

Global In Vitro Antimicrobial Susceptibility Profiles of *Mycobacterium abscessus*: A Systematic Review and Meta-Analysis

Nont Oudomying^{1,2}, Kanphai Wongjarit², Suwasin Udomkarnjananun^{3,4,5}, Nophol Leelayuwatanakul^{6,7},
Suwatchareeporn Rotcheewaphan^{2, 8, #}

¹ Chulalongkorn University International Medical Program (CU-MEDi), Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand

² Department of Microbiology, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand

³ Division of Nephrology, Department of Medicine, Faculty of Medicine, Chulalongkorn University and King Chulalongkorn Memorial Hospital, The Thai Red Cross Society, Bangkok, Thailand

⁴ Excellence Center for Organ Transplantation (ECOT), King Chulalongkorn Memorial Hospital, The Thai Red Cross Society, Bangkok, Thailand

⁵ Center of Excellence Renal Immunology and Renal Transplantation, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand

⁶ Division of Pulmonary and Critical Care Medicine, Department of Medicine, Chulalongkorn University, Bangkok, Thailand

⁷ Chulalongkorn Comprehensive Cancer Center, Department of Medicine, King Chulalongkorn Memorial Hospital, The Thai Red Cross Society, Bangkok, Thailand

⁸ Center of Excellence in Systems Microbiology, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand

#Corresponding author:

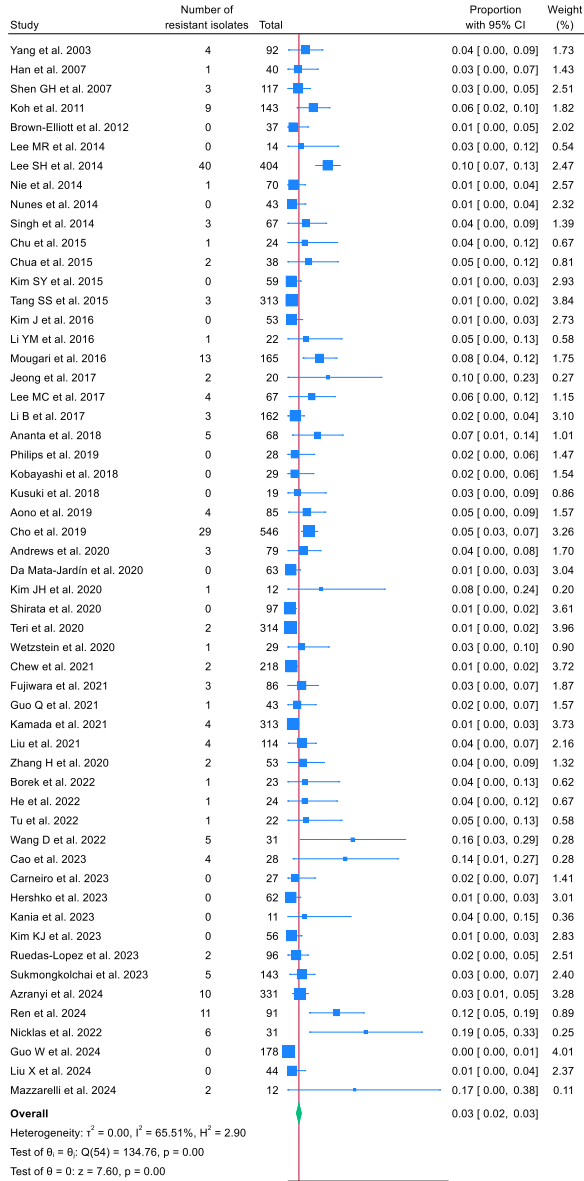
Suwatchareeporn Rotcheewaphan

Email: suwatchareeporn.r@chula.ac.th

Mailing address: 1873 Rama IV Road, Pathumwan, Bangkok, Thailand, 10330

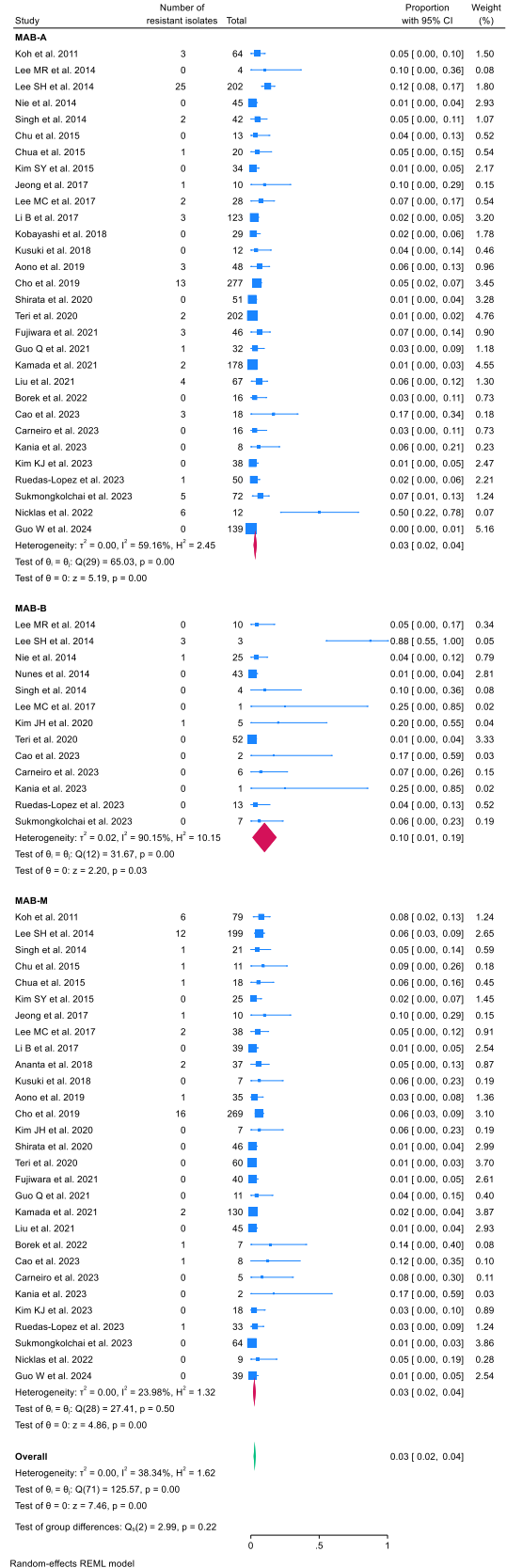
Supplementary Figures

Amikacin

M. abscessus

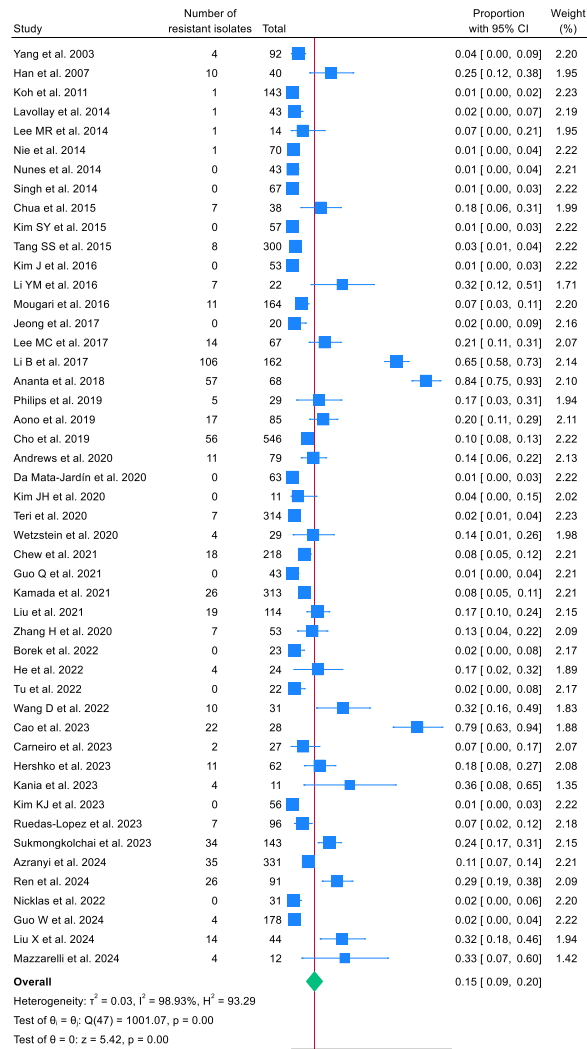
Random-effects REML model

Subspecies



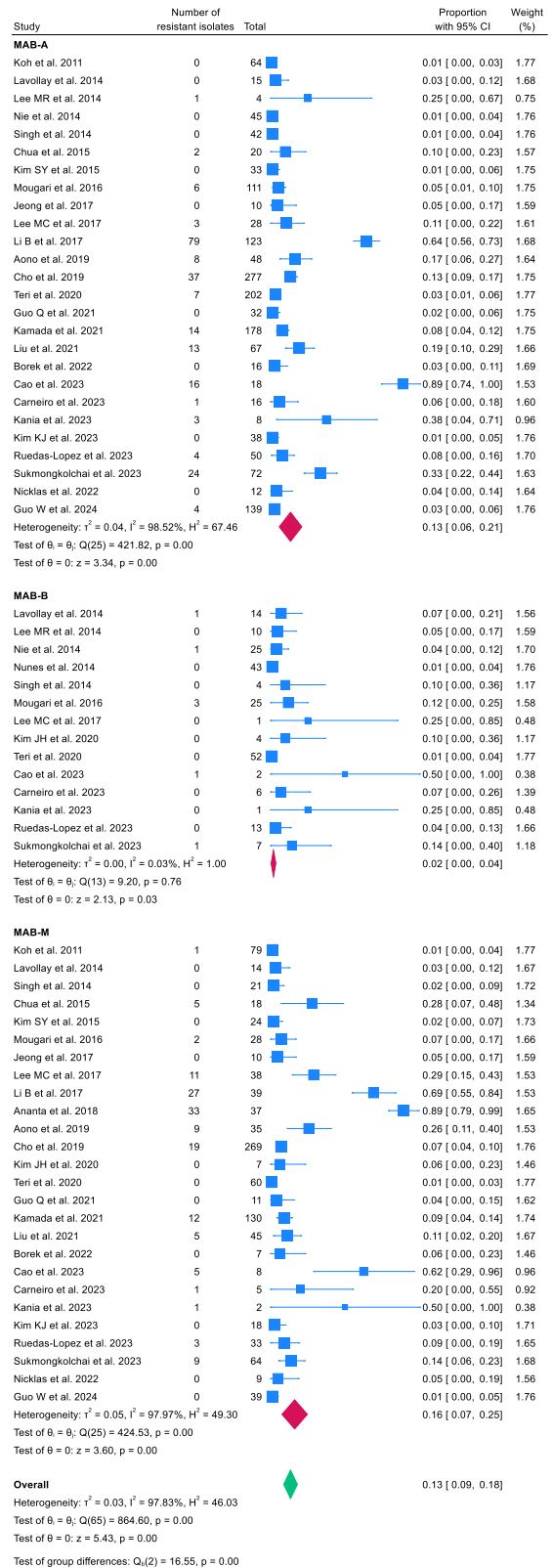
Random-effects REML model

Cefoxitin

M. abscessus

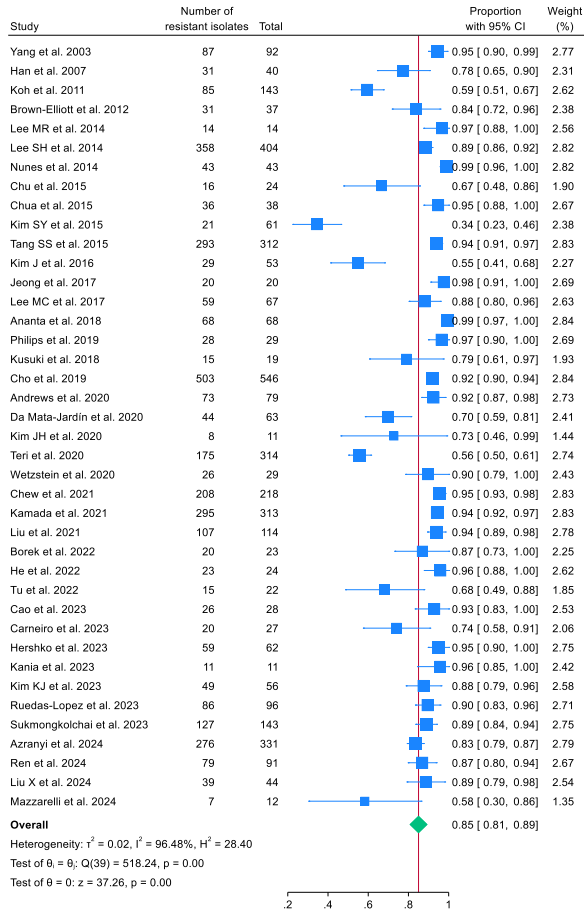
Random-effects REML model

Subspecies

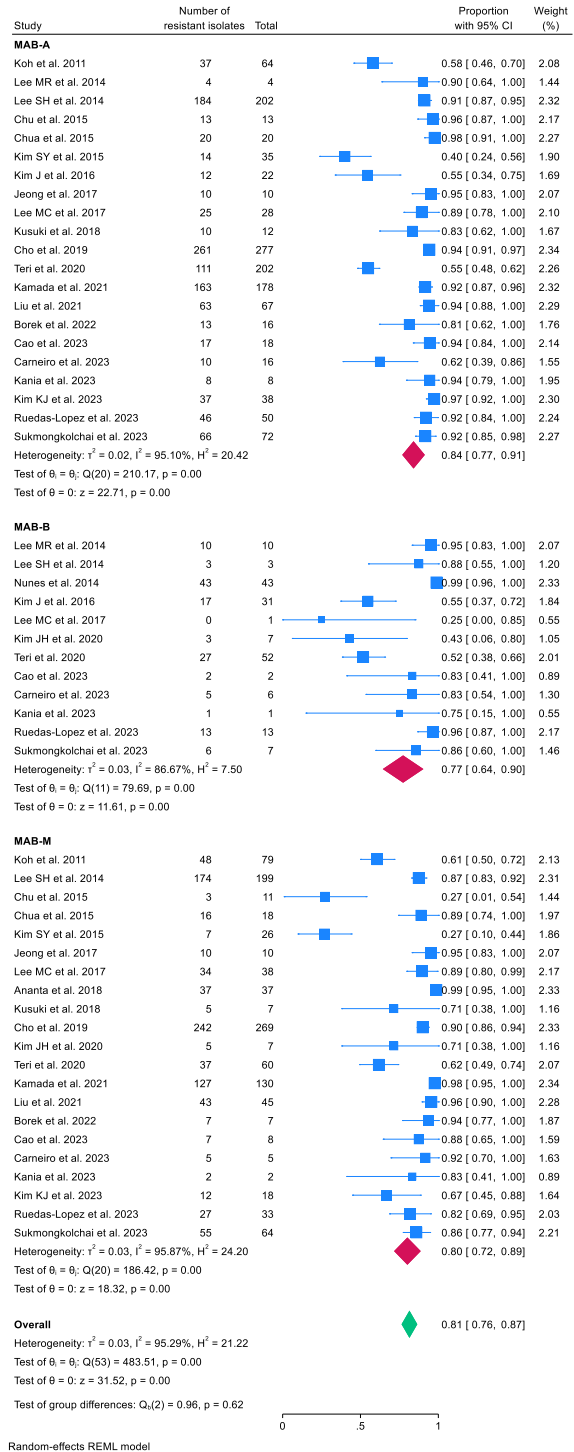


Random-effects REML model

Ciprofloxacin

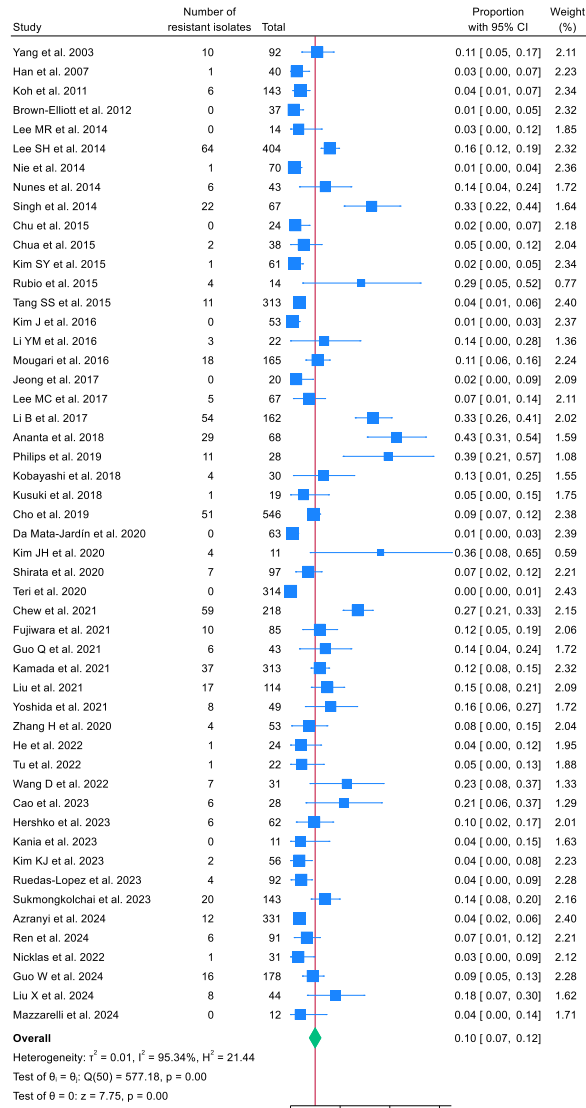
M. abscessus

Subspecies

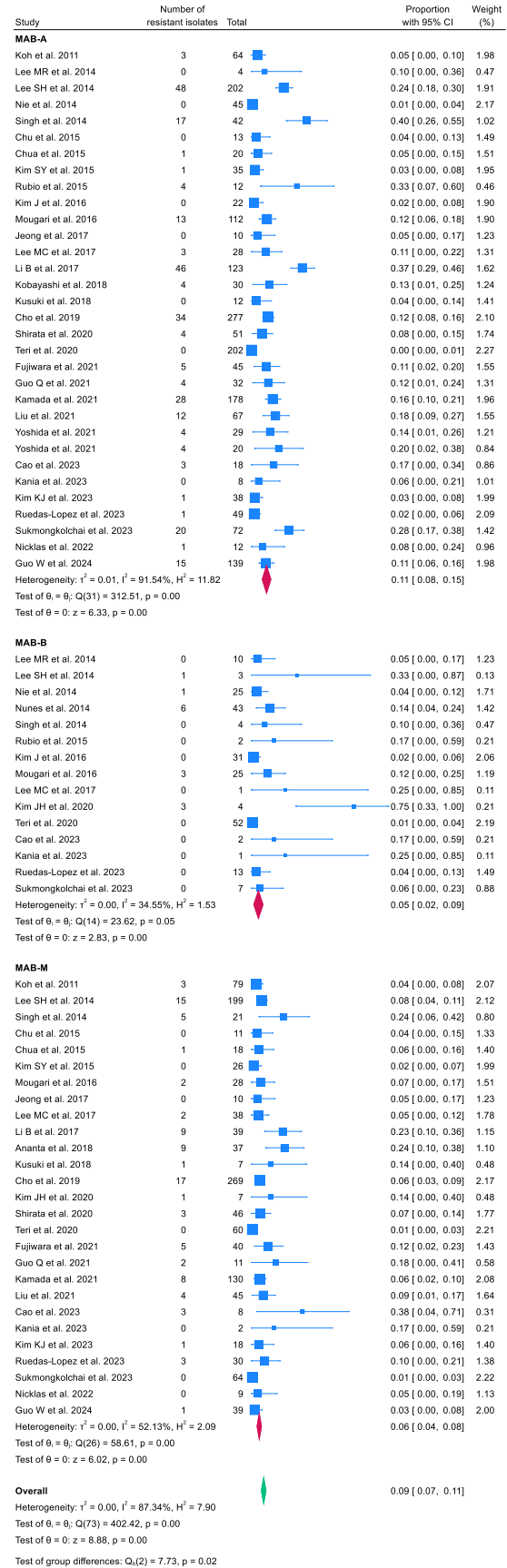


Clarithromycin

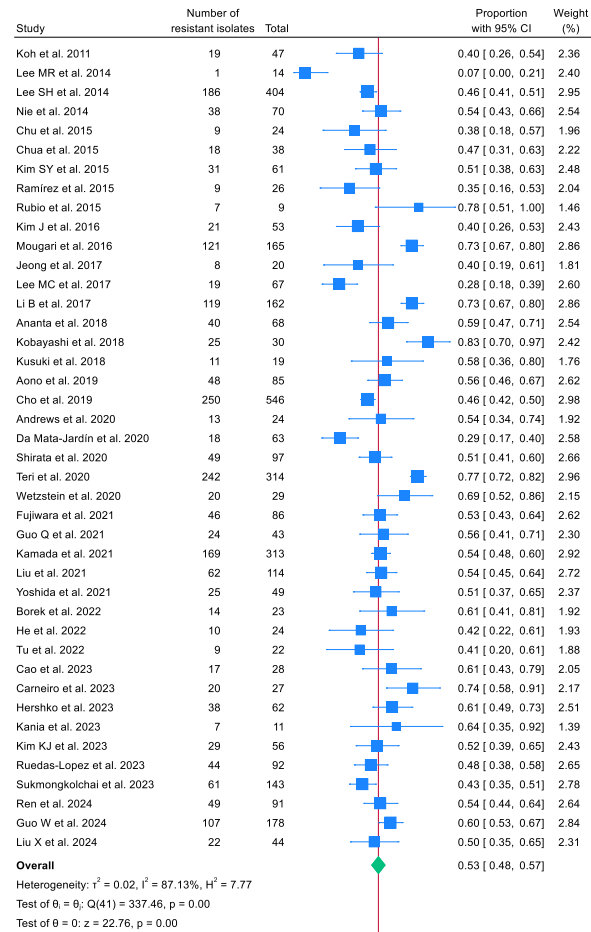
M. abscessus



Subspecies

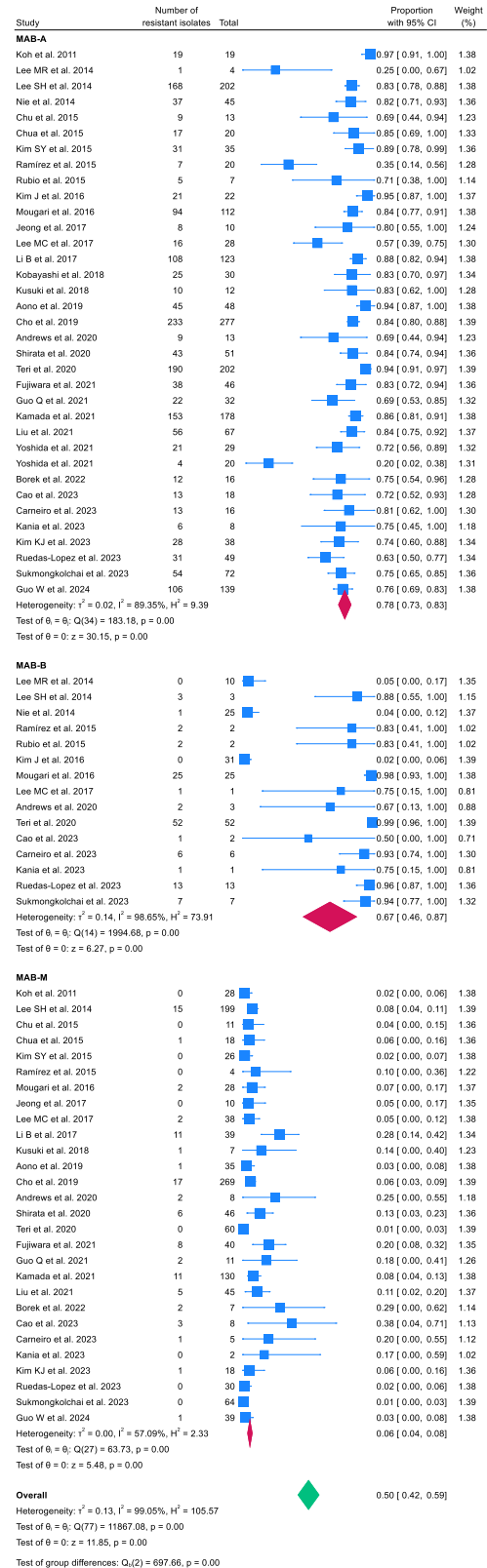


Inducible clarithromycin resistance

M. abscessus

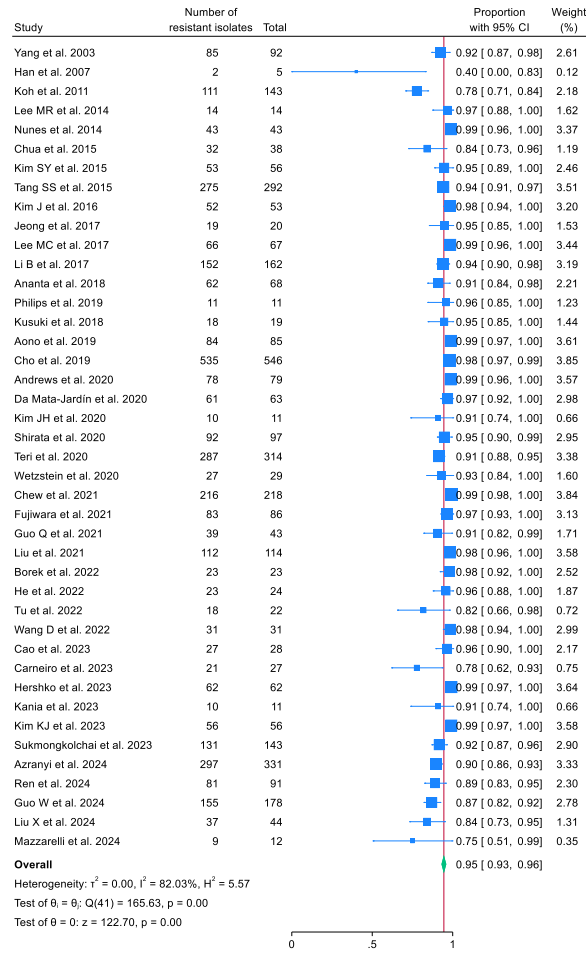
Random-effects REML model

Subspecies

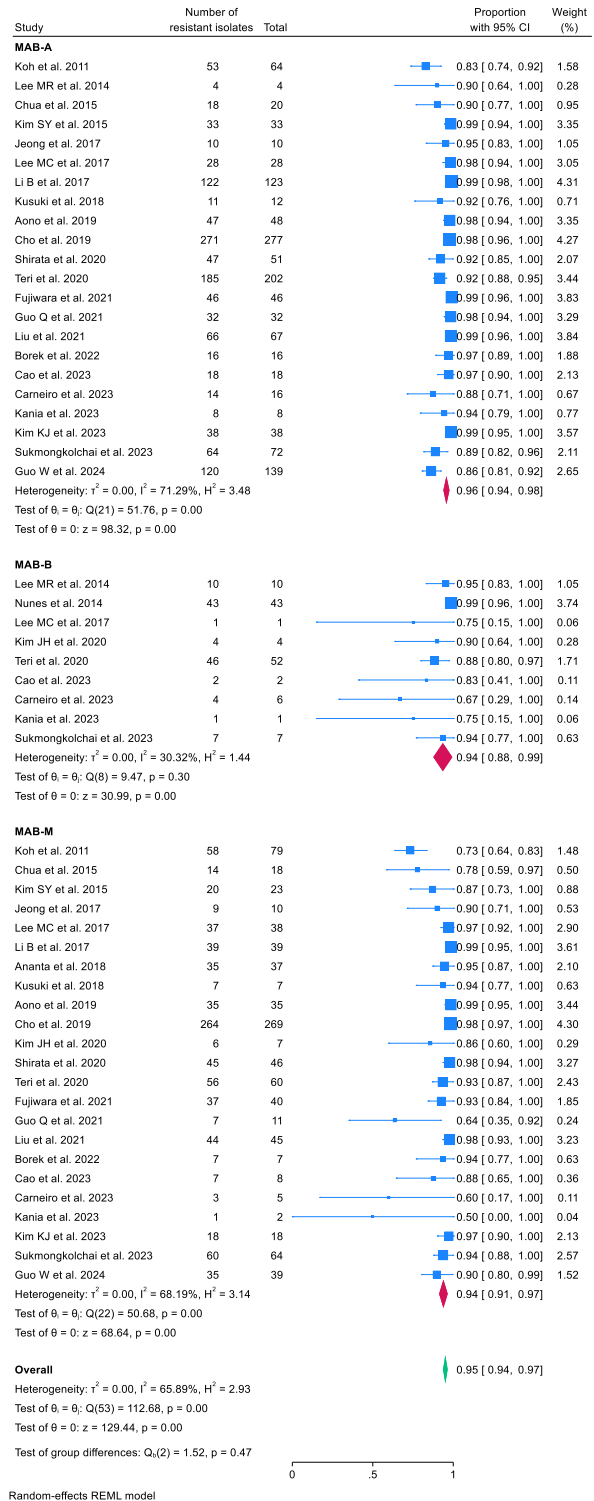


Random-effects REML model

Doxycycline

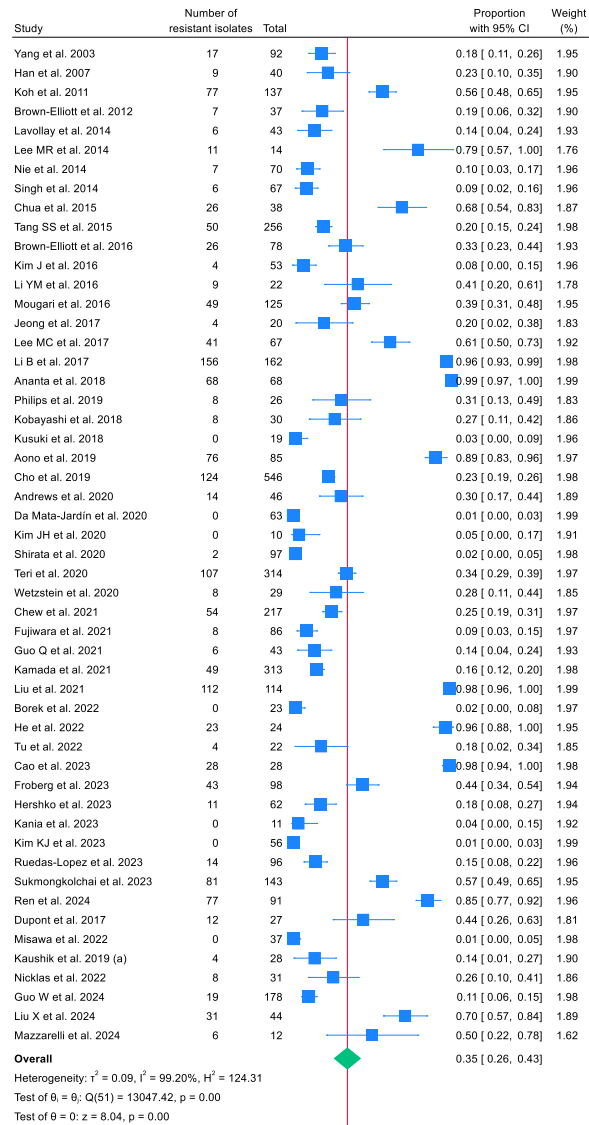
M. abscessus

Subspecies



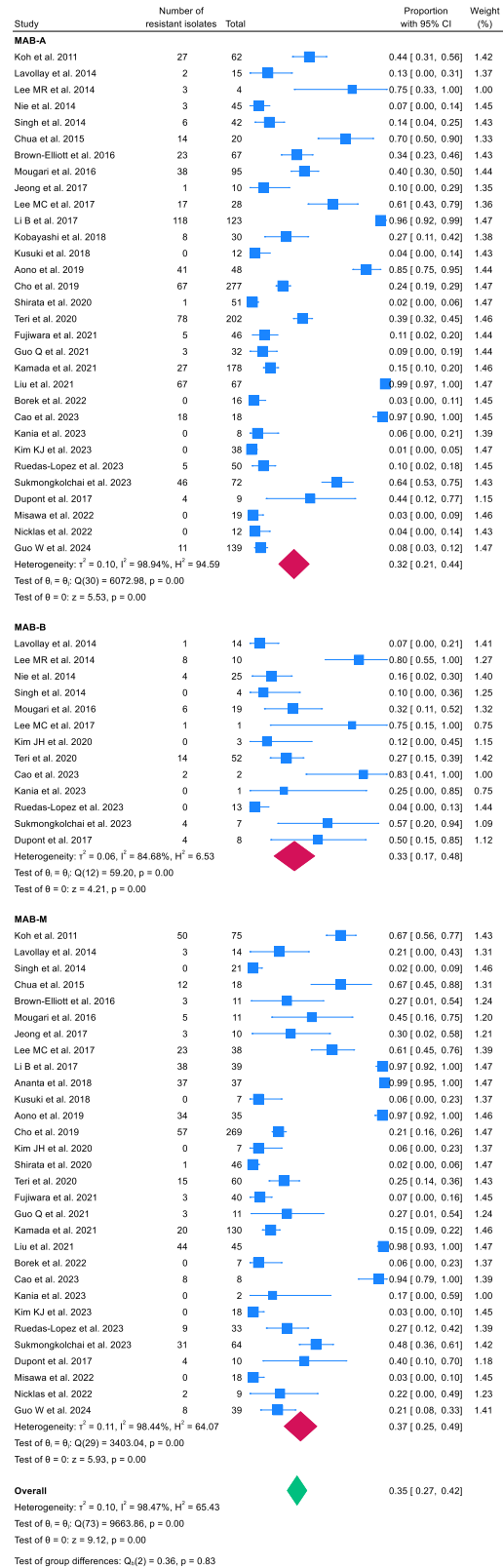
Imipenem

M. abscessus



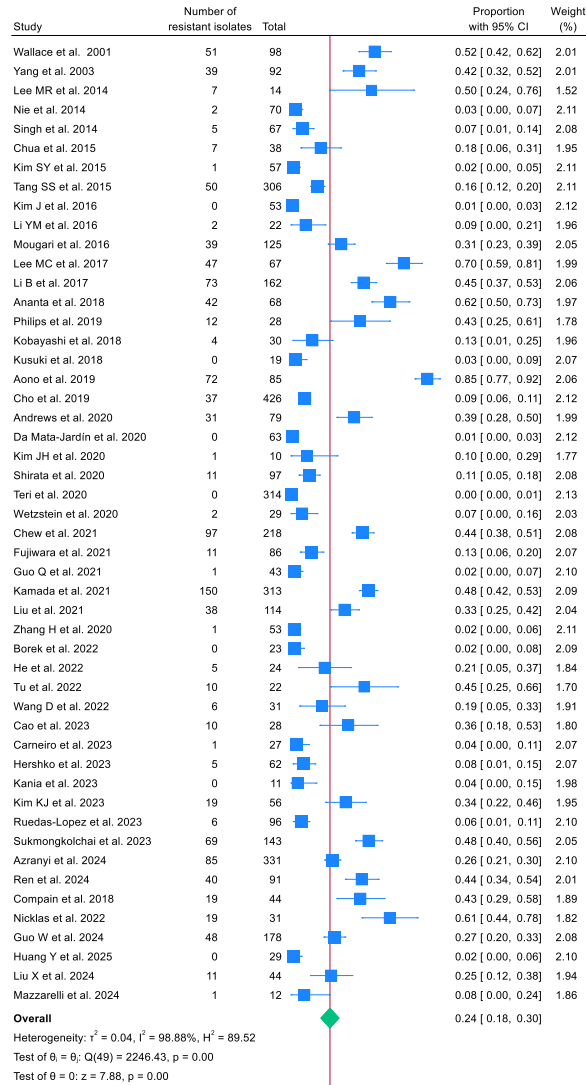
Random-effects REML model

Subspecies



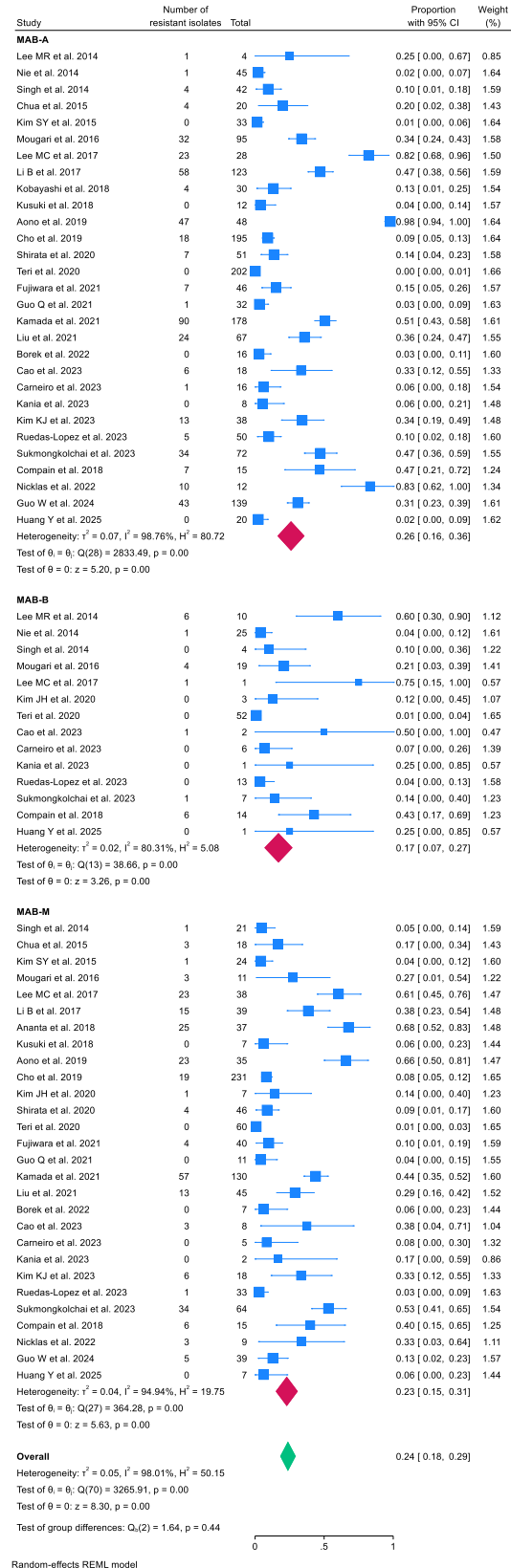
Random-effects REML model

Linezolid

M. abscessus

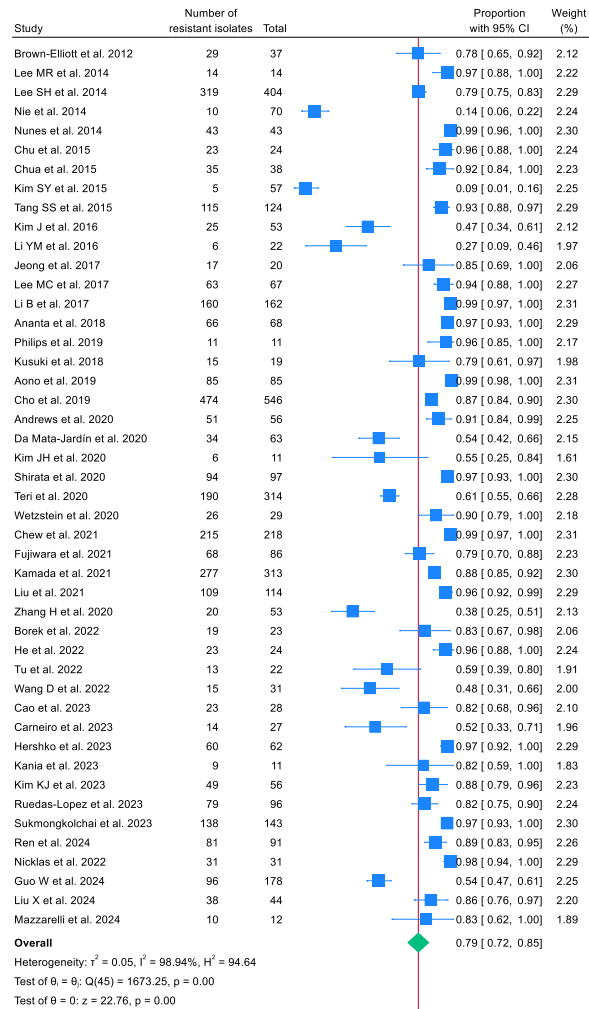
Random-effects REML model

Subspecies

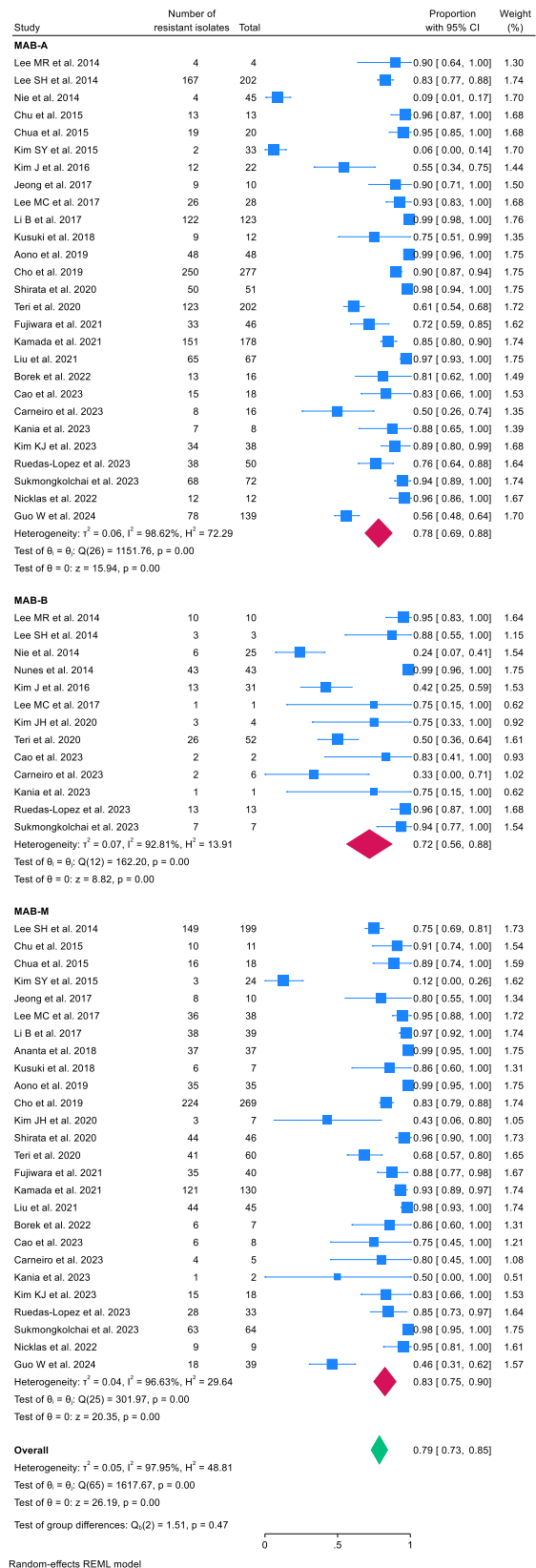


Random-effects REML model

Moxifloxacin

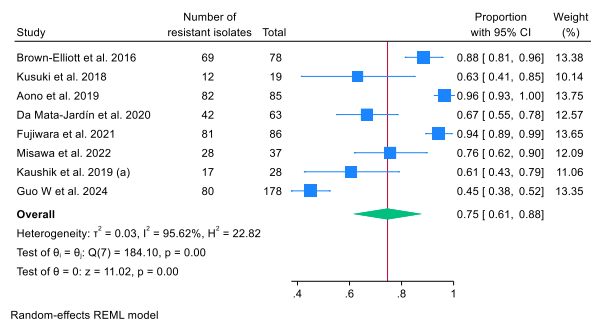
M. abscessus

Subspecies

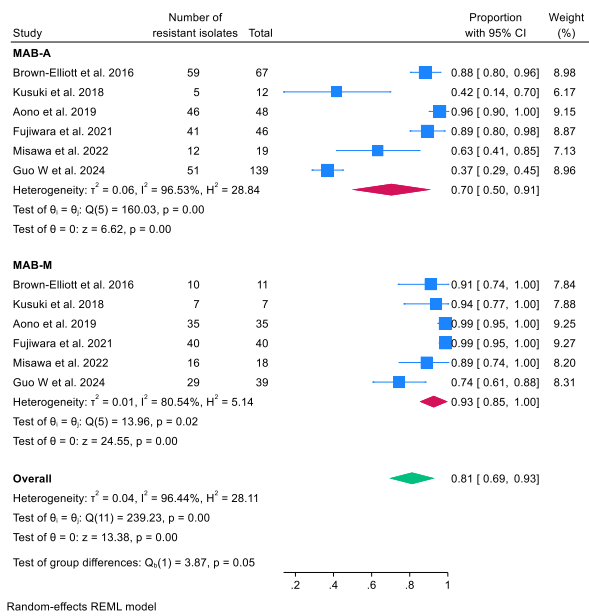


Meropenem

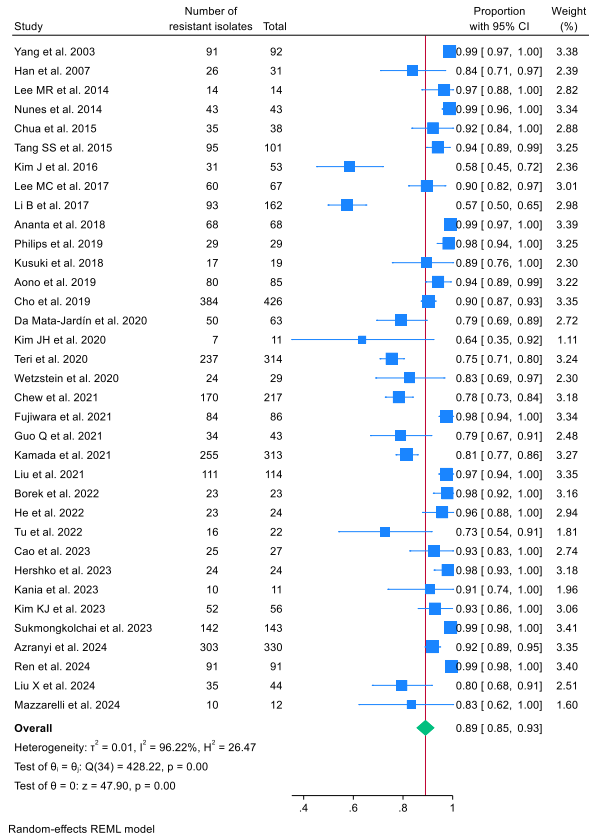
M. abscessus



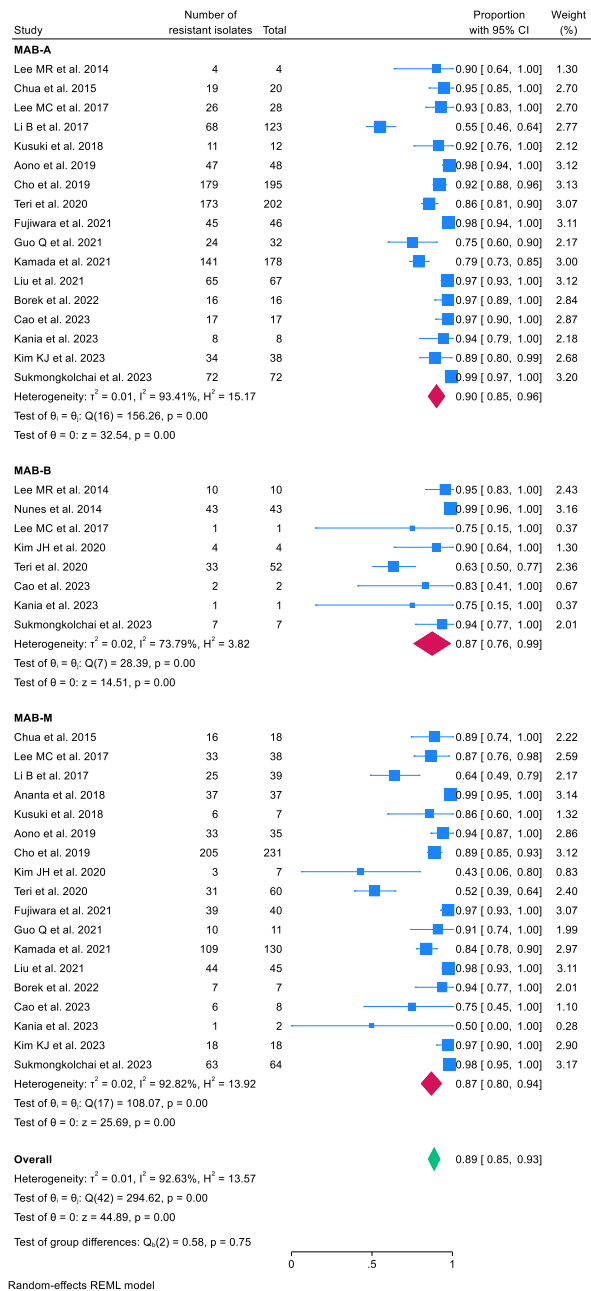
Subspecies



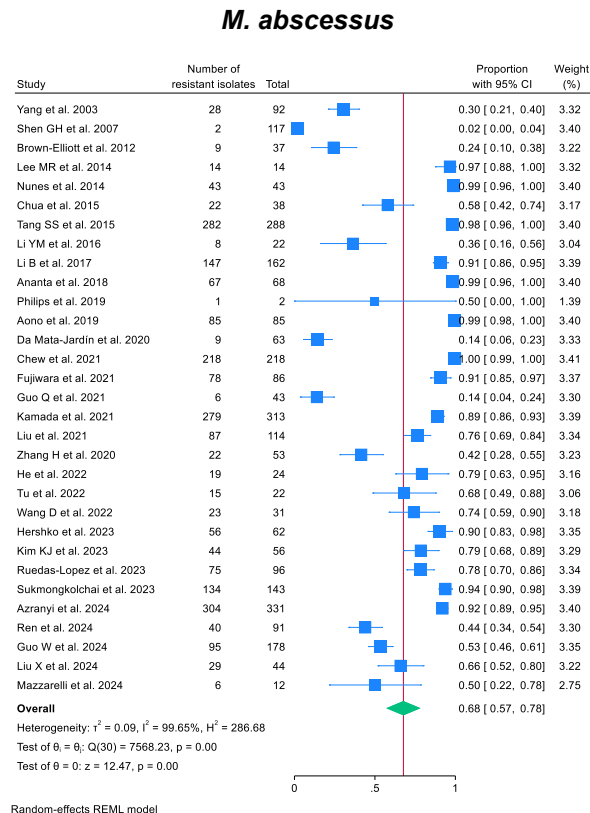
Trimethoprim-Sulfamethoxazole

M. abscessus

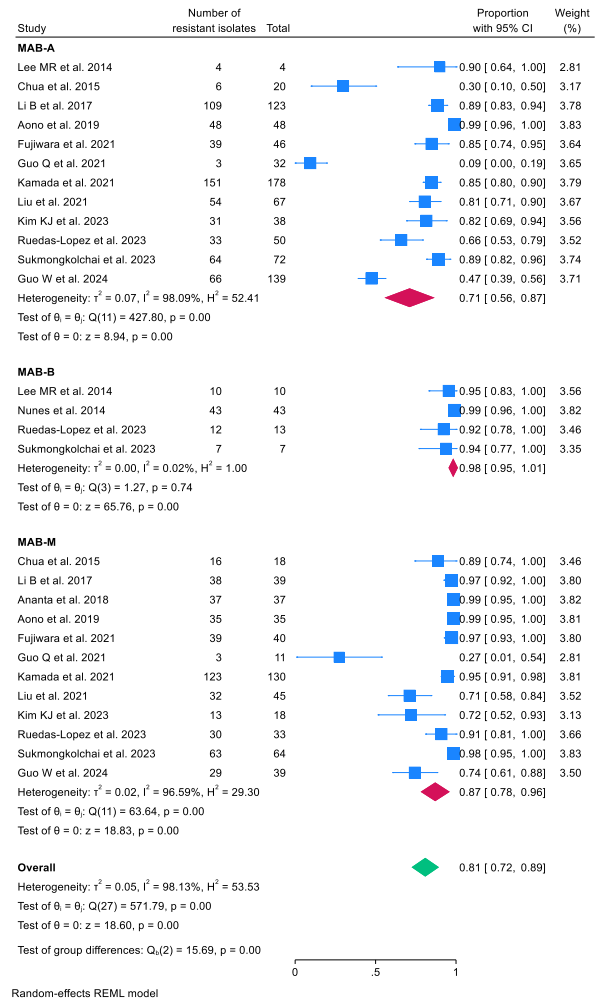
Subspecies



Tobramycin

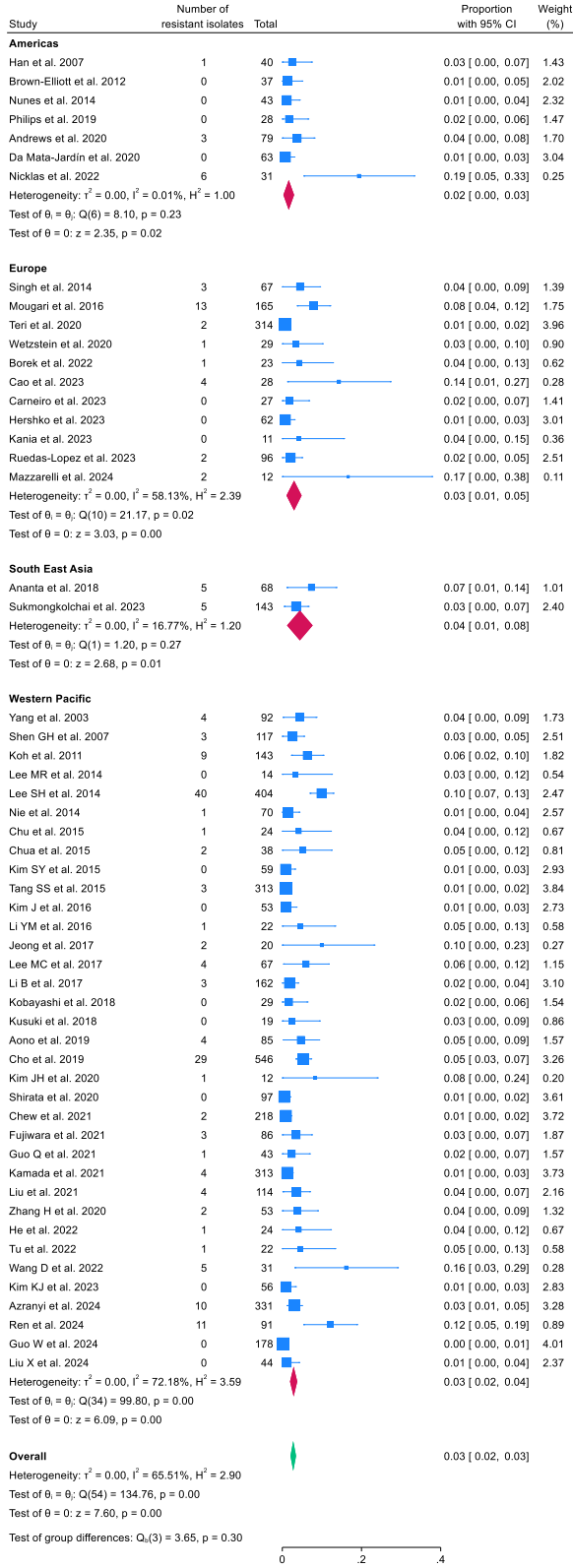


Subspecies

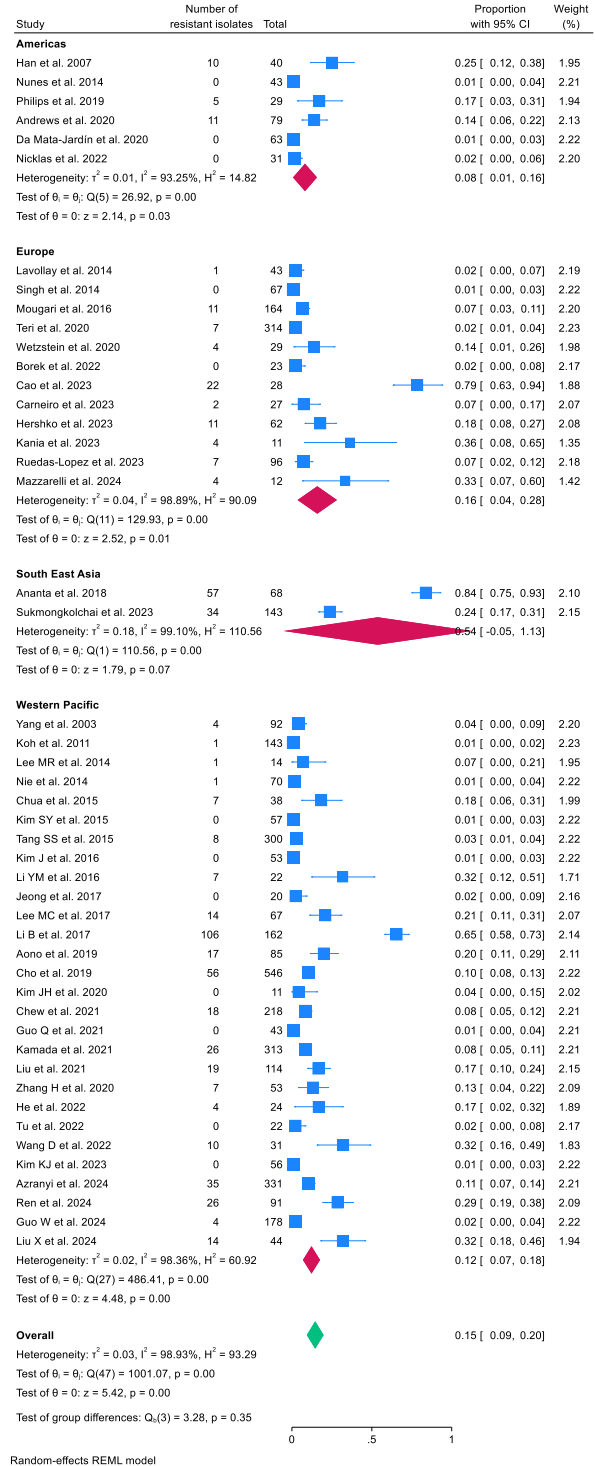


Supplementary Figure 1. Forest plots showing the global prevalence of drug-resistant *Mycobacterium abscessus* and its subspecies (MAB-A, *M. abscessus* subsp. *abscessus*; MAB-B, *M. abscessus* subsp. *bolletii*; and MAB-M, *M. abscessus* subsp. *massiliense*) estimated using a random-effects model.

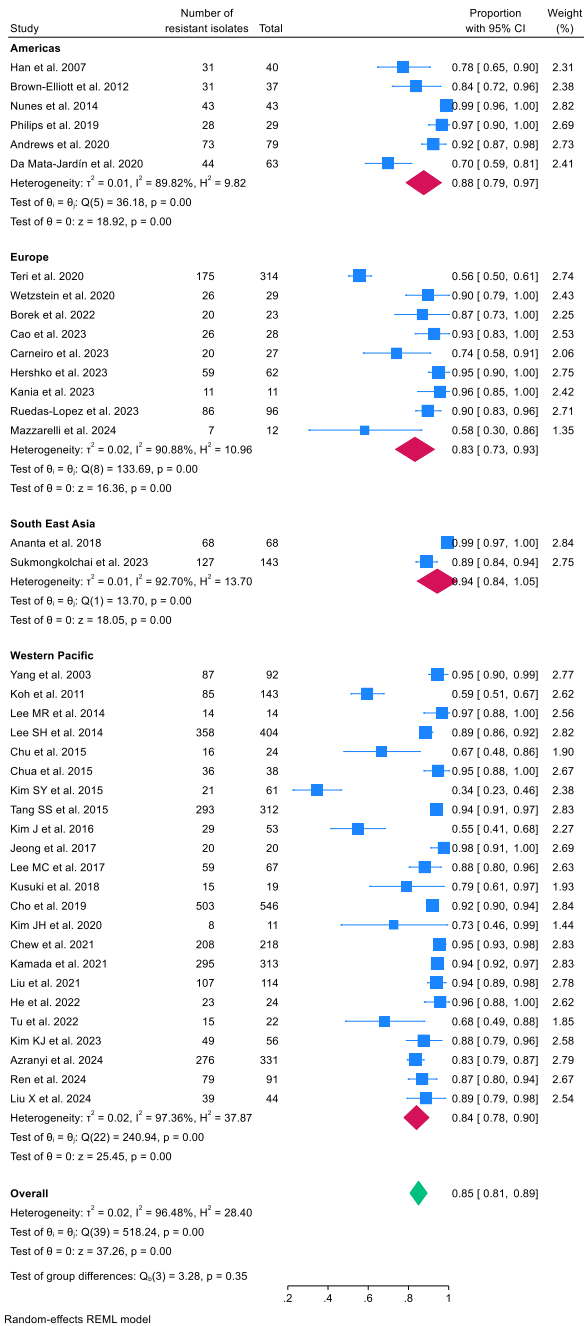
Amikacin



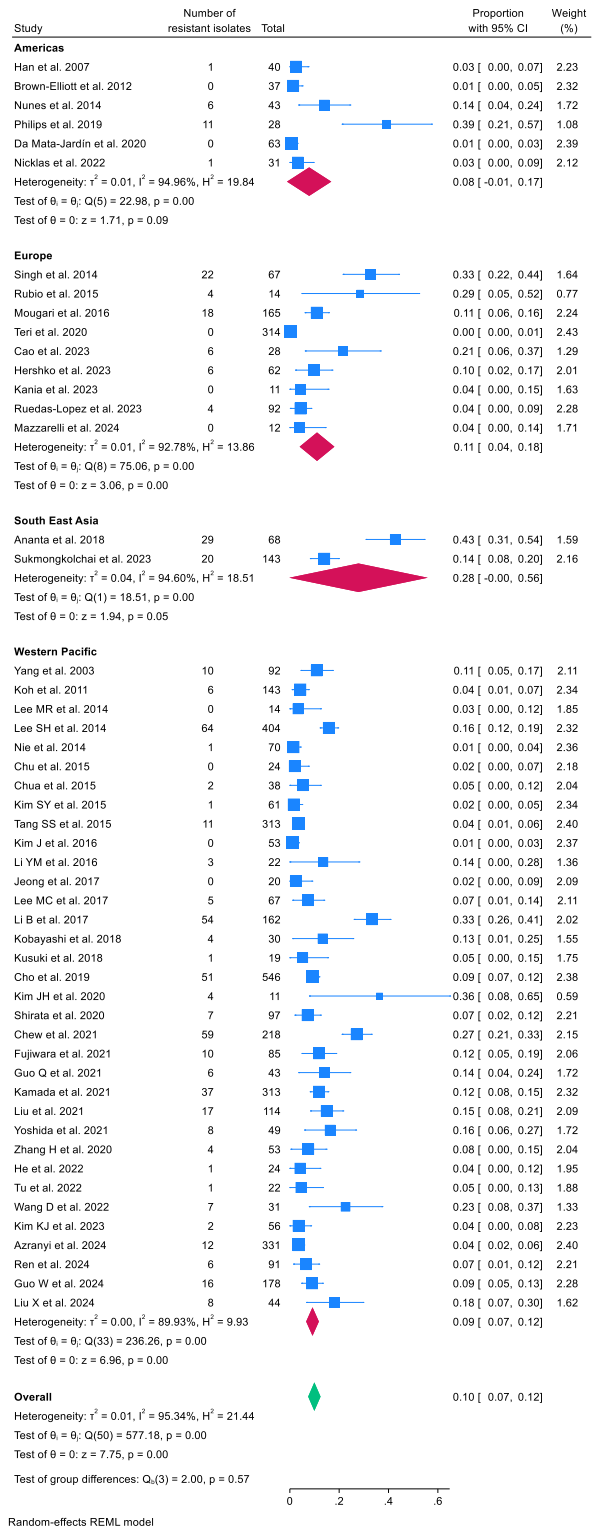
Cefoxitin



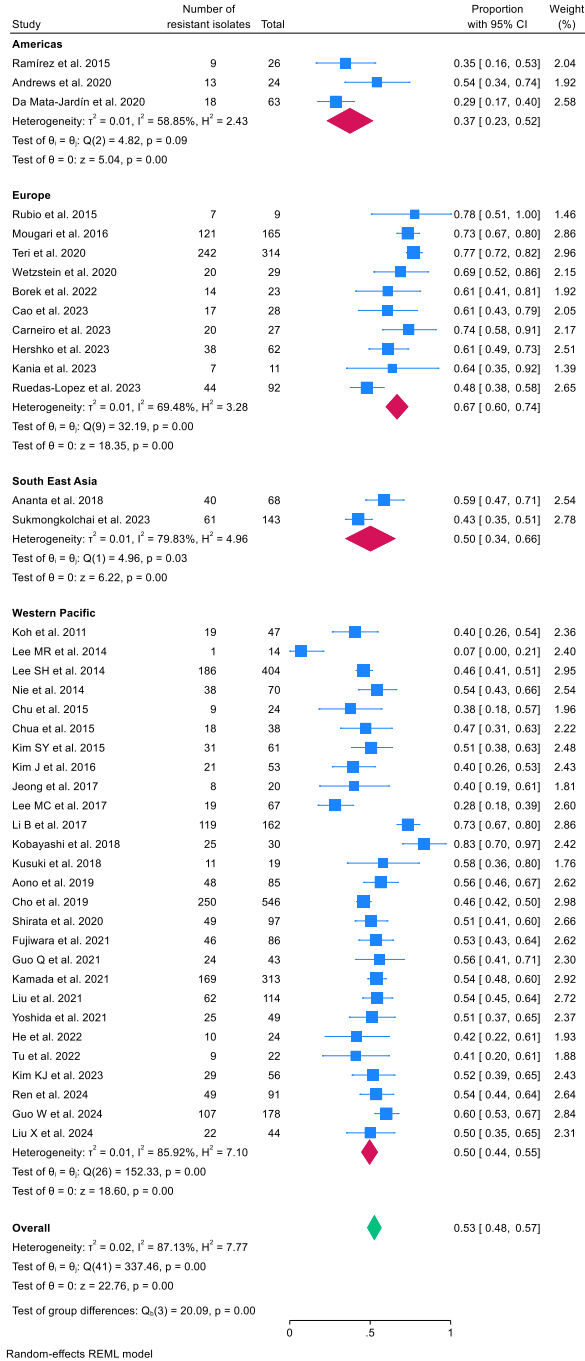
Ciprofloxacin



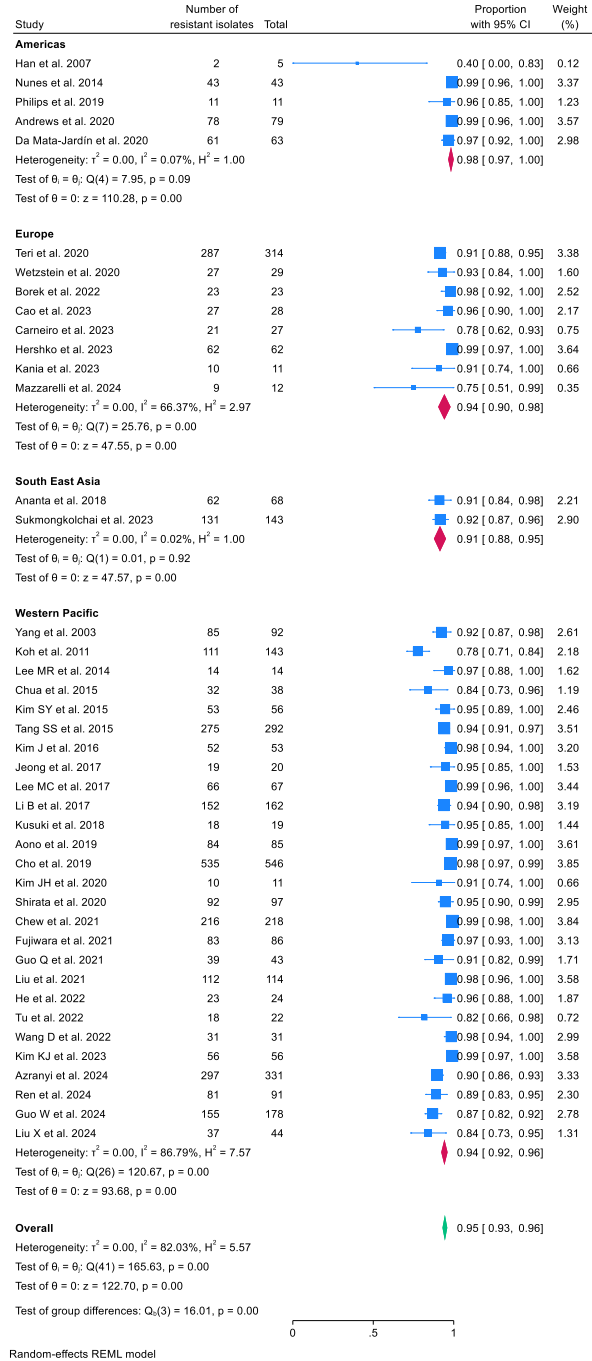
Clarithromycin



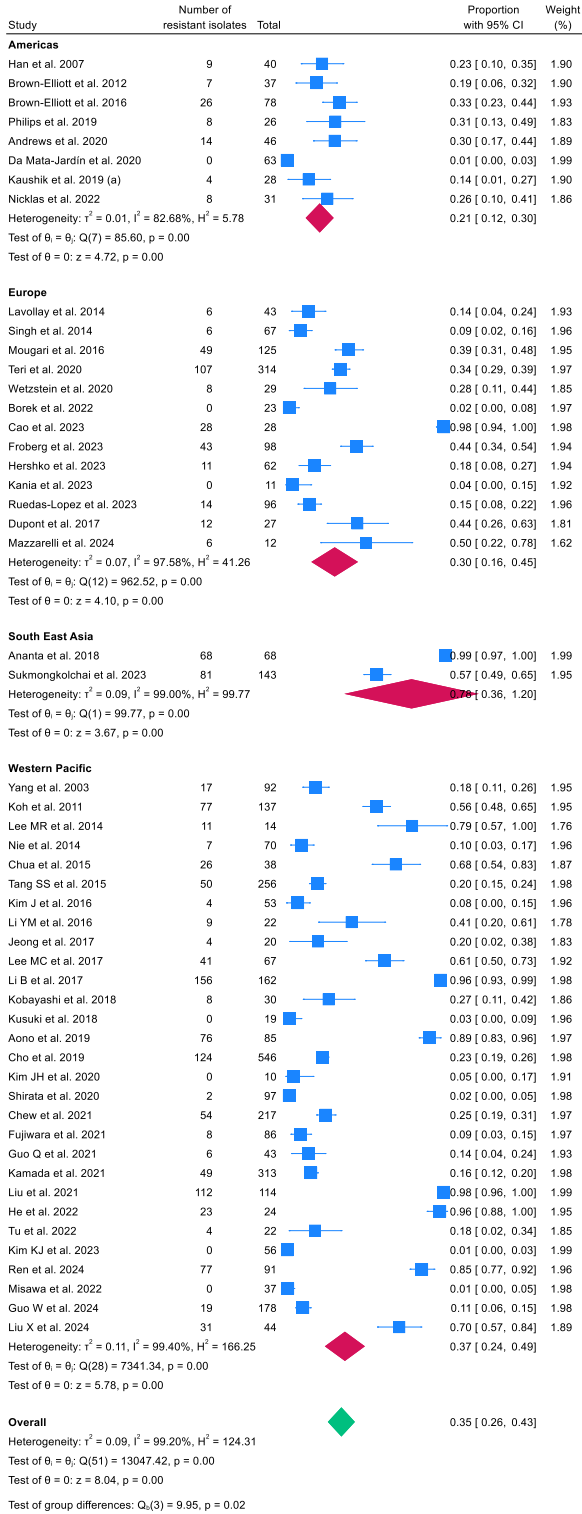
Inducible clarithromycin resistance



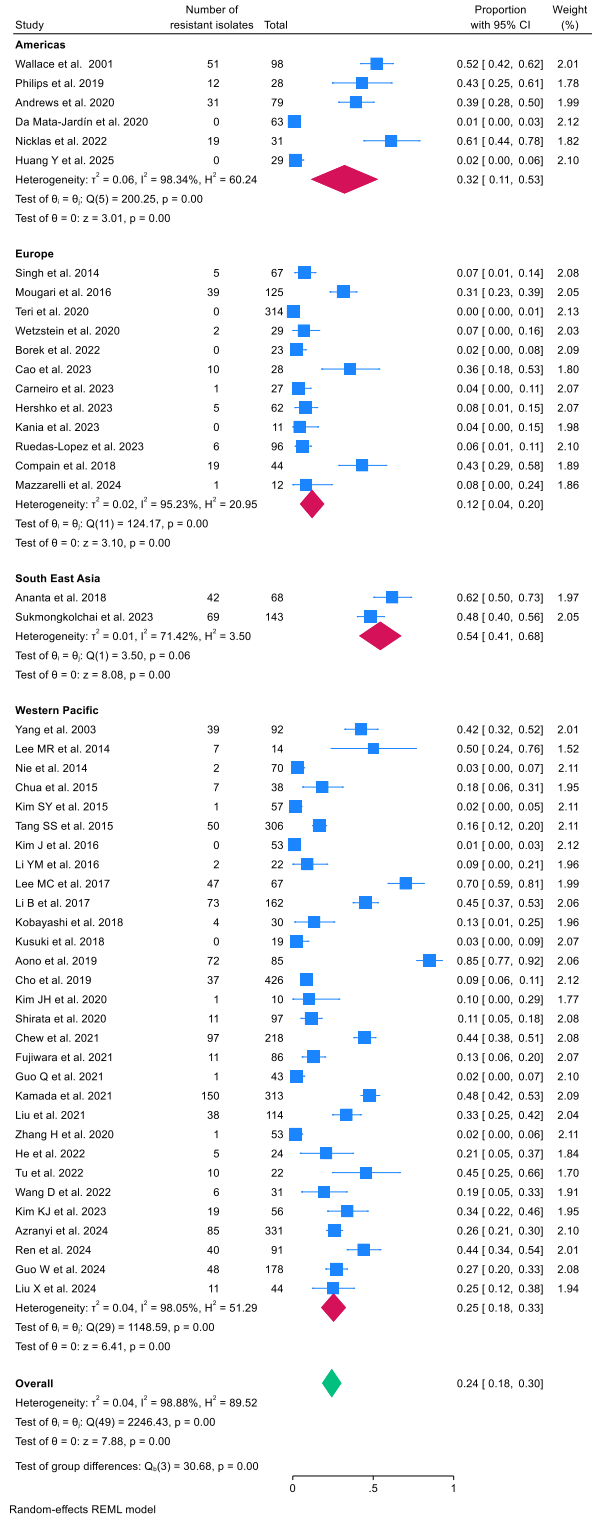
Doxycycline



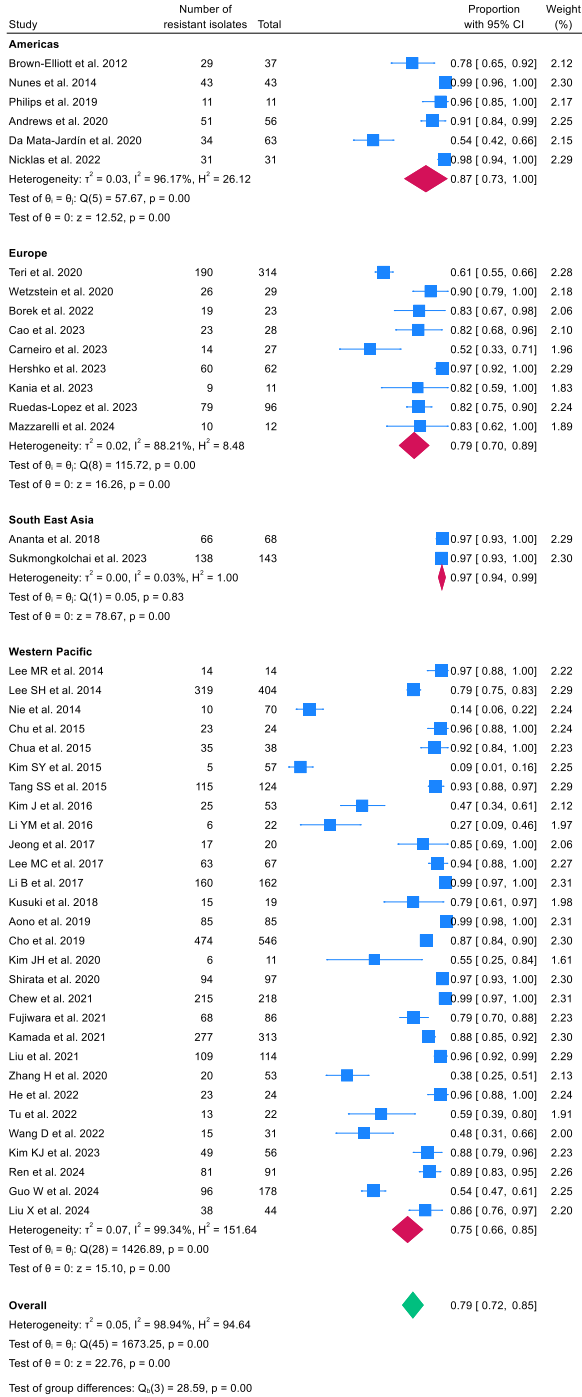
Imipenem



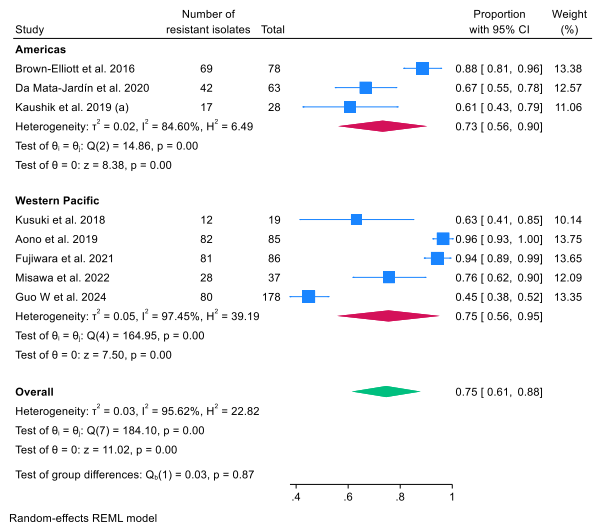
Linezolid

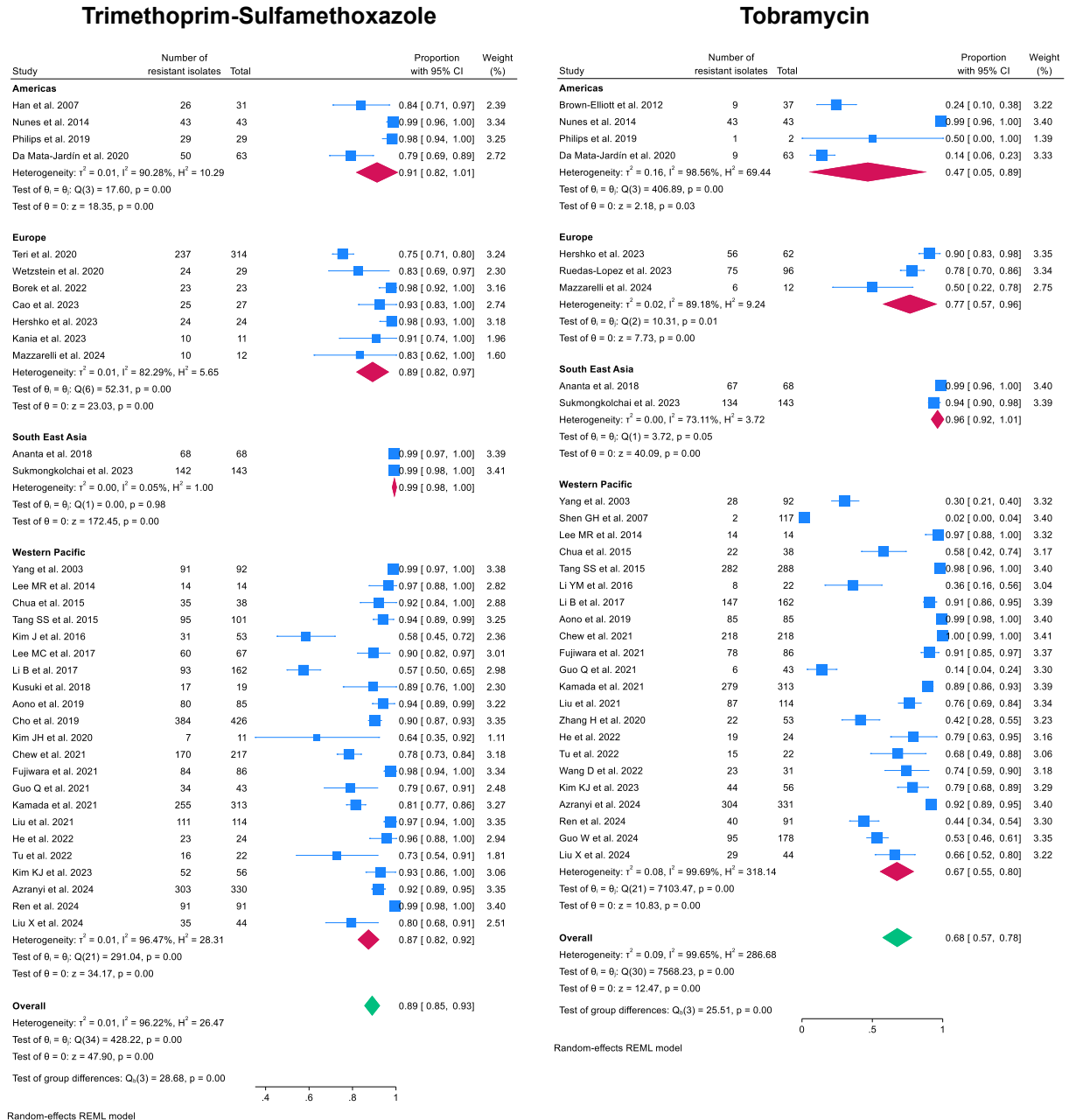


Moxifloxacin



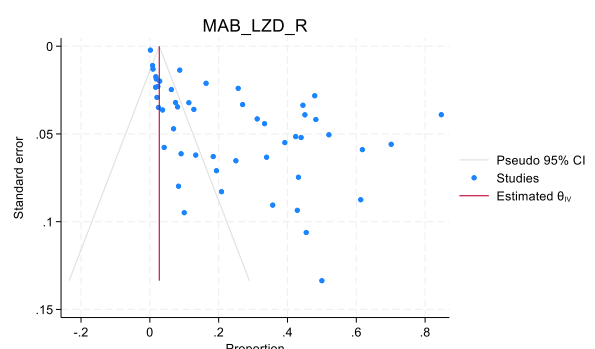
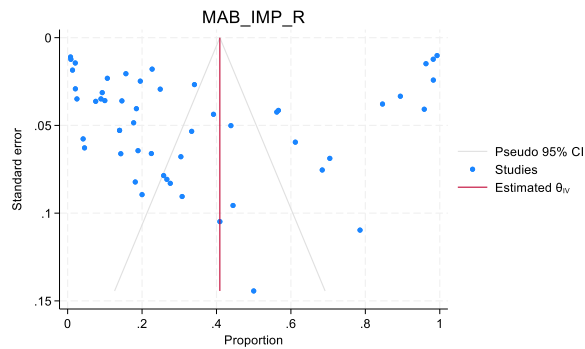
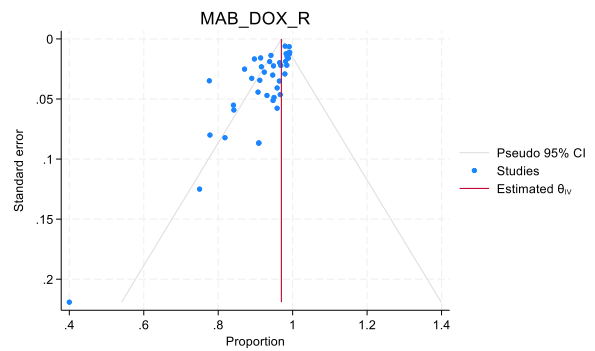
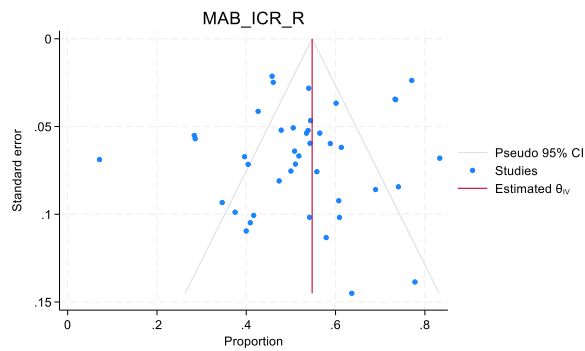
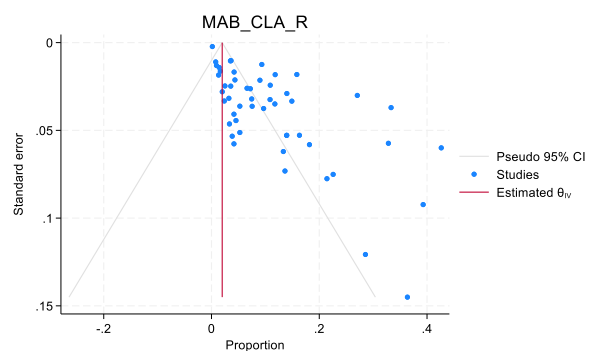
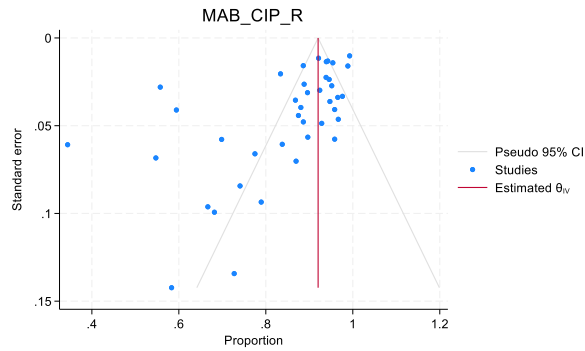
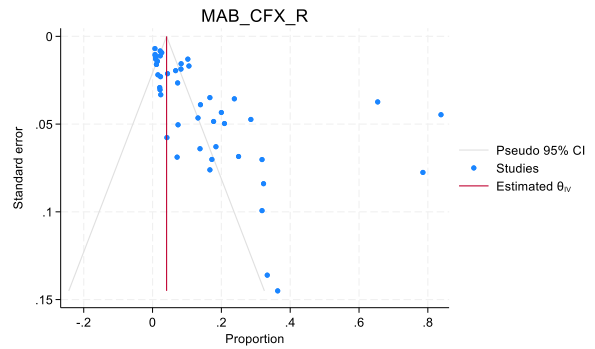
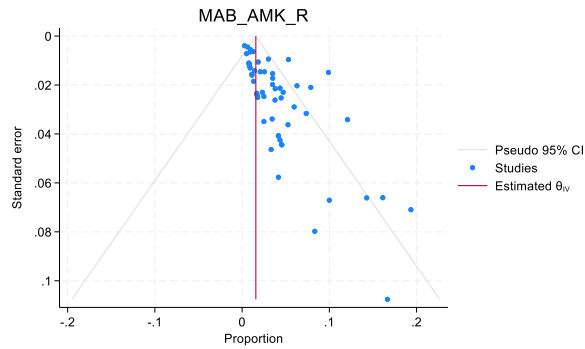
Meropenem

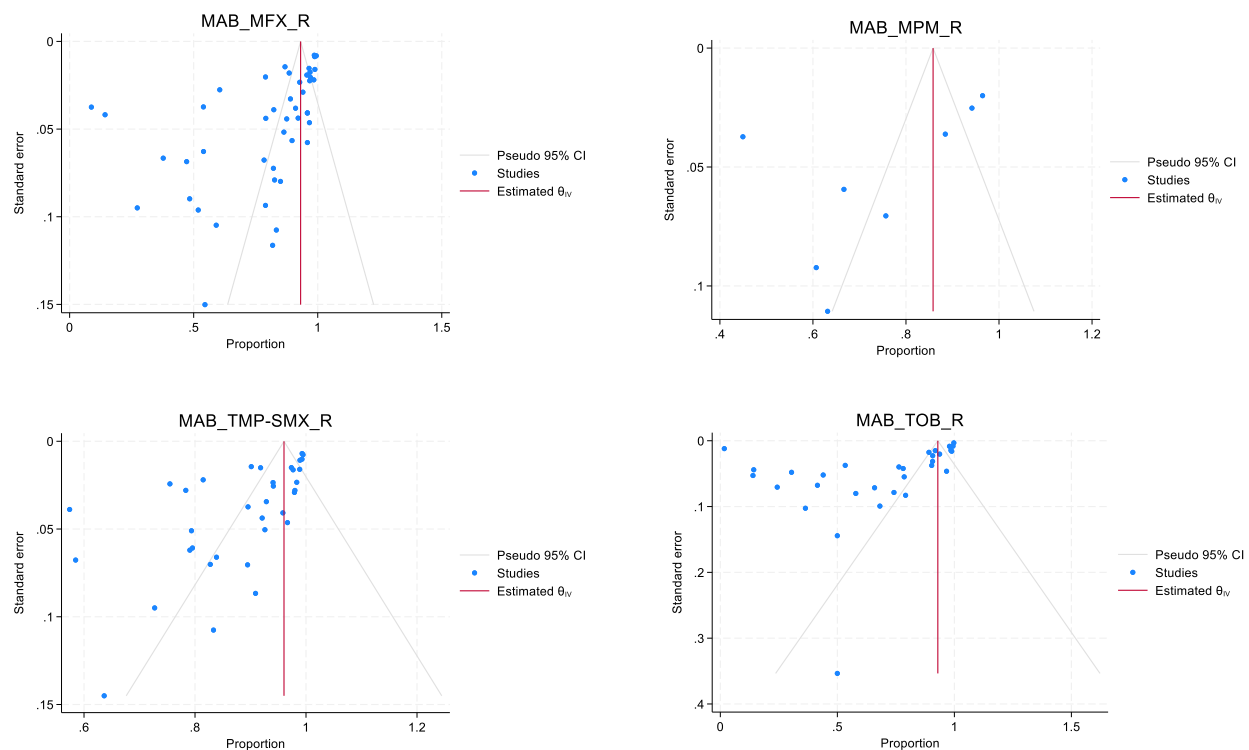




Supplementary Figure 2. Forest plots showing the global prevalence of drug-resistant *Mycobacterium abscessus* according to World Health Organization (WHO) regions (Region of the Americas, European Region, South-East Asia Region, and Western Pacific Region) estimated using a random-effects model. Countries were grouped according to the WHO regional classification: Region of the Americas (United States, Canada, Brazil, and Venezuela); European Region (France, Germany, Spain, Italy, Poland,

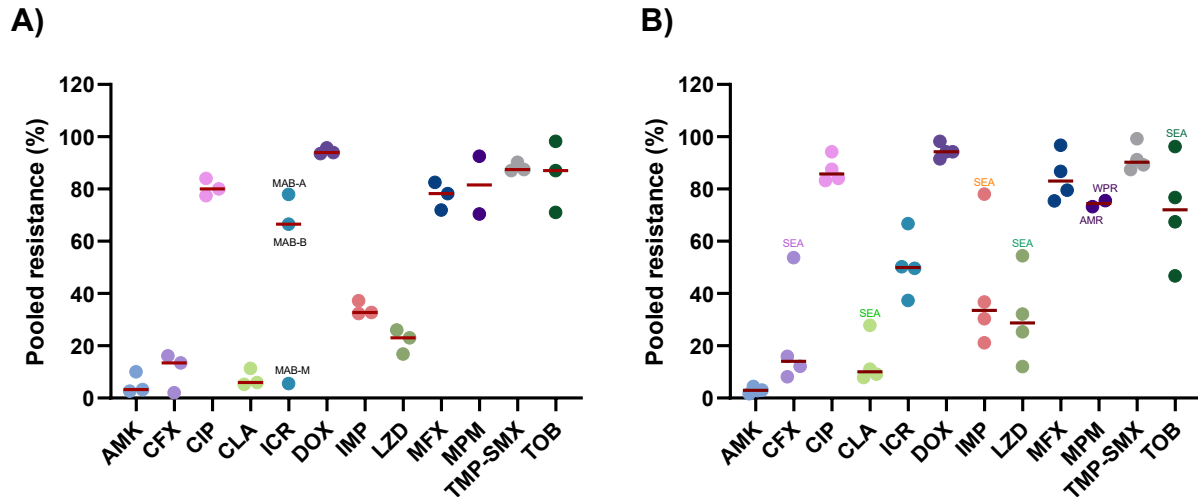
Portugal, Sweden, and Israel); South-East Asia Region (Thailand); and Western Pacific Region (Taiwan, South Korea, China, Australia, Singapore, Japan, and Malaysia).





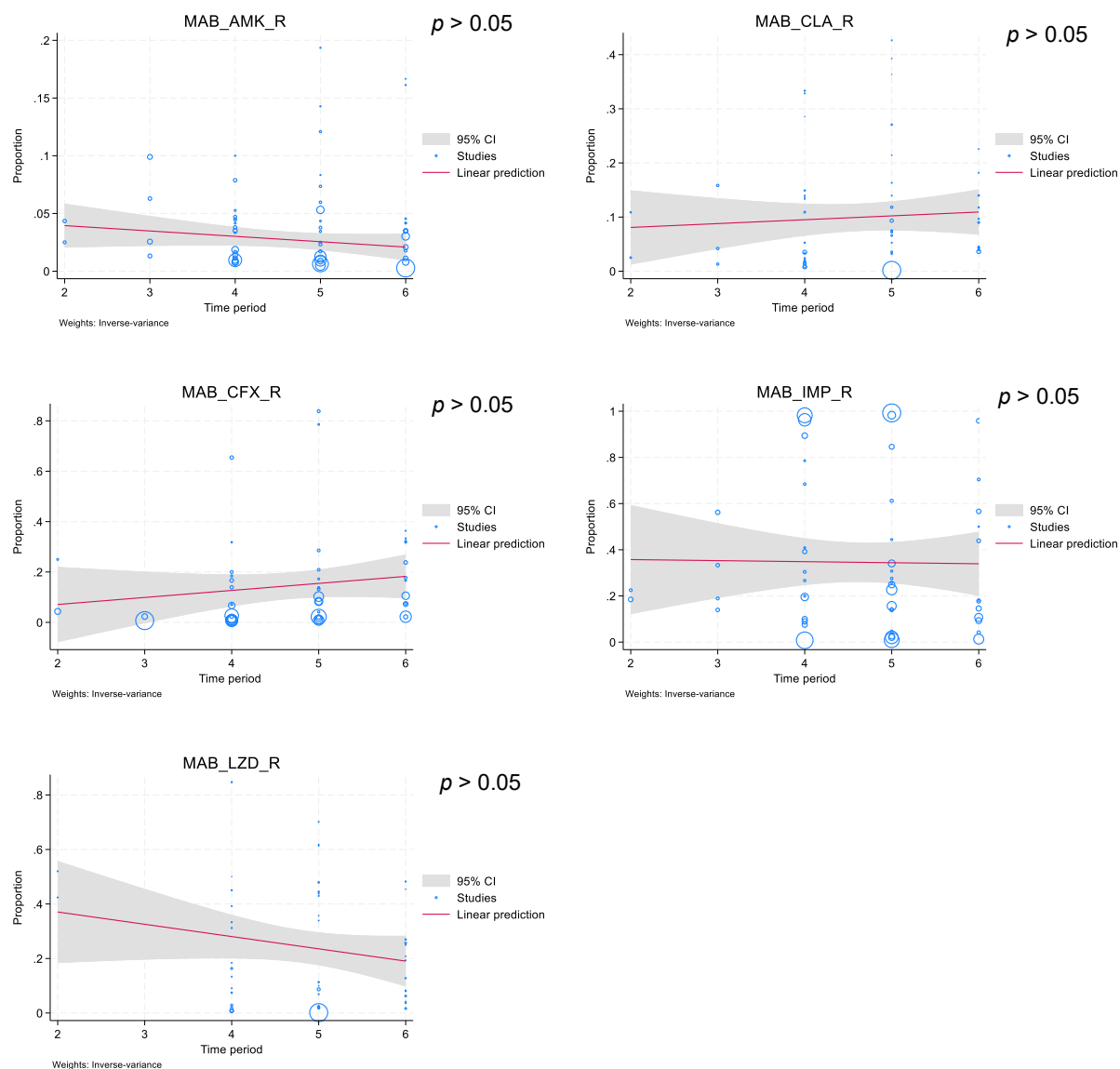
Supplementary Figure 3. Funnel plots assessing publication bias among the included studies on antimicrobial resistance in global *Mycobacterium abscessus* clinical isolates.

Abbreviations: AMK, amikacin; CFX, cefoxitin; CIP, ciprofloxacin; CLA, clarithromycin; ICR, inducible clarithromycin resistance; DOX, doxycycline; IMP, imipenem; LZD, linezolid; MFX, moxifloxacin; MPM, meropenem; TMP-SMX, trimethoprim–sulfamethoxazole; TOB, tobramycin; MAB, *Mycobacterium abscessus*; R, resistance.



Supplementary Figure 4. Distribution of the pooled resistance rates of 12 antimicrobial agents according to (A) *Mycobacterium abscessus* subspecies (MAB-A, *M. abscessus* subsp. *abscessus*; MAB-B, *M. abscessus* subsp. *bolletii*; and MAB-M, *M. abscessus* subsp. *massiliense*) and (B) World Health Organization (WHO) regions (Region of the Americas, European Region, South-East Asia Region, and Western Pacific Region). Meropenem data were available only for the Region of the Americas and the Western Pacific Region, and only for *M. abscessus* subsp. *abscessus* and *M. abscessus* subsp. *massiliense*.

Abbreviations: AMK, amikacin; CFX, cefoxitin; CIP, ciprofloxacin; CLA, clarithromycin; ICR, inducible clarithromycin resistance; DOX, doxycycline; IMP, imipenem; LZD, linezolid; MFX, moxifloxacin; MPM, meropenem; TMP-SMX, trimethoprim–sulfamethoxazole; TOB, tobramycin; SEA, South-East Asia Region; WPR, Western Pacific Region; and AMR, Region of the Americas.



Supplementary Figure 5. Meta-regression analysis of in vitro resistance to amikacin (AMK), clarithromycin (CLA), cefoxitin (CFX), imipenem (IMP), and linezolid (LZD) among global *Mycobacterium abscessus* (MAB) isolates from 2001 to 2025. Time periods (year) were defined as follows: 2 = 2000–2005; 3 = 2006–2010; 4 = 2011–2015; 5 = 2016–2020; and 6 = 2021–2025.