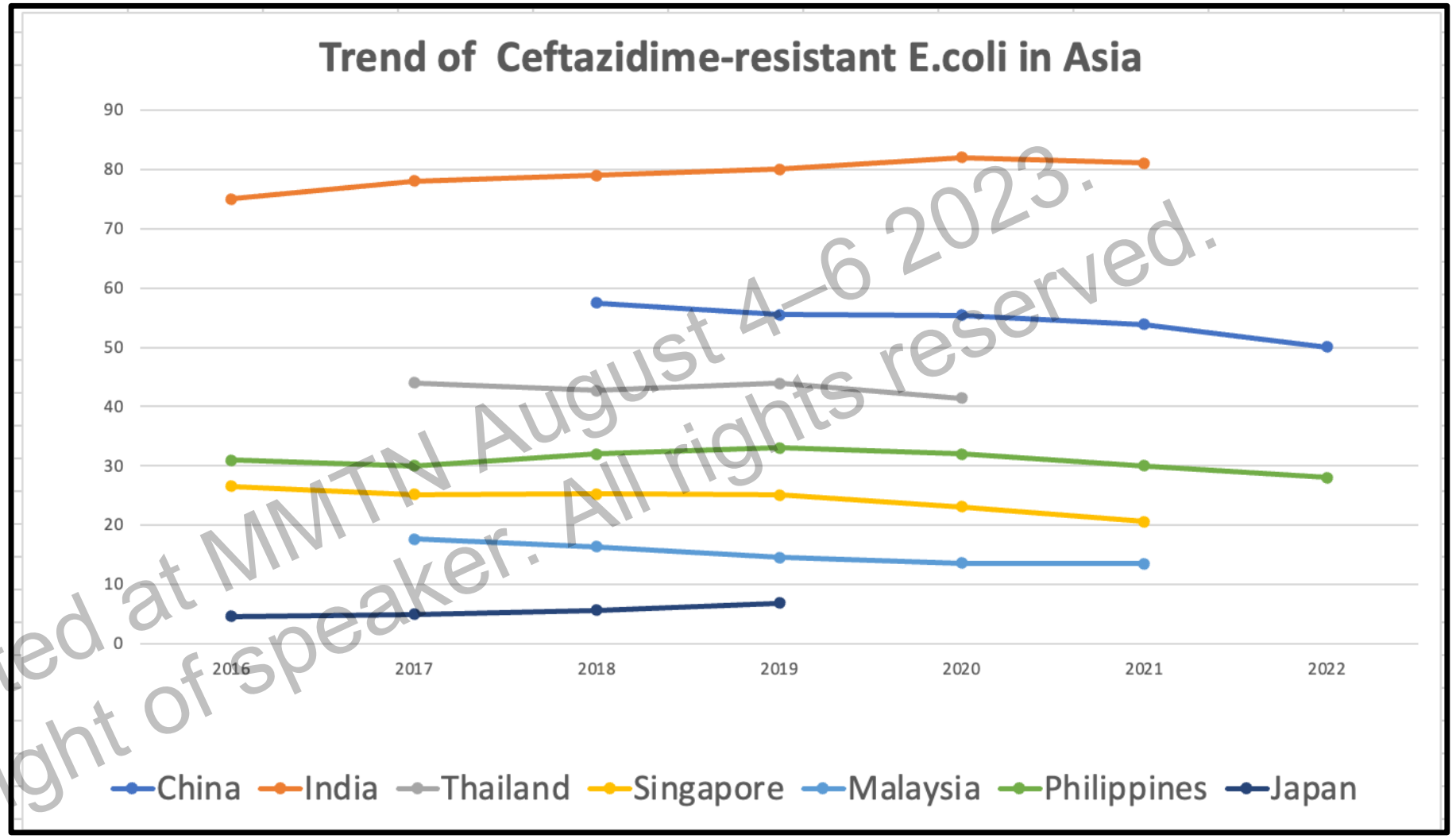

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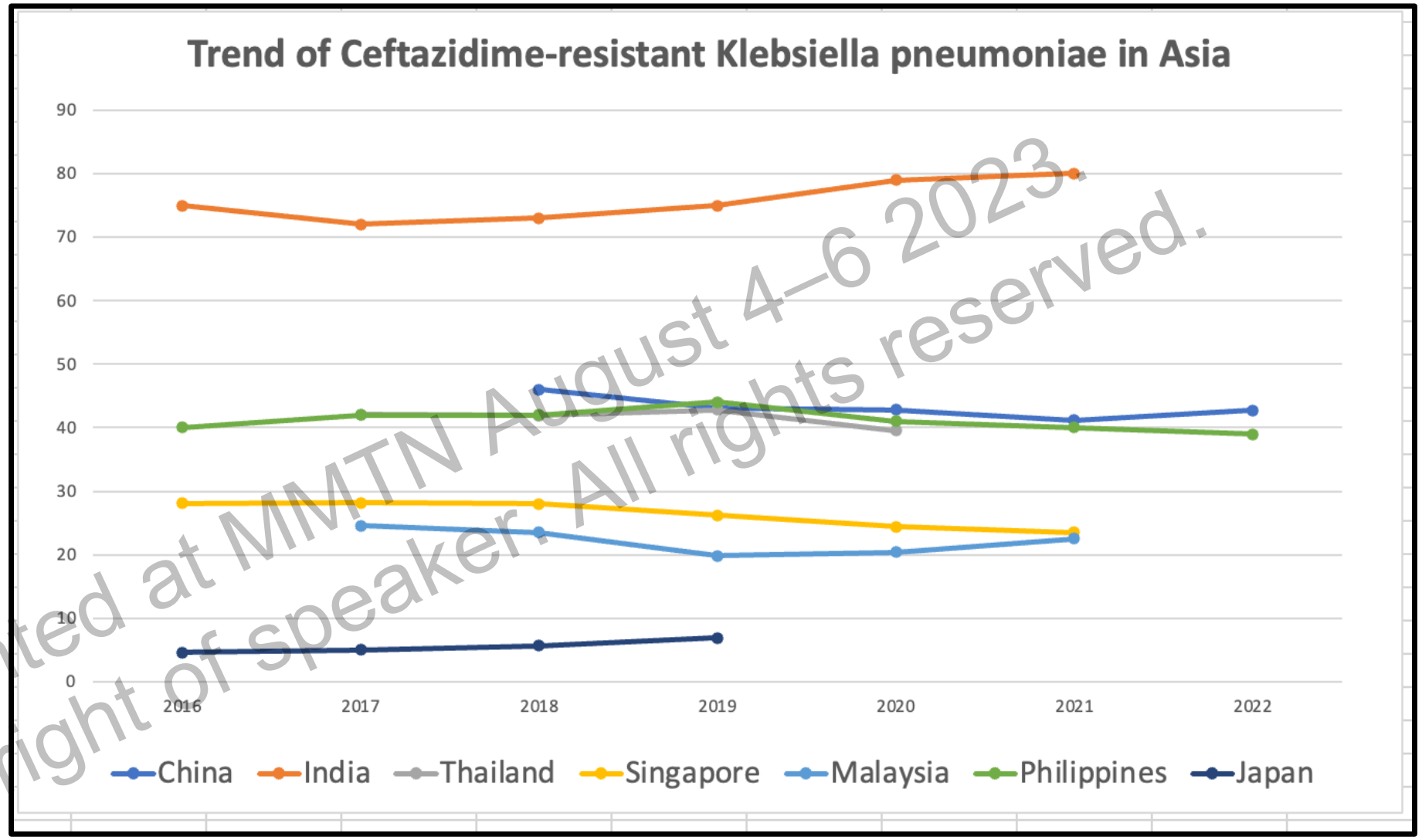

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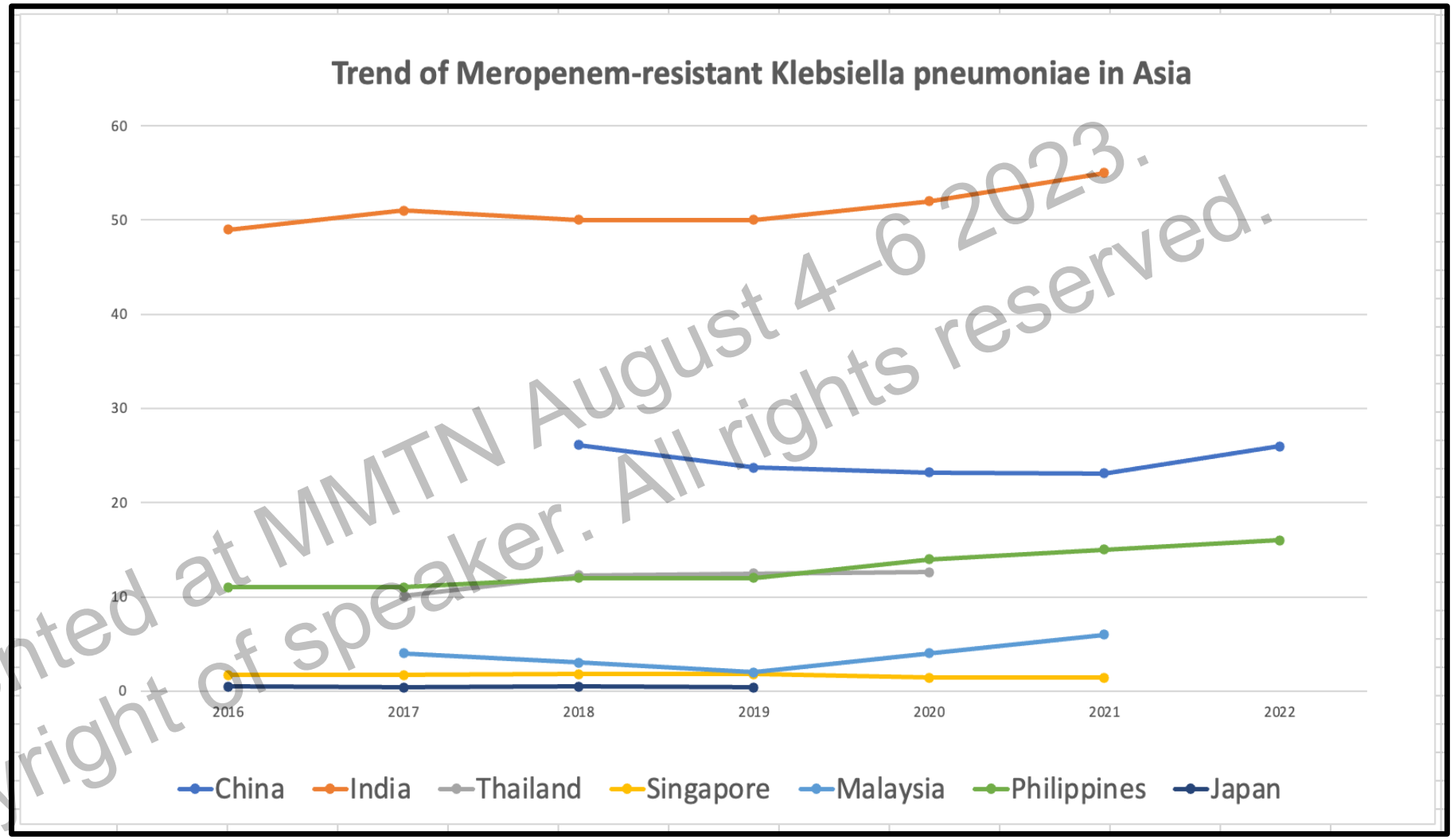

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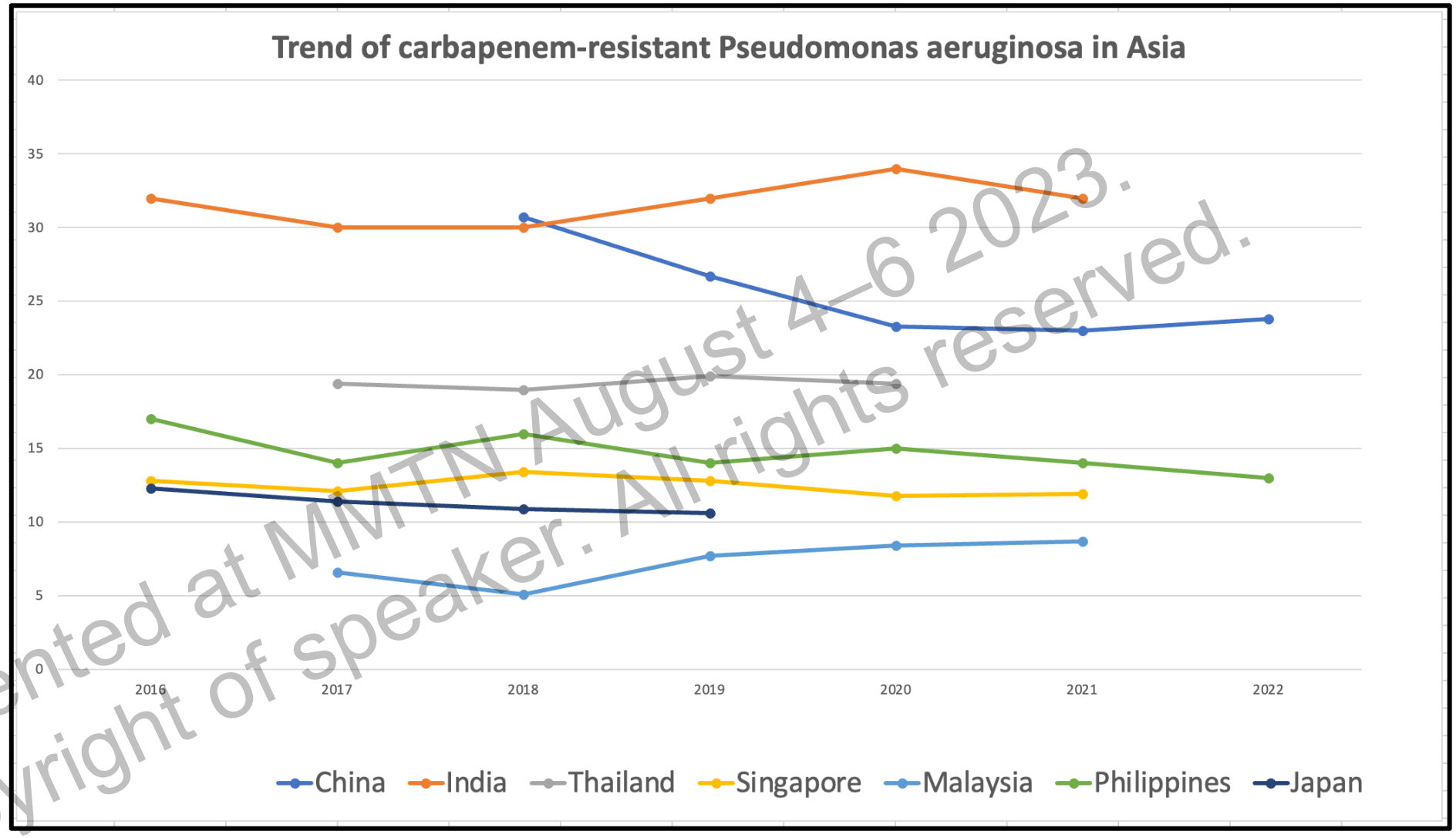

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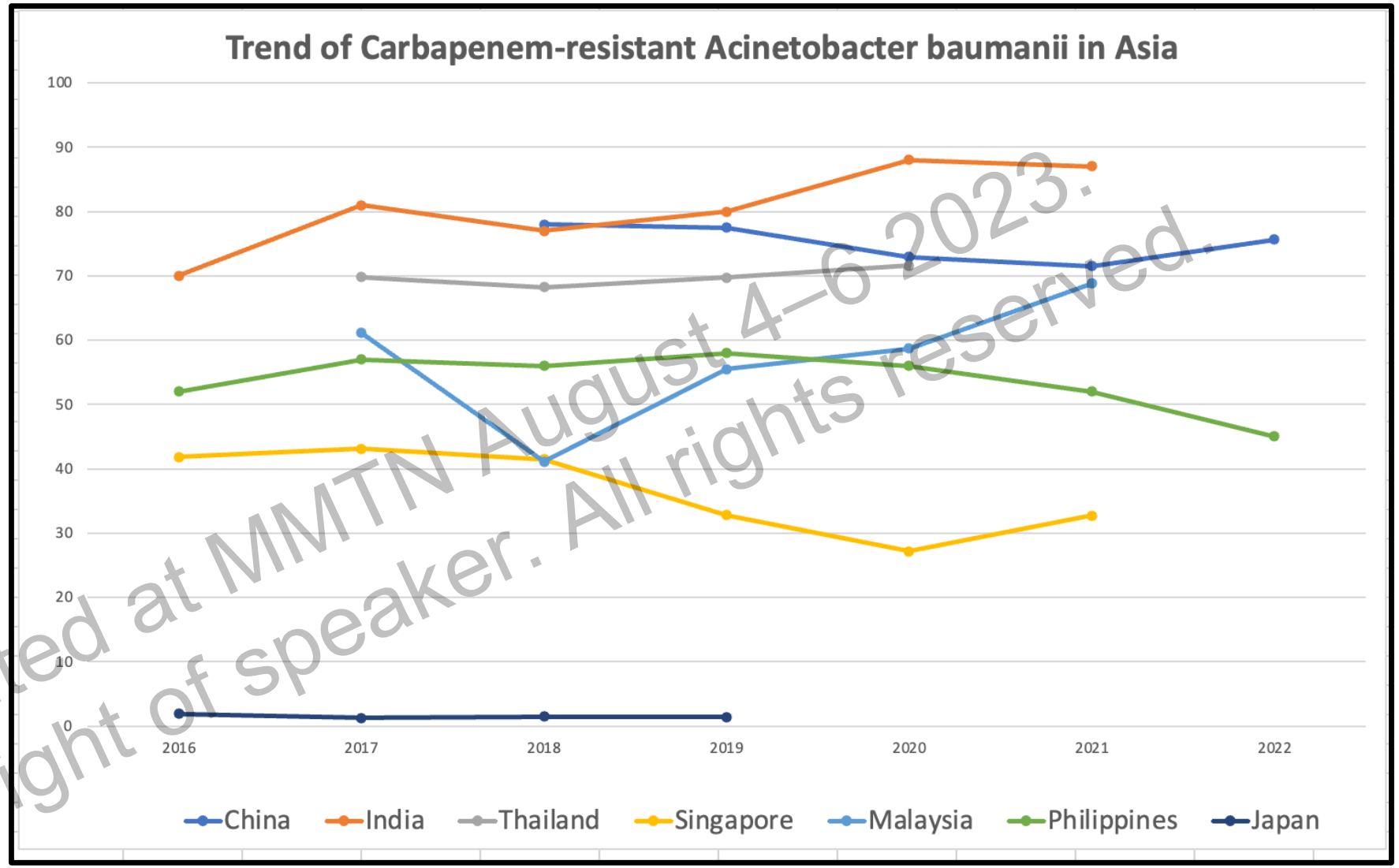

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https://www.moh.gov.sg/resources-statistics/reports/one-health-report-on-antimicrobial-utilisation-and-resistance-2019

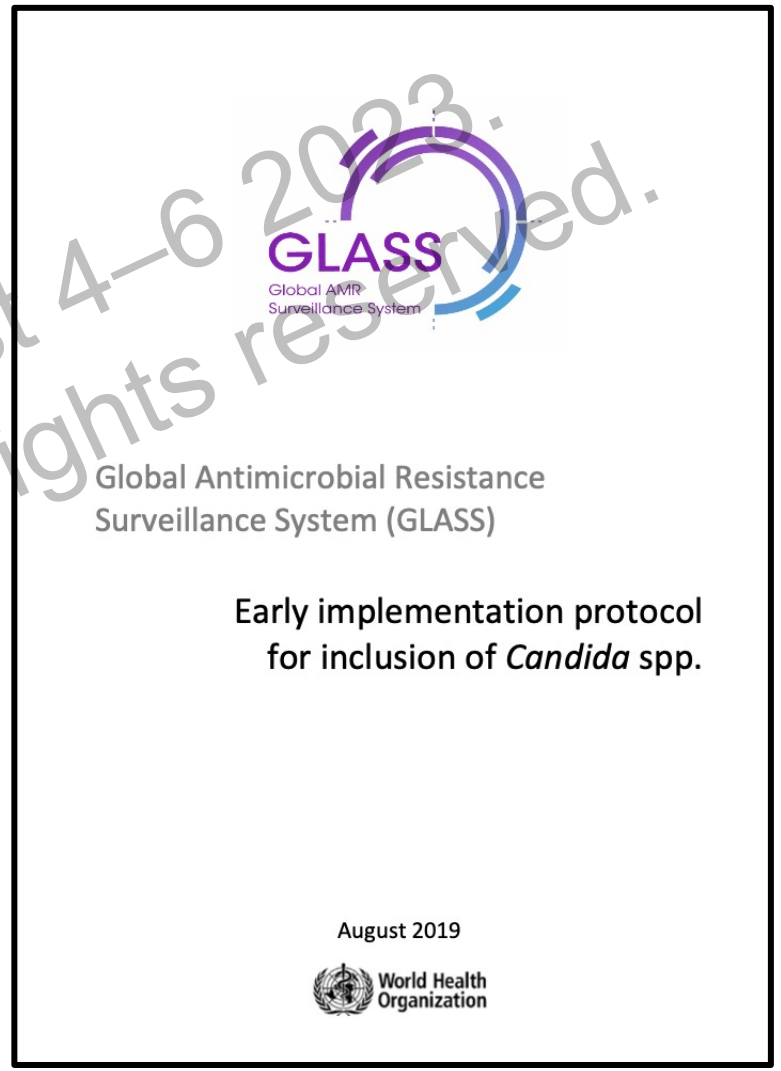
Fungal pathogens isolated from patients with bloodstream infection: frequency of occurrence and antimicrobial susceptibility patterns from the SENTRY Antimicrobial Surveillance Program (2012–2017)

Organism	Agent	Year/% resistant[a] (number tested)						
		Total	2012	2013	2014	2015	2016	2017
C. albicans	Fluconazole	0.0 (91)	0.0 (8)	0.0 (18)	0.0 (8)	0.0 (12)	0.0 (25)	0.0 (20)
	Caspofungin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Micafungin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Anidulafungin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C. tropicalis	Fluconazole	3.7 (27)	0.0 (2)	14.3 (7)	0.0 (3)	0.0 (4)	0.0 (7)	0.0 (4)
	Caspofungin	3.7	0.0	0.0	0.0)	0.0	14.3	0.0
	Micafungin	3.7	0.0	0.0	0.0	0.0	14.3	0.0
	Anidulafungin	3.7	0.0	0.0	0.0	0.0	14.3	0.0
C. parapsilosis	Fluconazole	3.4 (29)	0.0 (2)	0.0 (2)	0.0 (3)	12.5 (8)	0.0 (8)	0.0 (6)
	Caspofungin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Micafungin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Anidulafungin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C. glabrata	Fluconazole	10.5 (38)	0.0 (3)	28.6 (7)	16.7 (6)	8.3 (12)	0.0 (6)	0.0 (4)
	Caspofungin	2.6	0.0	0.0	0.0	8.3	0.0	0.0
	Micafungin	2.6	0.0	0.0	0.0	8.3	0.0	0.0
	Anidulafungin	2.6	0.0	0.0	0.0	8.3	0.0	0.0
C krusei	Caspofungin	0.0 (6)	NI	NI	0.0 (1)	0.0 (2)	0.0 (2)	0.0 (1)
	Micafungin	0.0	NI	NI	0.0	0.0	0.0	0.0
	Anidulafungin	0.0	NI	NI	0.0	0.0	0.0	0.0

https://doi.org/10.1016/j.diagmicrobio.2020.115016

WHO GLASS-Fungi

- Early implementation protocol to support countries to strengthen or build their national fungal AMR surveillance and enable incorporation of AMR surveillance for invasive *Candida* into GLASS



https://www.who.int/publications/i/item/WHO-WSI-AMR-2019.4

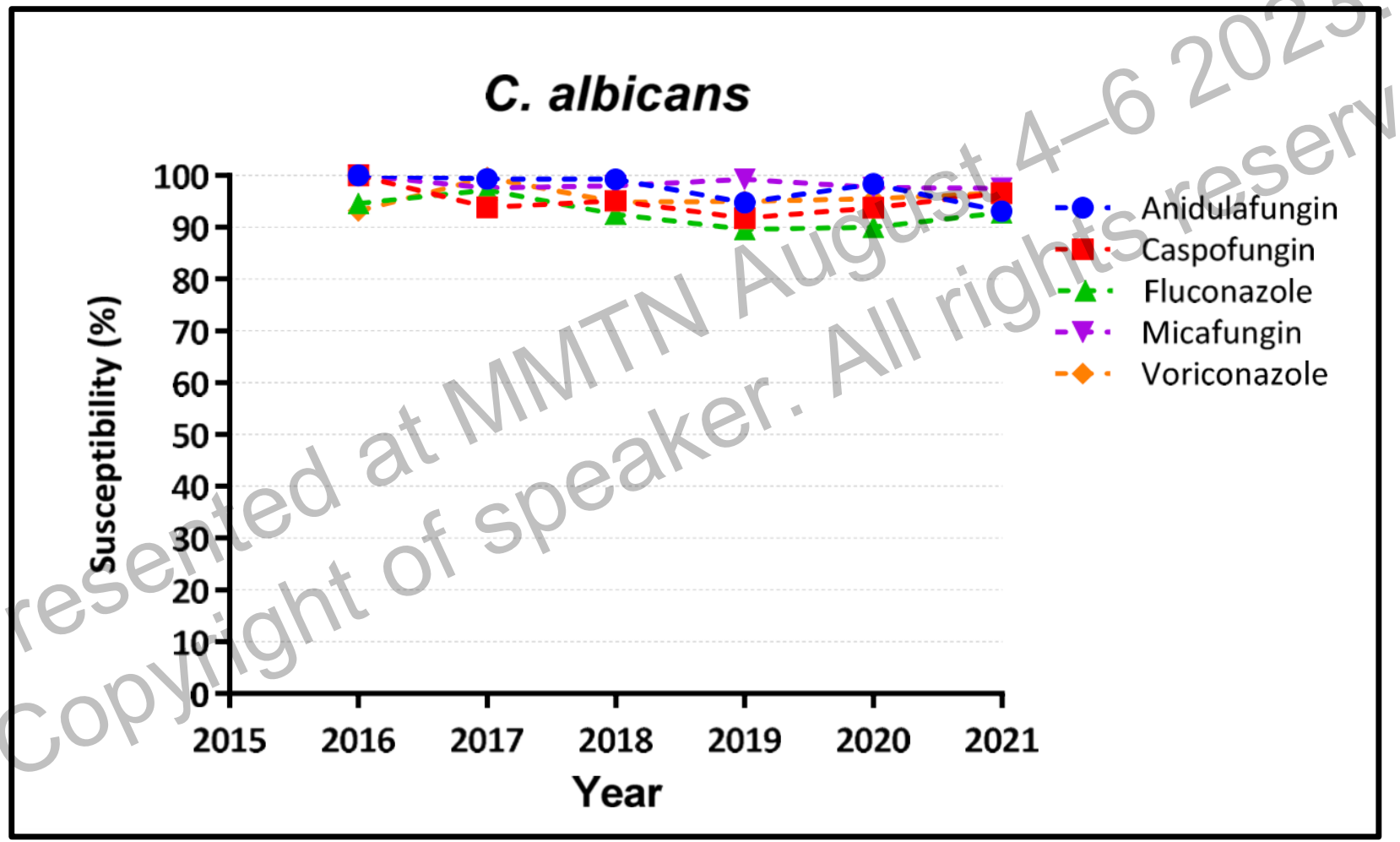
AMR surveillance Network, Indian Council of Medical Research, 2021: Susceptible pattern of Candida species isolated from all samples

AMA	*Candida* tropicalis n=796	*Candida albicans* n=664	*Candida glabrata* n=315	*Candida parapsilosis* n=279	*Candida auris* n=194	*Candida utilis* n=174	Candida krusei n=82
Anidulafungin	273/281 (97.2%)	161/173 (93.1%)	123/134 (91.8%)	85/86 (98.8%)	62/92 (67.4%)	159/165 (96.4%)	30/32 (93.8%)
Caspofungin	760/790 (96.2%)	634/656 (96.6%)	171/310 (55.2%)	271/277 (97.8%)	135/193 (69.9%)	159/166 (95.8%)	46/82 (56.1%)
Fluconazole	716/785 (91.2%)	614/661 (92.9%)	181/225 (80.4%)	217/277 (78.3%)	5/193 (2.6%)	155/165 (93.9%)	2/70 (2.9%)
Micafungin	672/688 (97.7%)	537/551 (97.5%)	229/234 (97.9%)	232/238 (97.5%)	145/172 (84.3%)	166/168 (98.8%)	61/73 (83.6%)
Voriconazole	736/770 (95.6%)	626/648 (96.6%)	197/225 (87.6%)	247/255 (96.9%)	48/142 (33.8%)	167/169 (98.8%)	80/81 (98.8%)

AMR surveillance Network, Indian Council of Medical Research, 2021

AMR surveillance Network, Indian Council of Medical Research, 2021:

Susceptible pattern of Candida species isolated from all samples through the years



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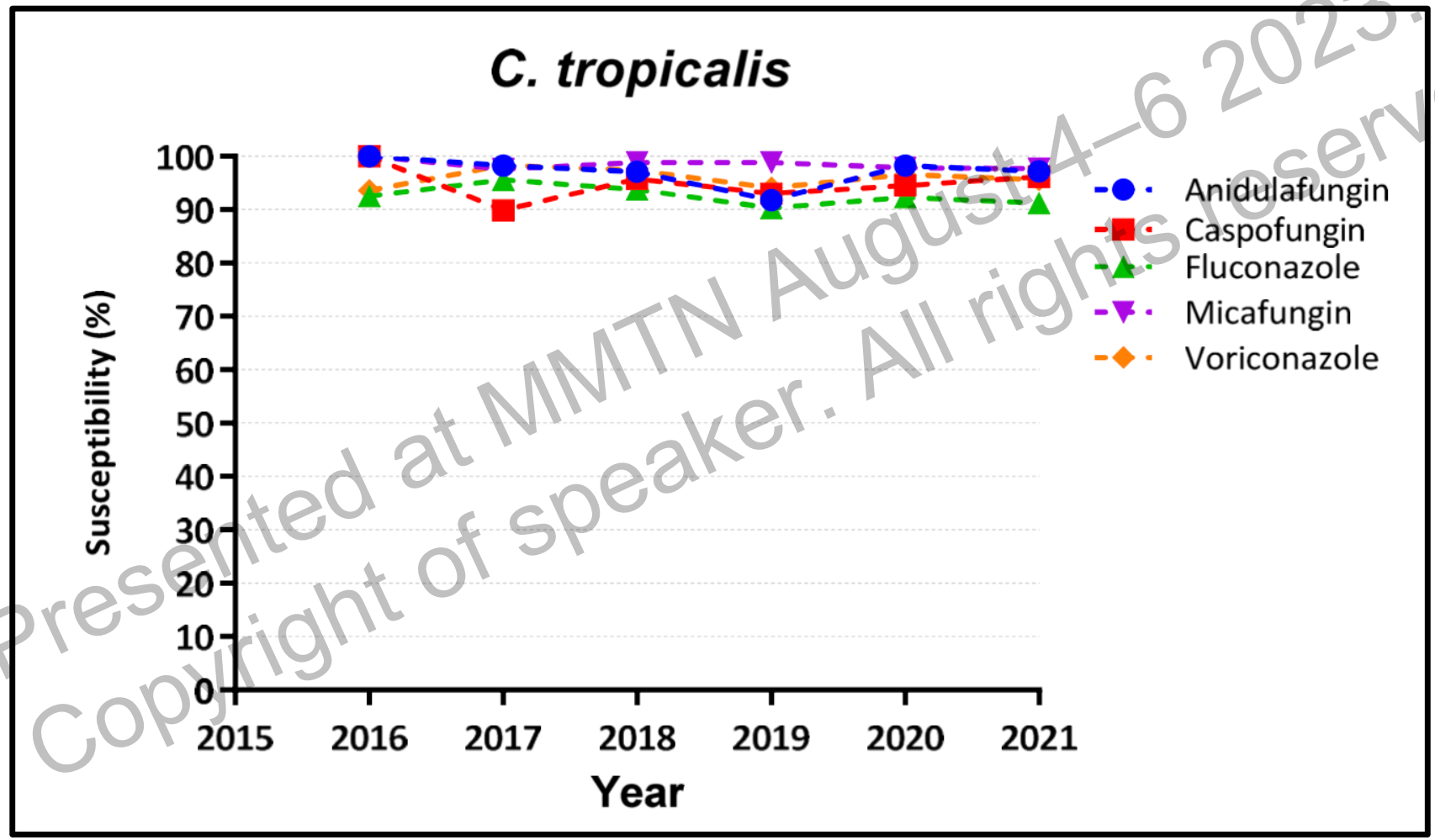

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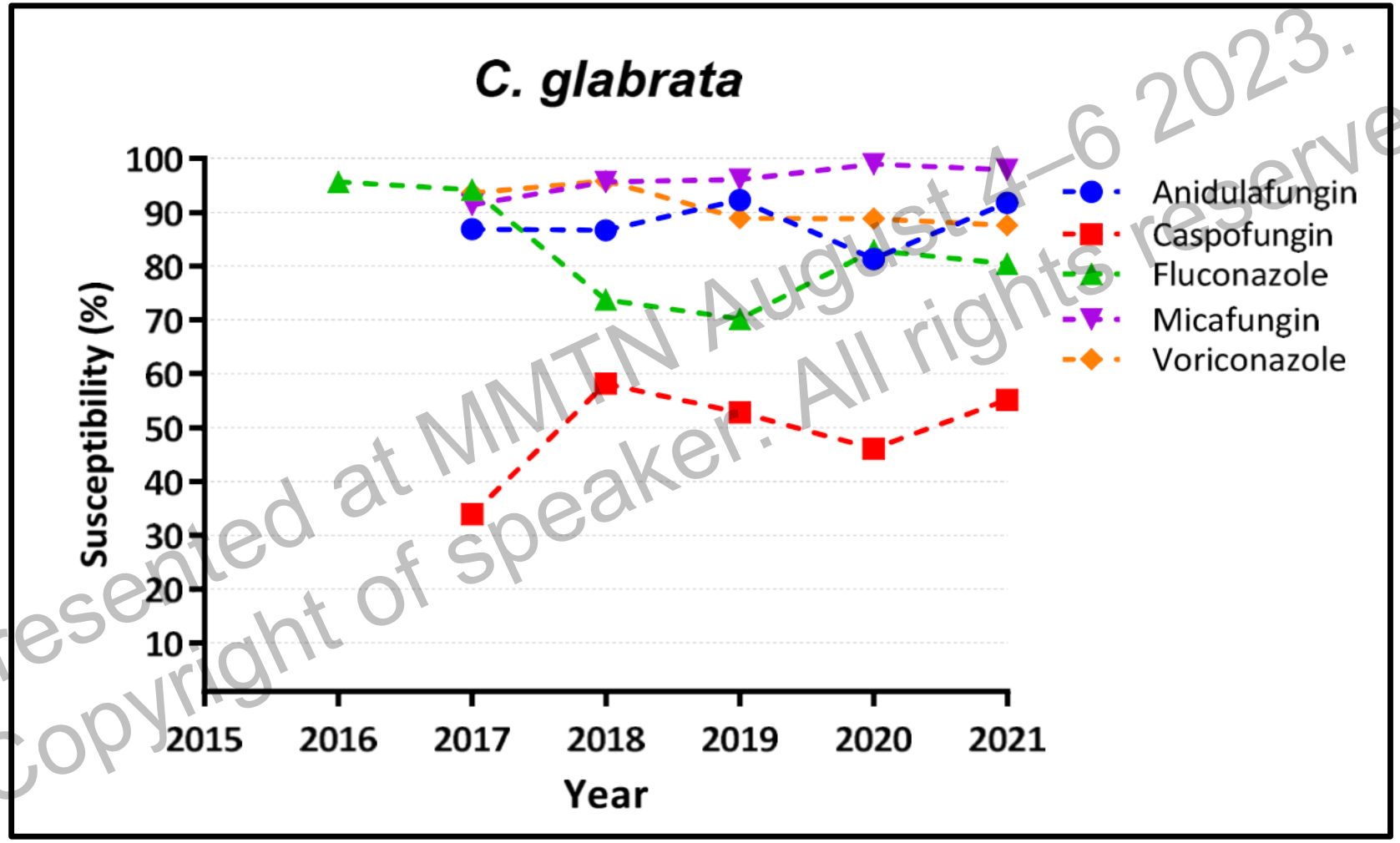

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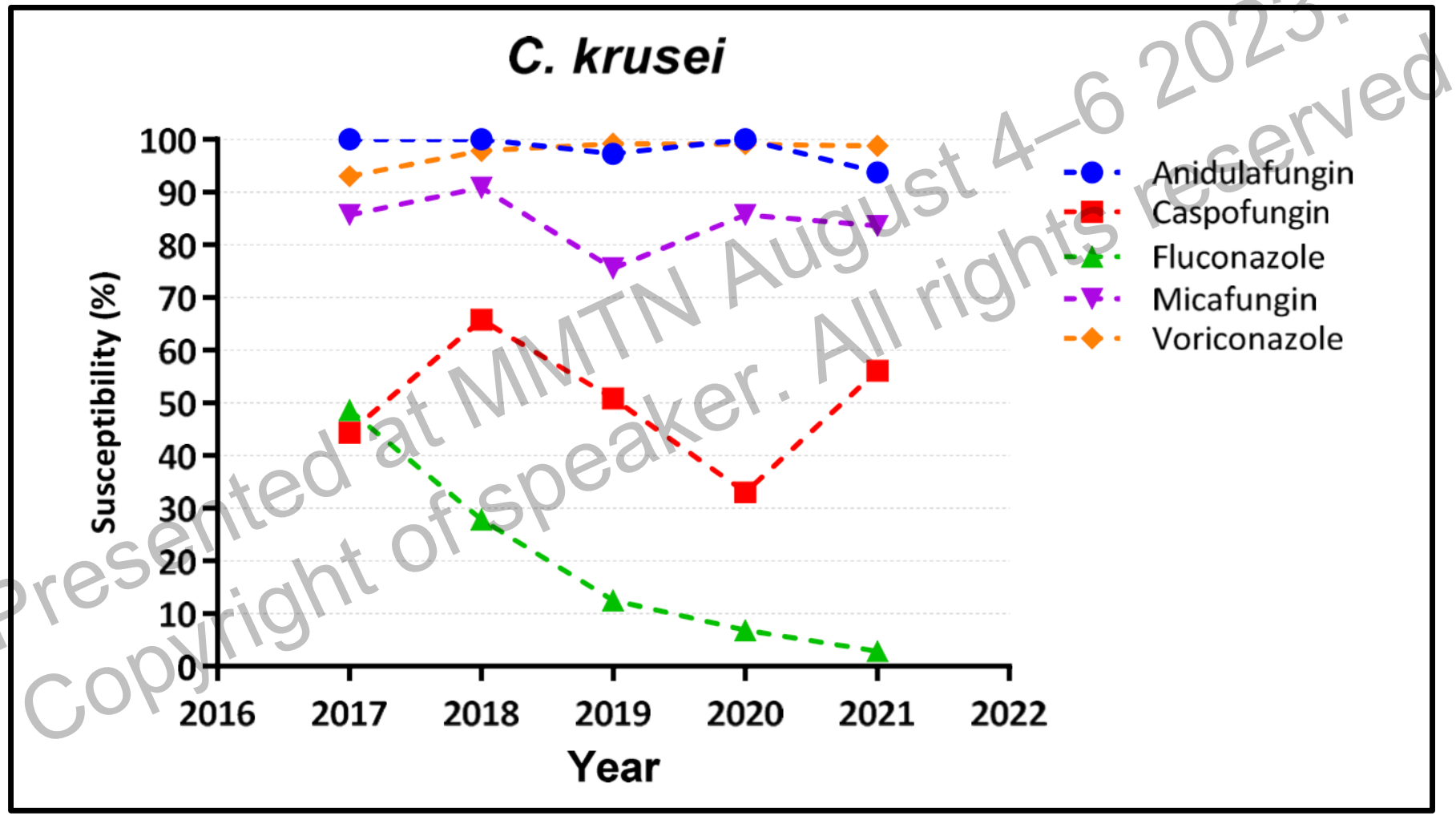

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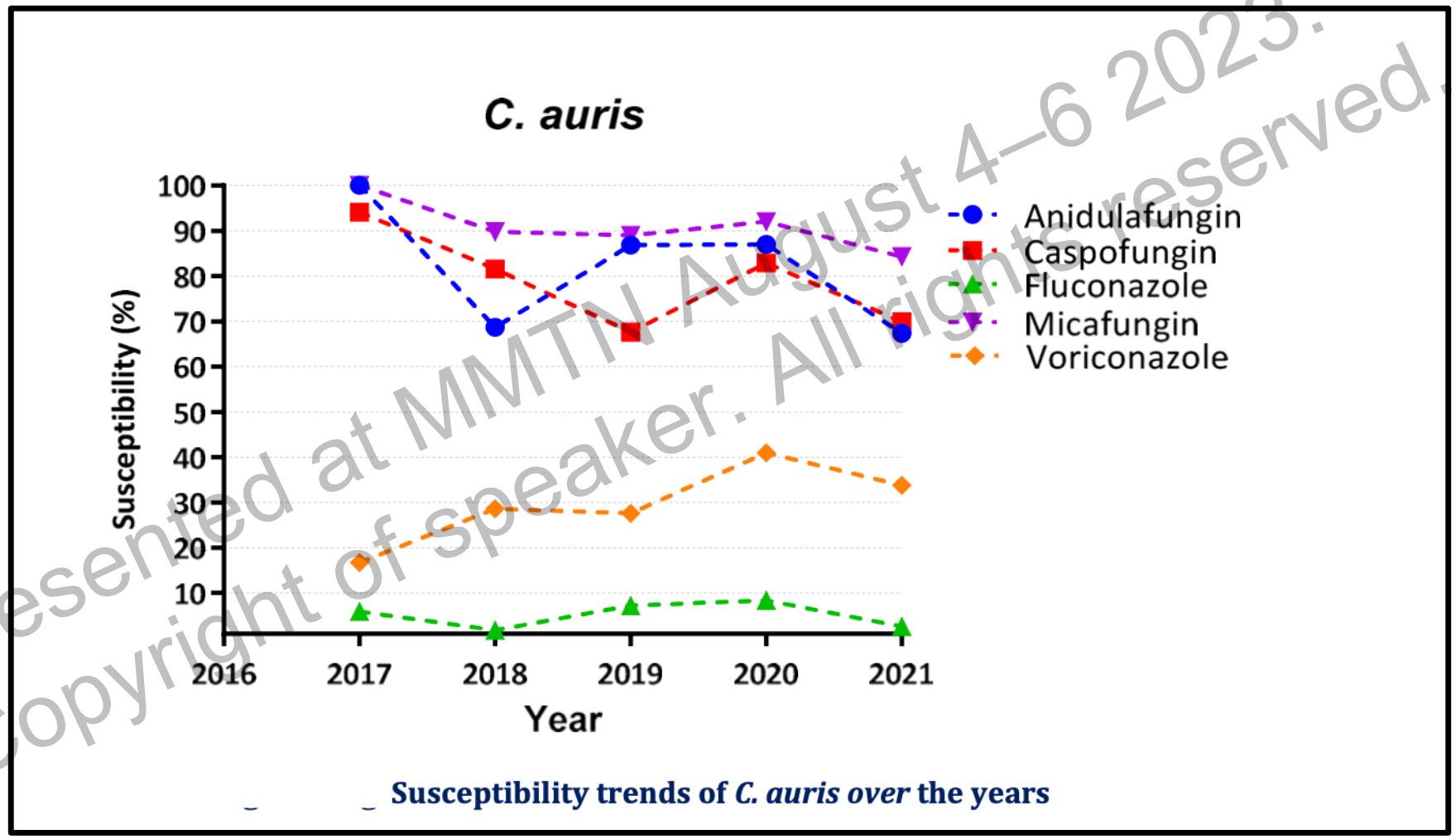

Susceptibility trends of *C. auris over* the years

Moving forward:

- Collaboration and coordination between existing surveillance networks could develop synergies, avoid redundancy and promote standardized collection and analysis of samples
- Determination of AMR profile and the dissemination of results should follow the recommendations of WHO's Global Antimicrobial Resistance Surveillance System (GLASS)
- Standardized reporting of results via a common platform would permit real-time information sharing, in a form that is clear and useful for the public, health professionals and policymakers.

J Antimicrob Chemother 2017; 72: 2963–2972

Summary:

- SENTRY Program was a successful effort to establish AMR surveillance in Asia Pacific and in comparing AMR of the different continents.
- SENTRY: APAC problem on MDR S. pneumoniae and MRSA; ESBL-producing and MDR E. coli were higher than other continents until 2016
- Some Asian countries especially in SEA have local AMR surveillance in place
- India and China have the highest AMR trends in Asia
- There were low number of fungal isolates tested in SENTRY data
- India has a consistent Candida resistance surveillance in Asia
- Consistency in the surveillance of standardized and consistent data and reporting processes will bridge the gap to reliably determine the burden of AMR in the region.