



EUCAST

European Committee
on Antimicrobial
Susceptibility Testing

Streptococcus pneumoniae

Calibration of zone diameter
breakpoints to MIC values

Version 11.0
January 2026

Streptococcus pneumoniae

MIC and zone diameter correlates

- The following histograms present inhibition zone diameter distributions from EUCAST antimicrobial susceptibility testing. In most, the different colours of the bars indicate different MIC values. In some, the colours of the bars indicate a resistance gene or a resistance mechanism.
- The distributions include data for wild-type isolates and for isolates with acquired resistance mechanisms. A large number of isolates with MIC values close to the edge of the wild-type distribution and/or close to EUCAST clinical breakpoints were intentionally included. These distributions can not be used to infer resistance rates or the performance of the tests with routine isolates.
- For some agents, isolates were tested on more than one occasion, including parallel tests with disks and media from several manufacturers. When this is the case, data are presented as both the “number of isolates tested” and the “total number of MIC-zone diameter correlates”, including replicate tests and parallel tests with disks and media from different sources.

Streptococcus pneumoniae

Materials and methods

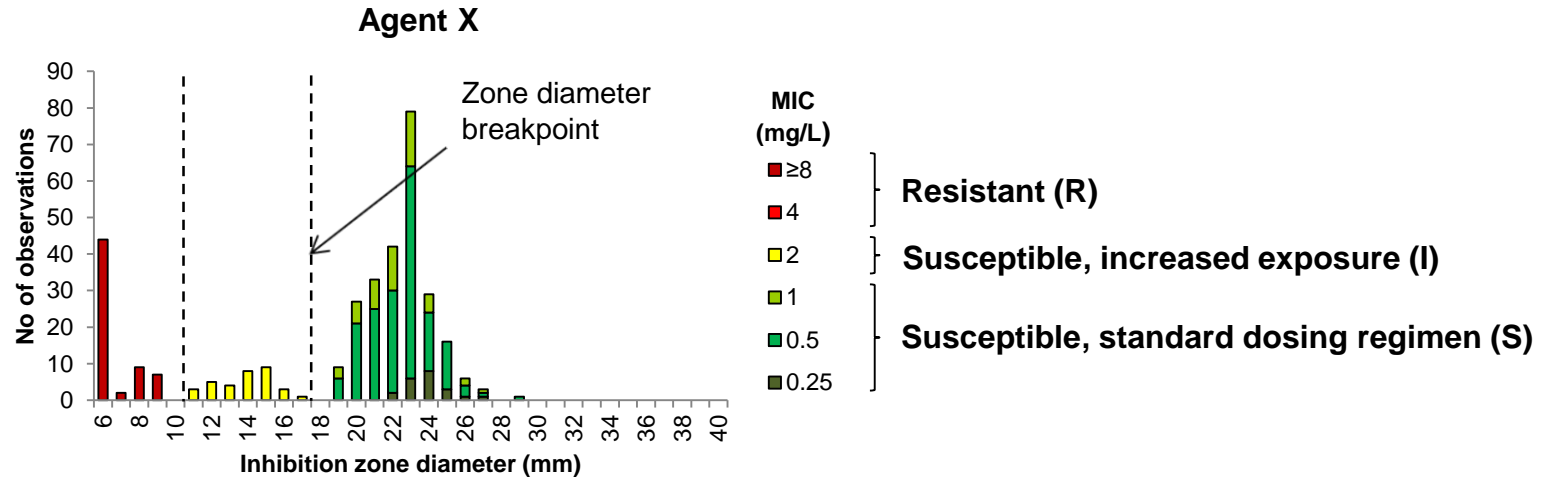
- Antimicrobial susceptibility testing was performed on clinical isolates of *Streptococcus pneumoniae*, including isolates with known resistance mechanisms. Disk diffusion was performed on MH-F media according to EUCAST methodology and MIC determination was performed with the ISO broth microdilution method using MH-F broth or gradient tests.
- Several distributions of MIC vs. zone diameter in this presentation are the result of a collaboration between EUCAST, JMI Laboratories (US) and Hospital Universitari de Bellvitge (Barcelona, Spain).
- This presentation is based on EUCAST Clinical Breakpoint Tables v. 16.0.

Changes from previous version (10.0)

Changes
<ul style="list-style-type: none">• MIC and zone diameter breakpoints changed for trimethoprim-sulfamethoxazole.

Explanation of graphs:

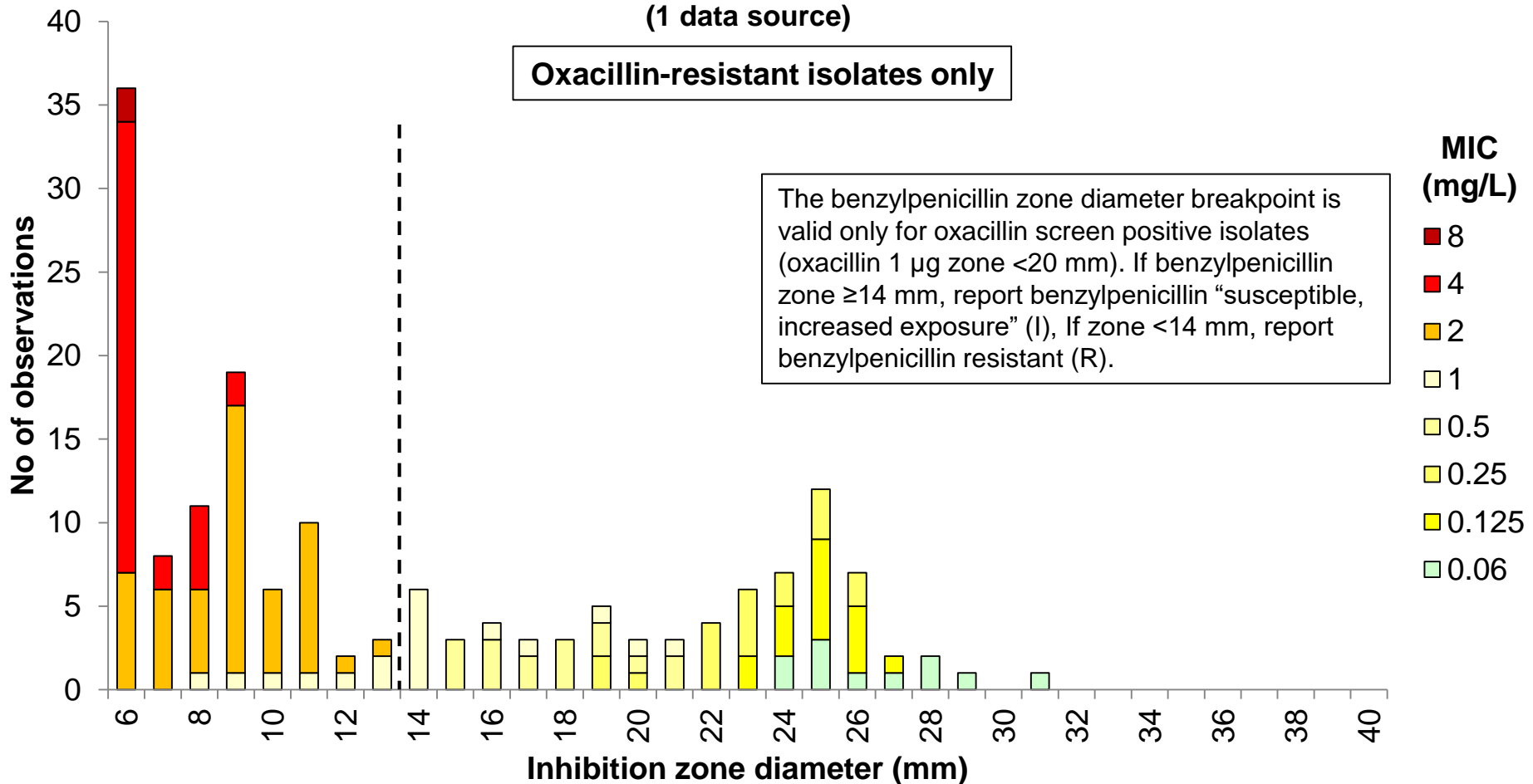
- These graphs show zone diameter distributions with MIC values or resistance mechanisms as coloured bars. Colours are related to current EUCAST MIC breakpoints.



Benzylpenicillin 1 unit vs. MIC

S. pneumoniae, 84 isolates (167 correlates)

(1 data source)



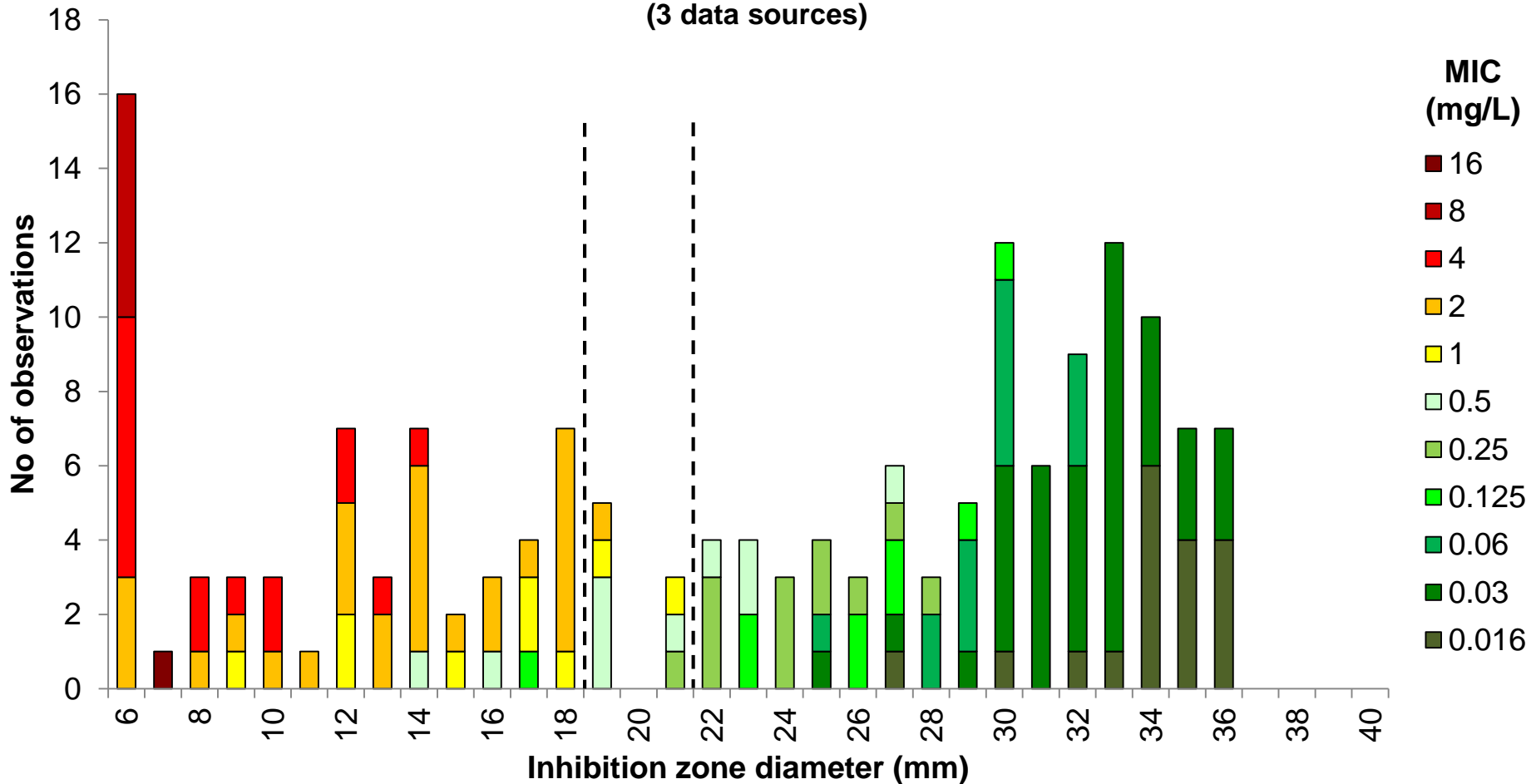
Breakpoints (non-meningitis, non-endocarditis)

MIC	$S \leq 0.06$, $R > 1$ mg/L
Zone diameter	$R < 14$ mm

Ampicillin 2 µg vs. MIC

S. pneumoniae, 163 isolates

(3 data sources)



Breakpoints (non-meningitis, non-endocarditis)

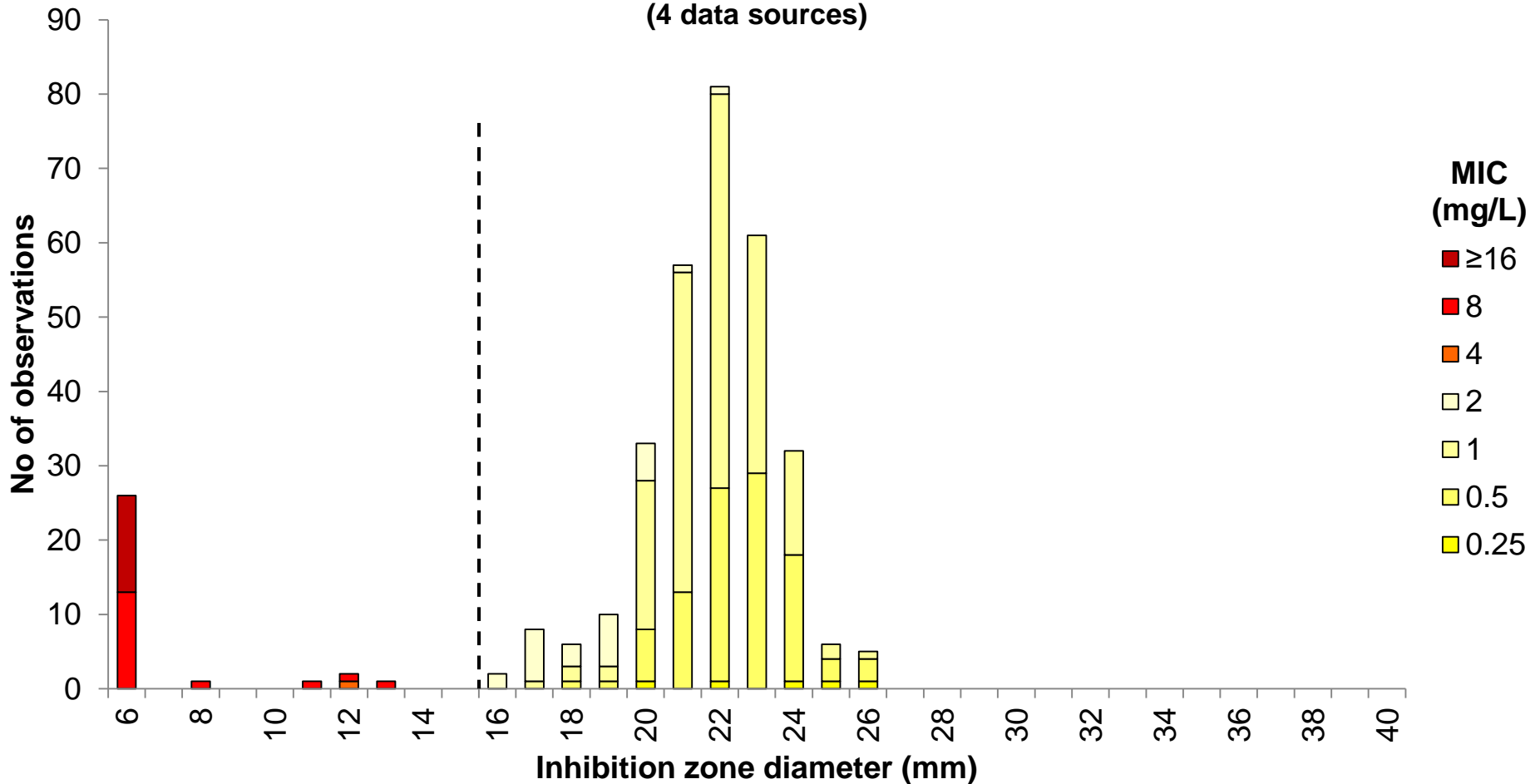
MIC $S \leq 0.5$, $R > 1$ mg/L

Zone diameter $S \geq 22$, $R < 19$ mm

Levofloxacin 5 μ g vs. MIC

S. pneumoniae, 139 isolates (332 correlates)

(4 data sources)



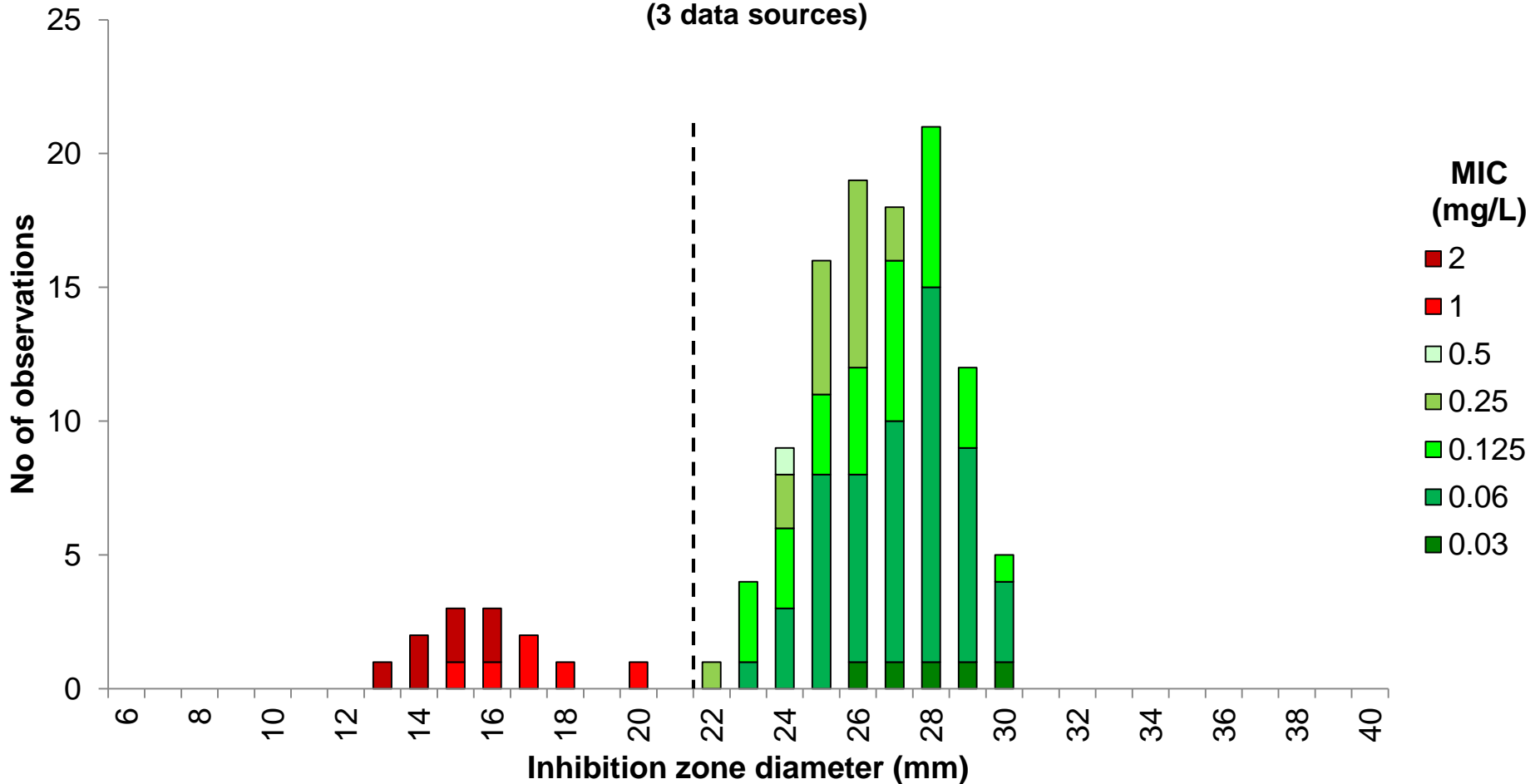
Breakpoints

MIC $S \leq 0.001$, $R > 2$ mg/L

Zone diameter $S \geq 50$, $R < 16$ mm

Moxifloxacin 5 µg vs. MIC *S. pneumoniae*, 118 isolates

(3 data sources)



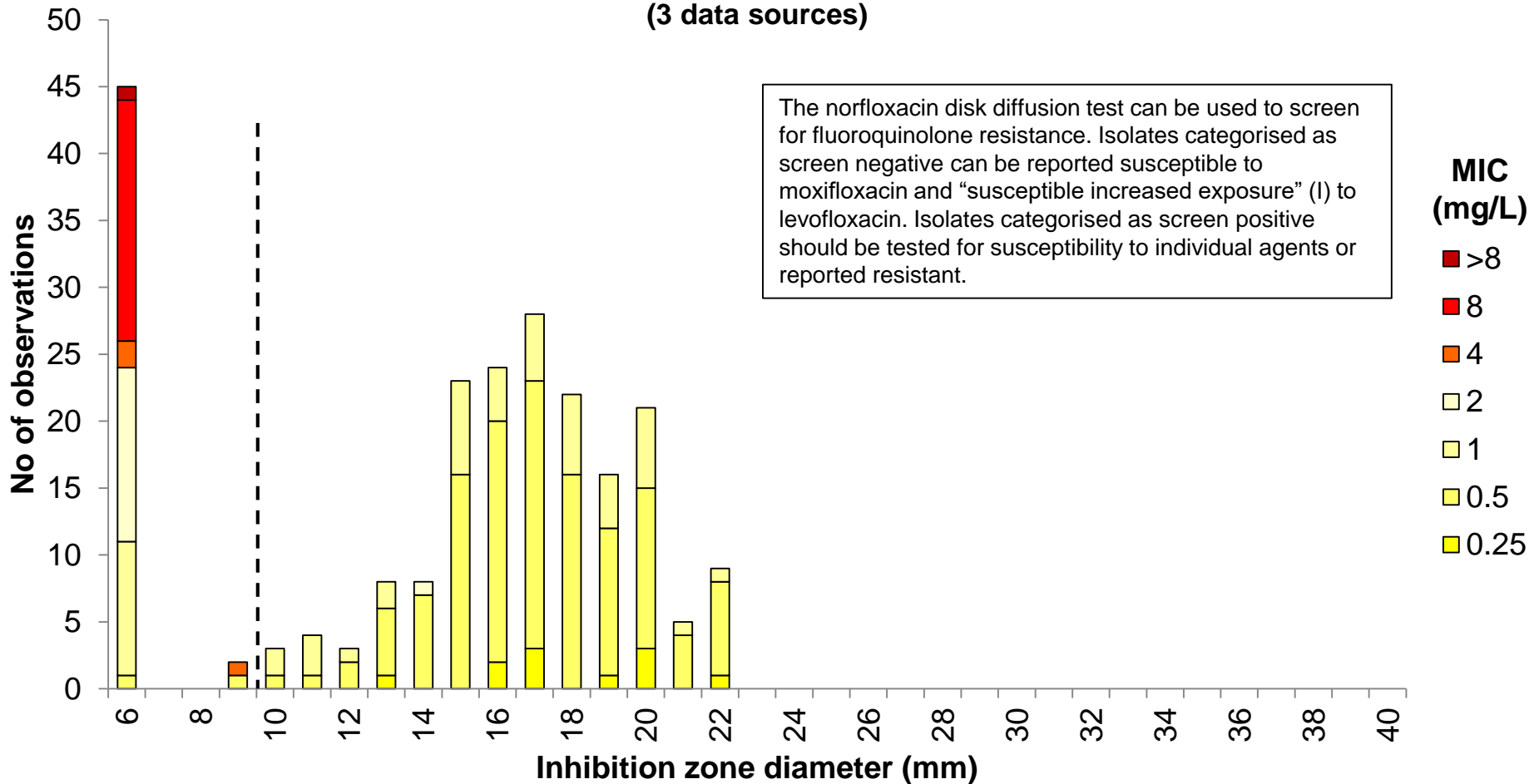
Breakpoints

MIC	$S \leq 0.5$, $R > 0.5$ mg/L
Zone diameter	$S \geq 22$, $R < 22$ mm

Norfloxacin 10 µg vs. Levofloxacin MIC

S. pneumoniae, 171 isolates (221 correlates)

(3 data sources)



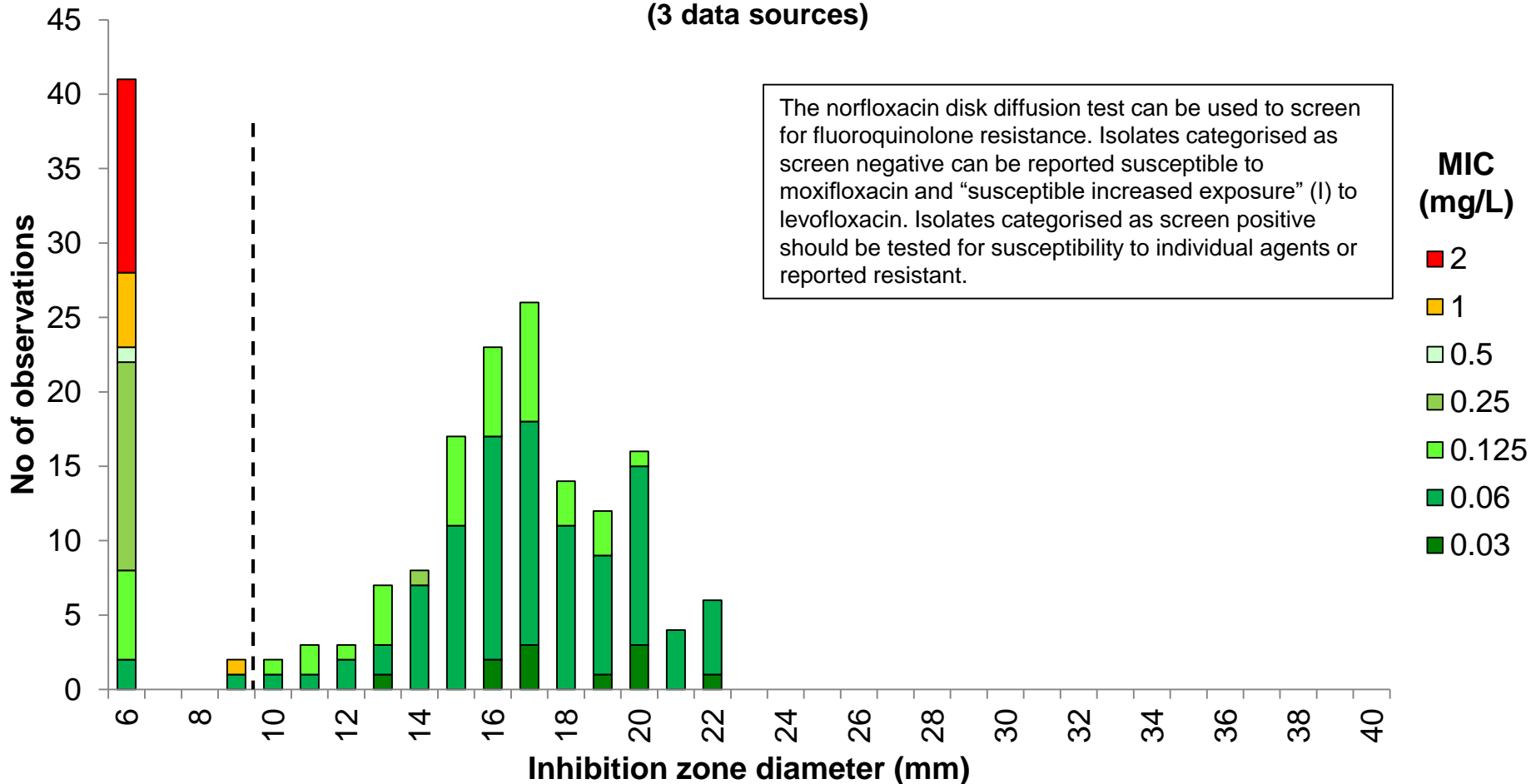
The norfloxacin disk diffusion test can be used to screen for fluoroquinolone resistance. Isolates categorised as screen negative can be reported susceptible to moxifloxacin and “susceptible increased exposure” (I) to levofloxacin. Isolates categorised as screen positive should be tested for susceptibility to individual agents or reported resistant.

Breakpoints
 Levofloxacin MIC $S \leq 0.001$, $R > 2$ mg/L
 Norfloxacin zone diameter (screen) $S \geq 10$, $R < 10$ mm

Norfloxacin 10 µg vs. Moxifloxacin MIC

S. pneumoniae, 136 isolates (184 correlates)

(3 data sources)



The norfloxacin disk diffusion test can be used to screen for fluoroquinolone resistance. Isolates categorised as screen negative can be reported susceptible to moxifloxacin and “susceptible increased exposure” (I) to levofloxacin. Isolates categorised as screen positive should be tested for susceptibility to individual agents or reported resistant.

MIC
(mg/L)

- 2
- 1
- 0.5
- 0.25
- 0.125
- 0.06
- 0.03

Breakpoints

Moxifloxacin MIC

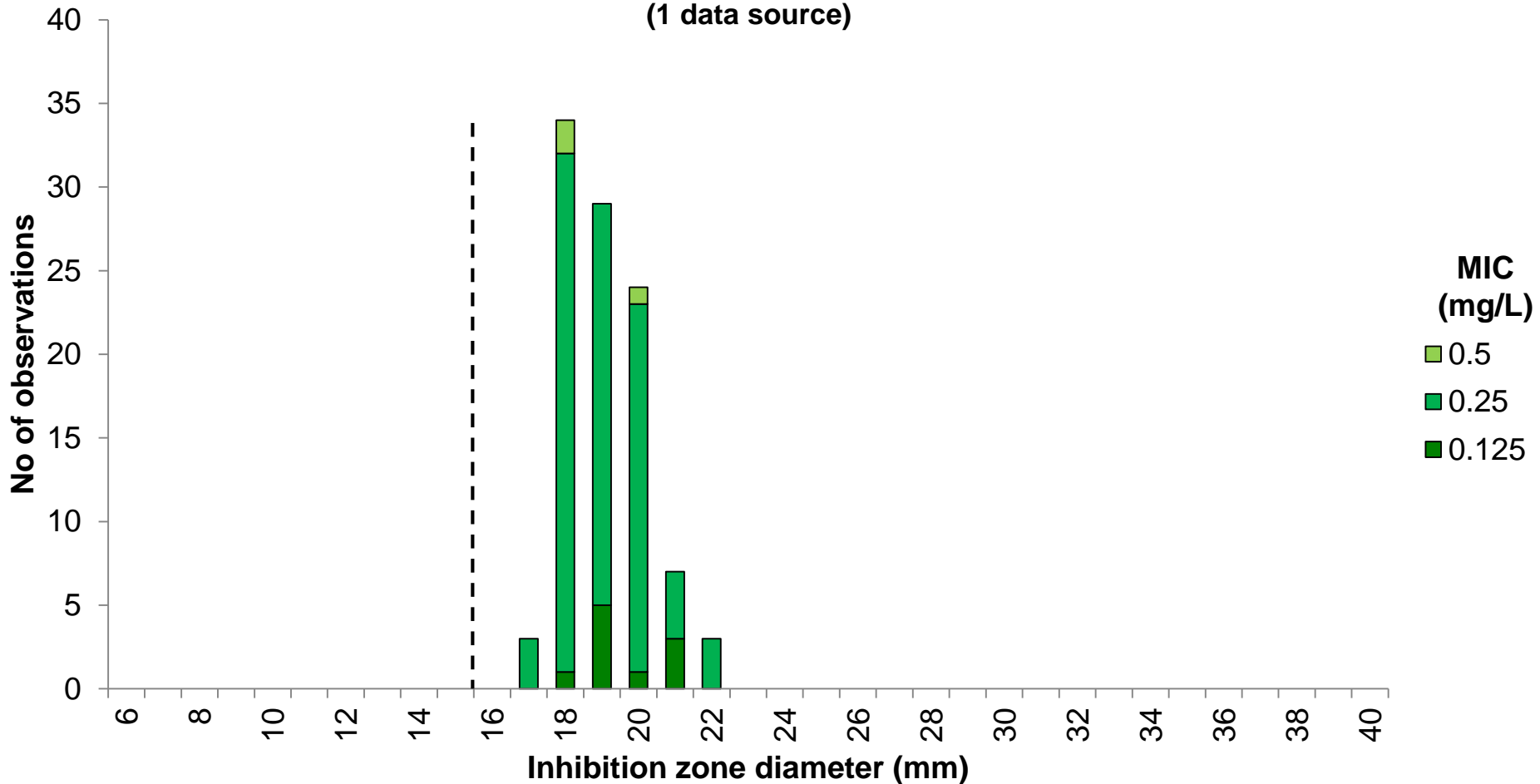
$S \leq 0.5$, $R > 0.5$ mg/L

Norfloxacin zone diameter (screen)

$S \geq 10$, $R < 10$ mm

Vancomycin 5 µg vs. MIC *S. pneumoniae*, 100 isolates

(1 data source)



Breakpoints

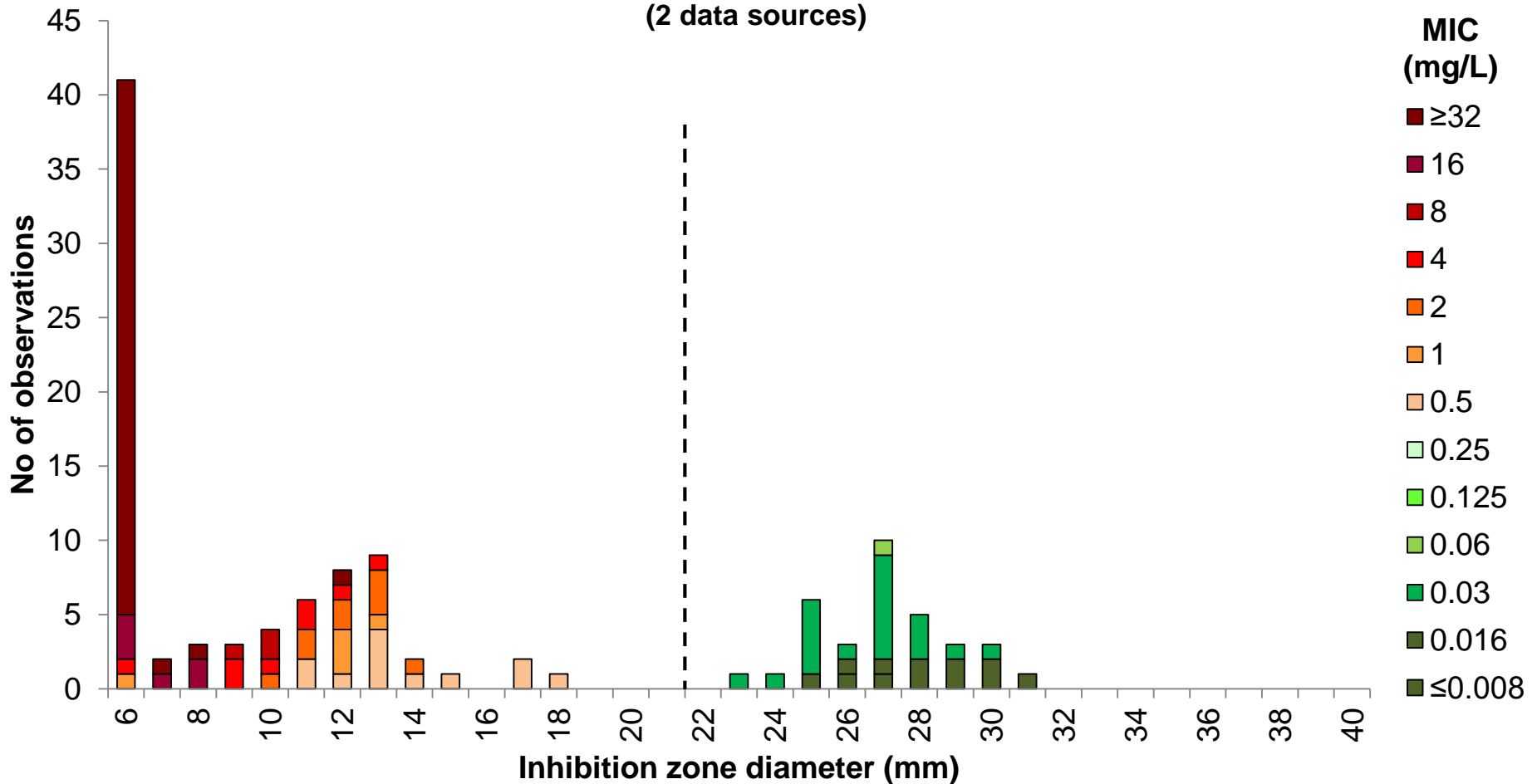
MIC $S \leq 2$, $R > 2$ mg/L

Zone diameter $S \geq 16$, $R < 16$ mm

Erythromycin 15 µg vs. MIC

S. pneumoniae, 105 isolates (115 correlates)

(2 data sources)



Breakpoints

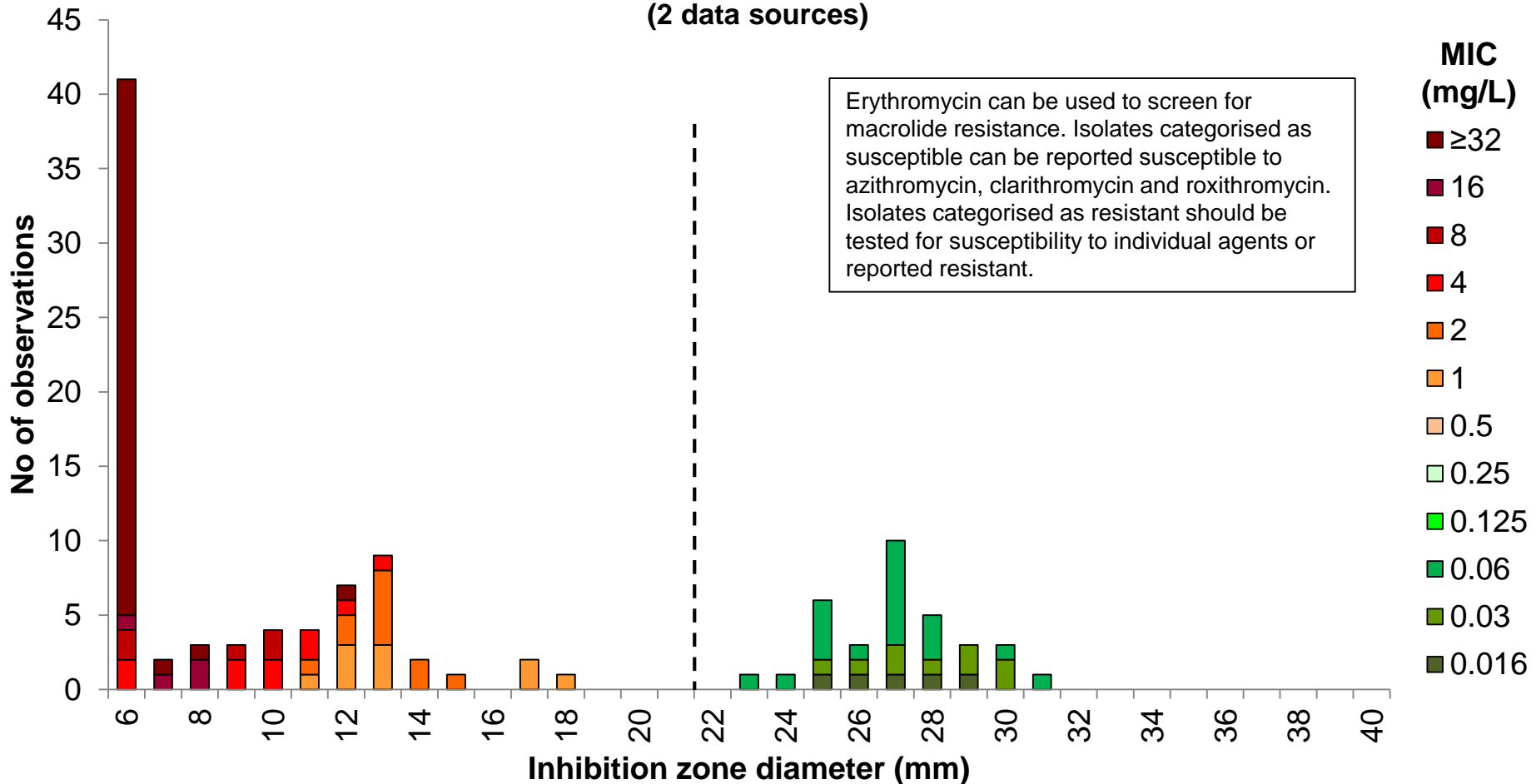
MIC S ≤ 0.25, R > 0.25 mg/L

Zone diameter S ≥ 22, R < 22 mm

Erythromycin 15 µg vs. Azithromycin MIC

S. pneumoniae, 104 isolates (112 correlates)

(2 data sources)



Breakpoints

Azithromycin MIC

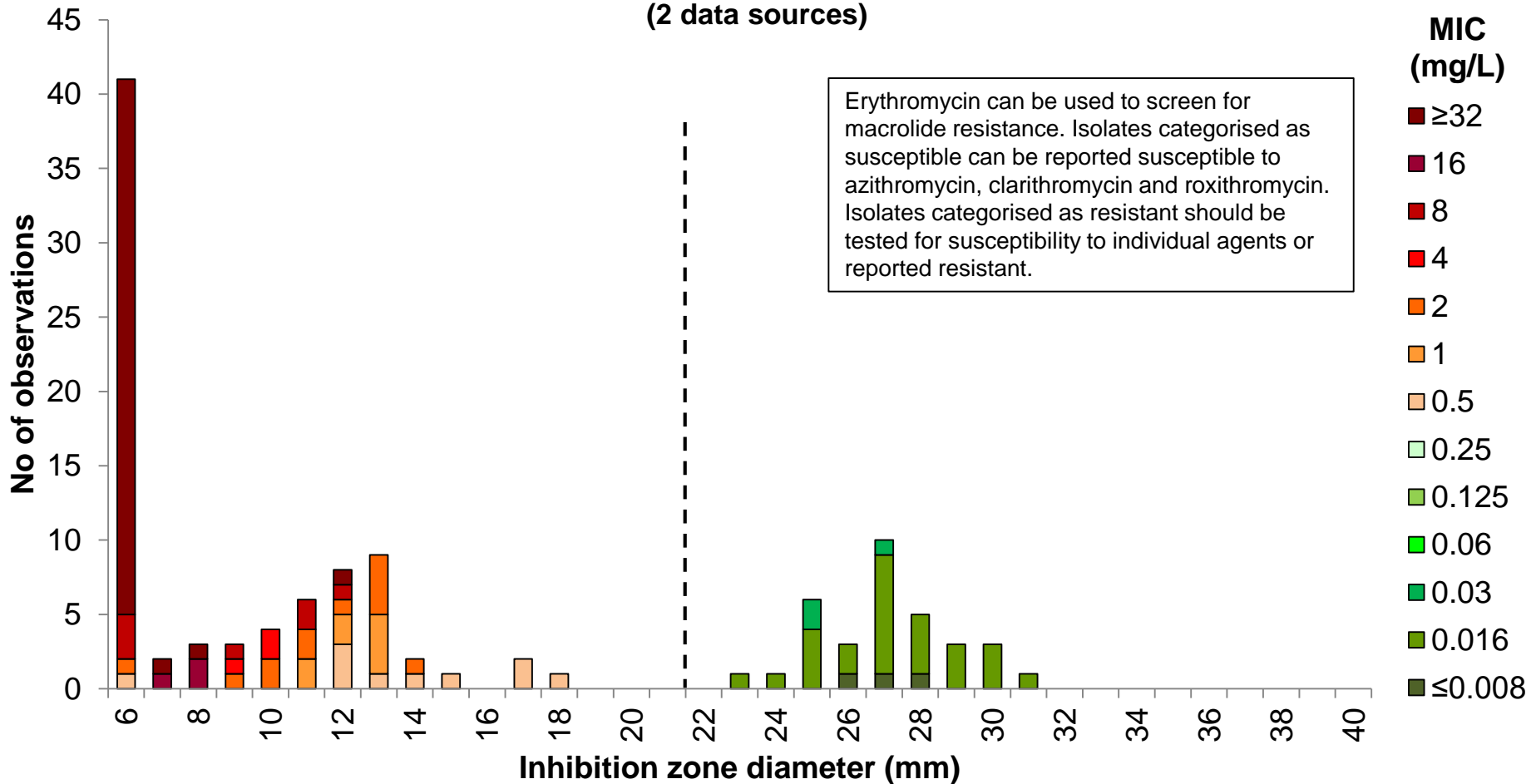
S ≤ 0.25, R > 0.25 mg/L

Erythromycin zone diameter

S ≥ 22, R < 22 mm

Erythromycin 15 µg vs. Clarithromycin MIC *S. pneumoniae*, 105 isolates (115 correlates)

(2 data sources)



Breakpoints

Clarithromycin MIC

S ≤ 0.25, R > 0.25 mg/L

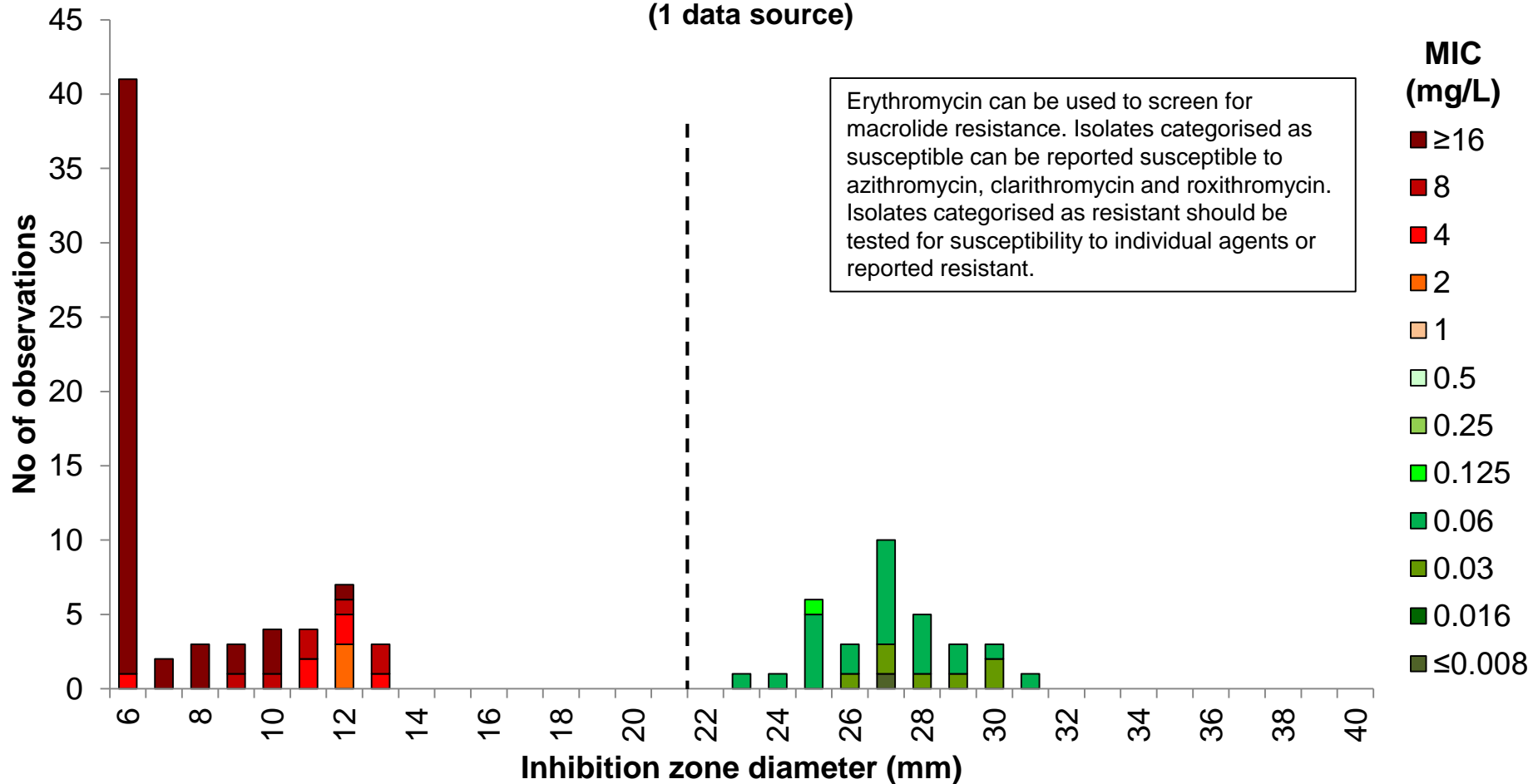
Erythromycin zone diameter

S ≥ 22, R < 22 mm

Erythromycin 15 µg vs. Roxithromycin MIC

S. pneumoniae, 100 isolates

(1 data source)



Breakpoints

Roxithromycin MIC

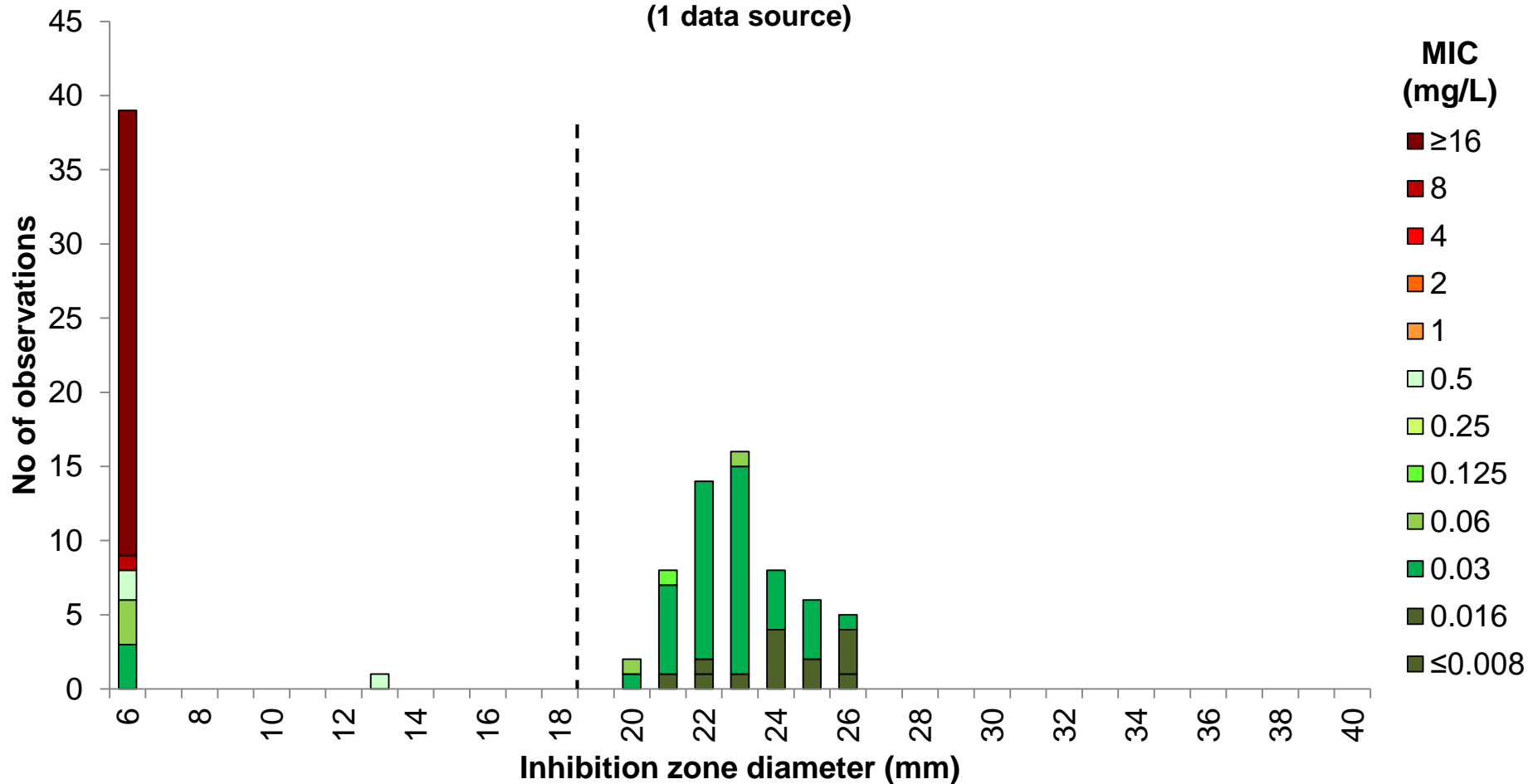
S ≤ 0.5, R > 0.5 mg/L

Erythromycin zone diameter

S ≥ 22, R < 22 mm

Clindamycin 2 µg vs. MIC *S. pneumoniae*, 99 isolates

(1 data source)



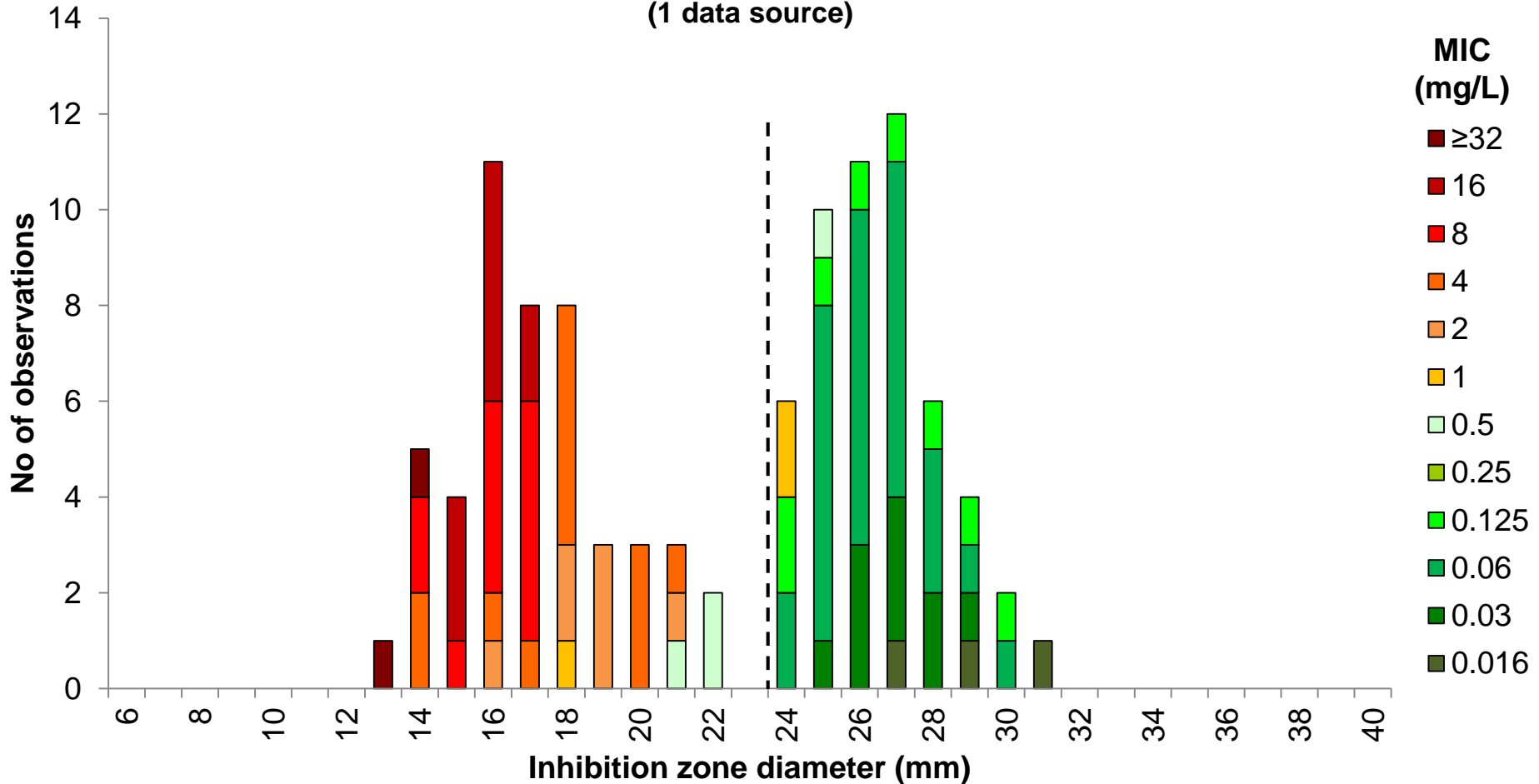
Breakpoints

MIC $S \leq 0.5$, $R > 0.5$ mg/L

Zone diameter $S \geq 19$, $R < 19$ mm

Minocycline 30 µg vs. MIC *S. pneumoniae*, 100 isolates

(1 data source)



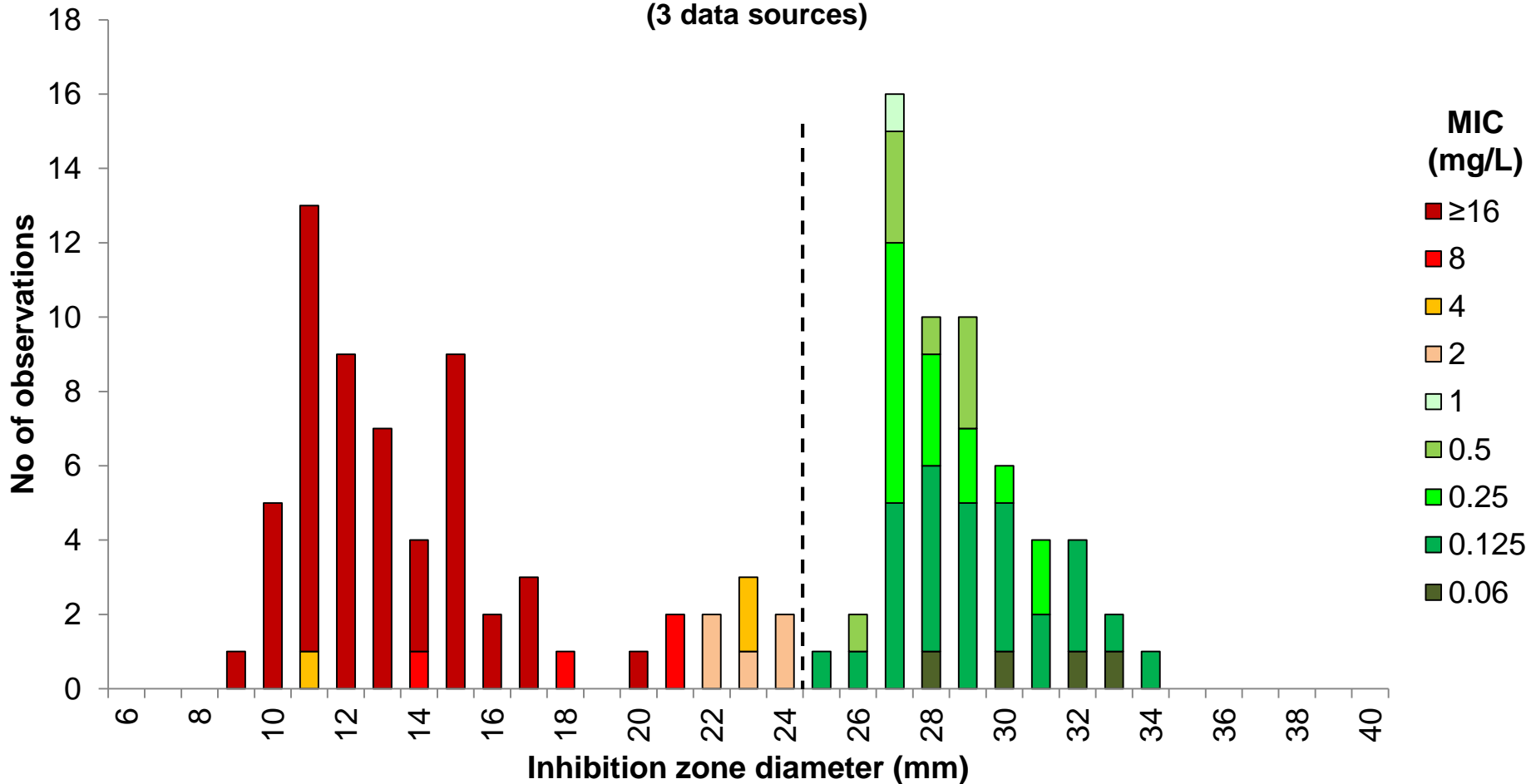
Breakpoints

MIC S ≤ 0.5 , R > 0.5 mg/L

Zone diameter S ≥ 24 , R < 24 mm

Tetracycline 30 µg vs. MIC *S. pneumoniae*, 120 isolates

(3 data sources)



Breakpoints

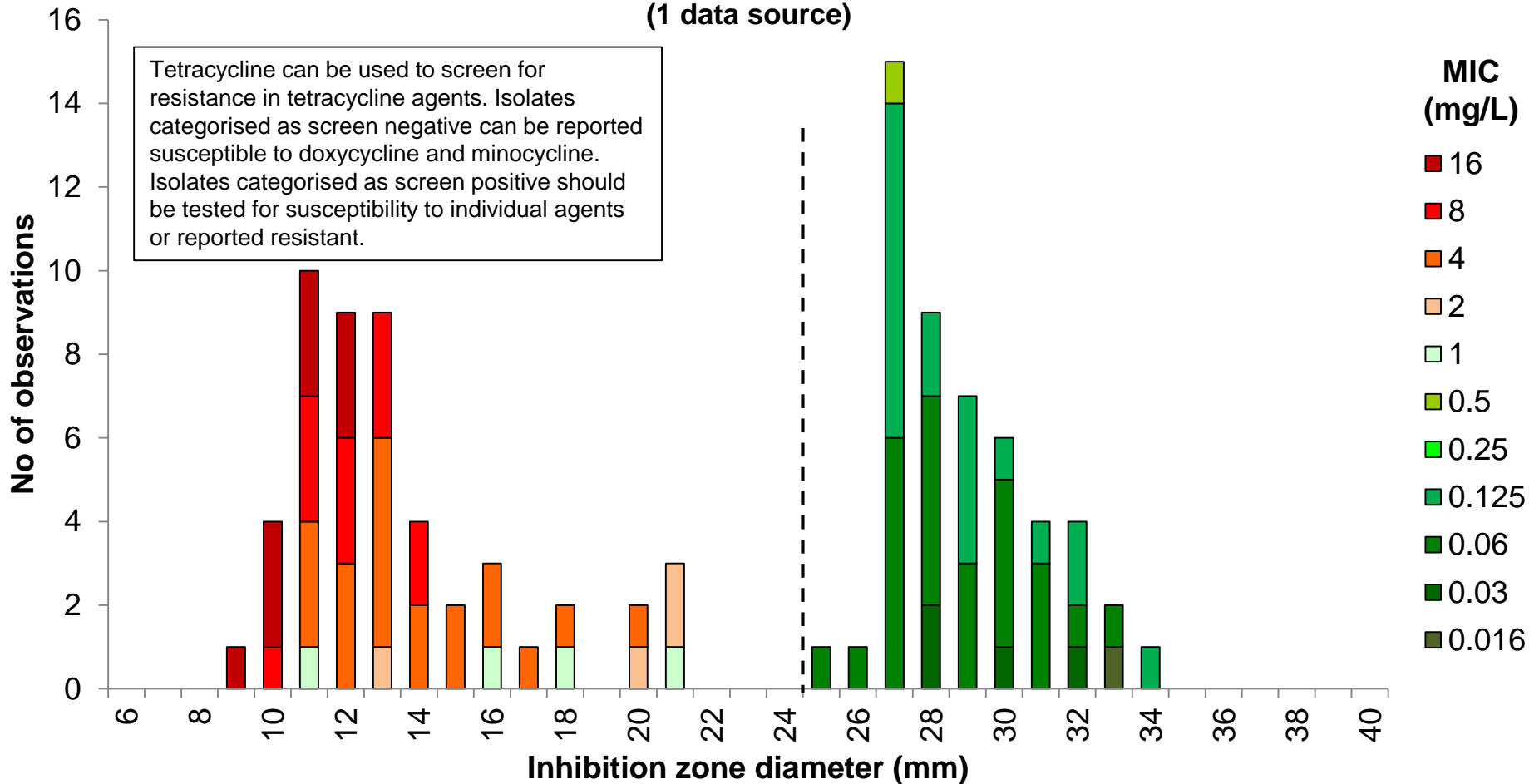
MIC S ≤ 1, R > 1 mg/L

Zone diameter S ≥ 25, R < 25 mm

Tetracycline 30 µg vs. Doxycycline MIC

S. pneumoniae, 100 isolates

(1 data source)



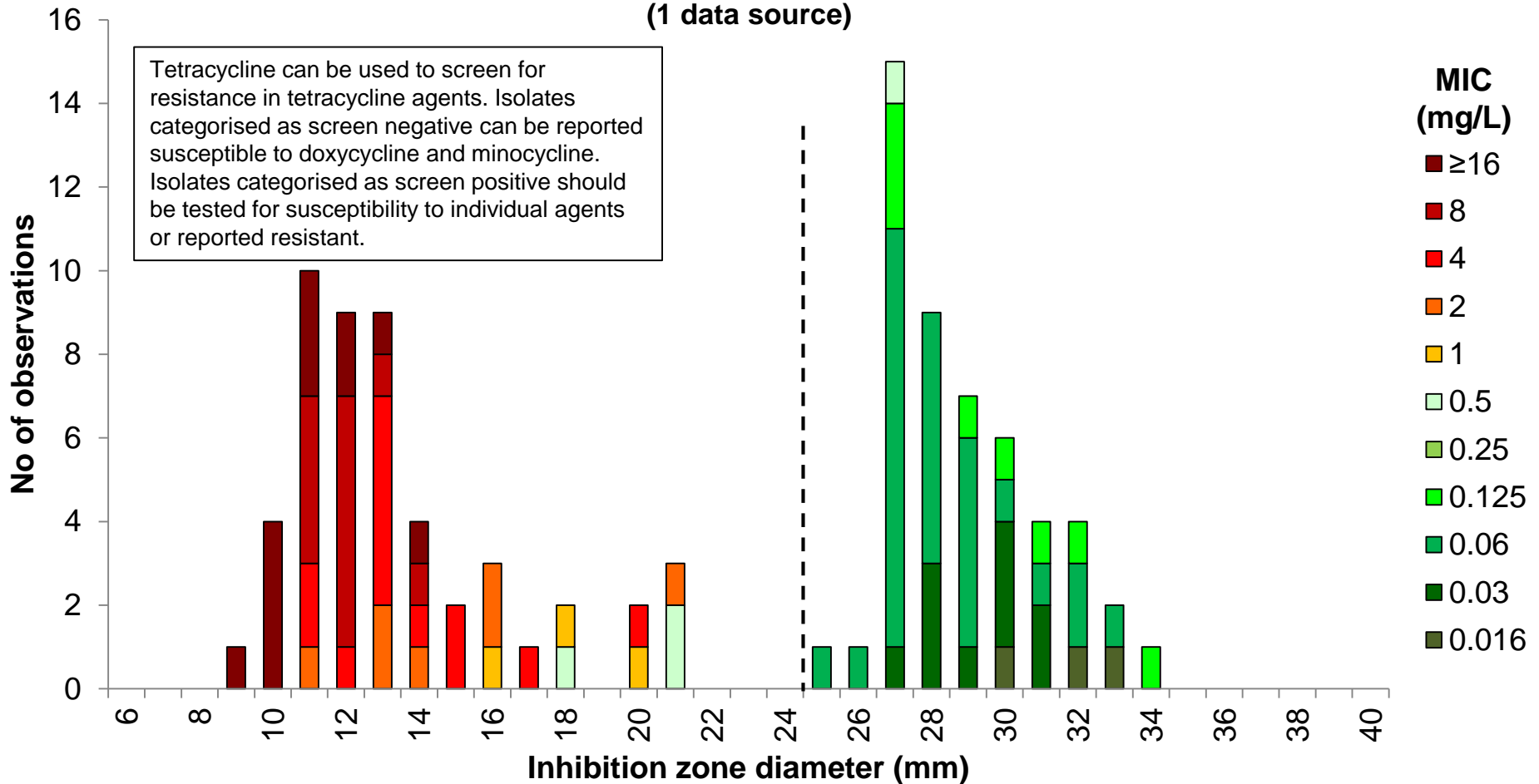
Tetracycline can be used to screen for resistance in tetracycline agents. Isolates categorised as screen negative can be reported susceptible to doxycycline and minocycline. Isolates categorised as screen positive should be tested for susceptibility to individual agents or reported resistant.

Breakpoints
 Doxycycline MIC: $S \leq 1, R > 1$ mg/L
 Tetracycline zone diameter: $S \geq 25, R < 25$ mm

Tetracycline 30 µg vs. Minocycline MIC

S. pneumoniae, 100 isolates

(1 data source)



Breakpoints

Minocycline MIC

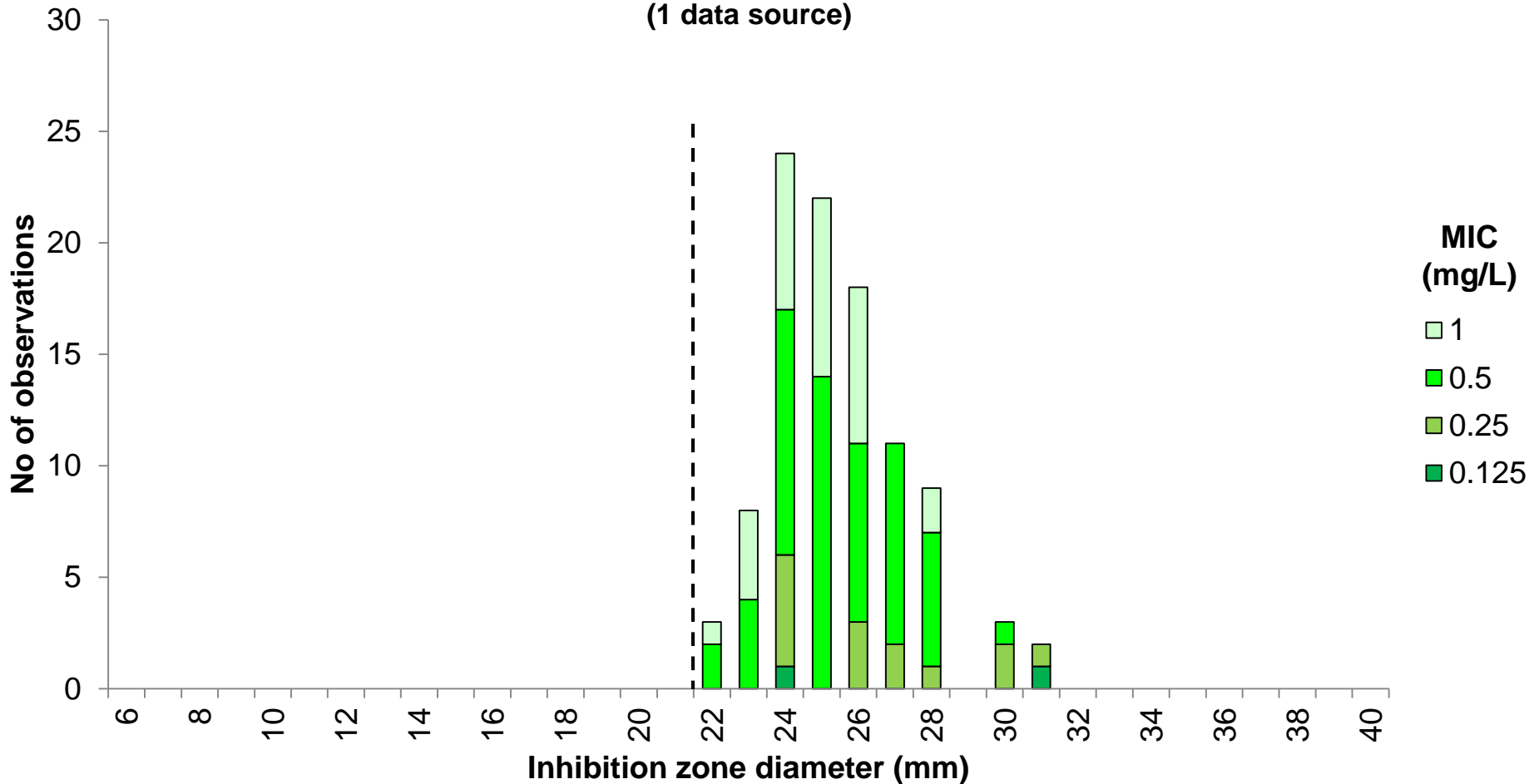
$S \leq 0.5$, $R > 0.5$ mg/L

Tetracycline zone diameter

$S \geq 25$, $R < 25$ mm

Linezolid 10 µg vs. MIC *S. pneumoniae*, 100 isolates

(1 data source)



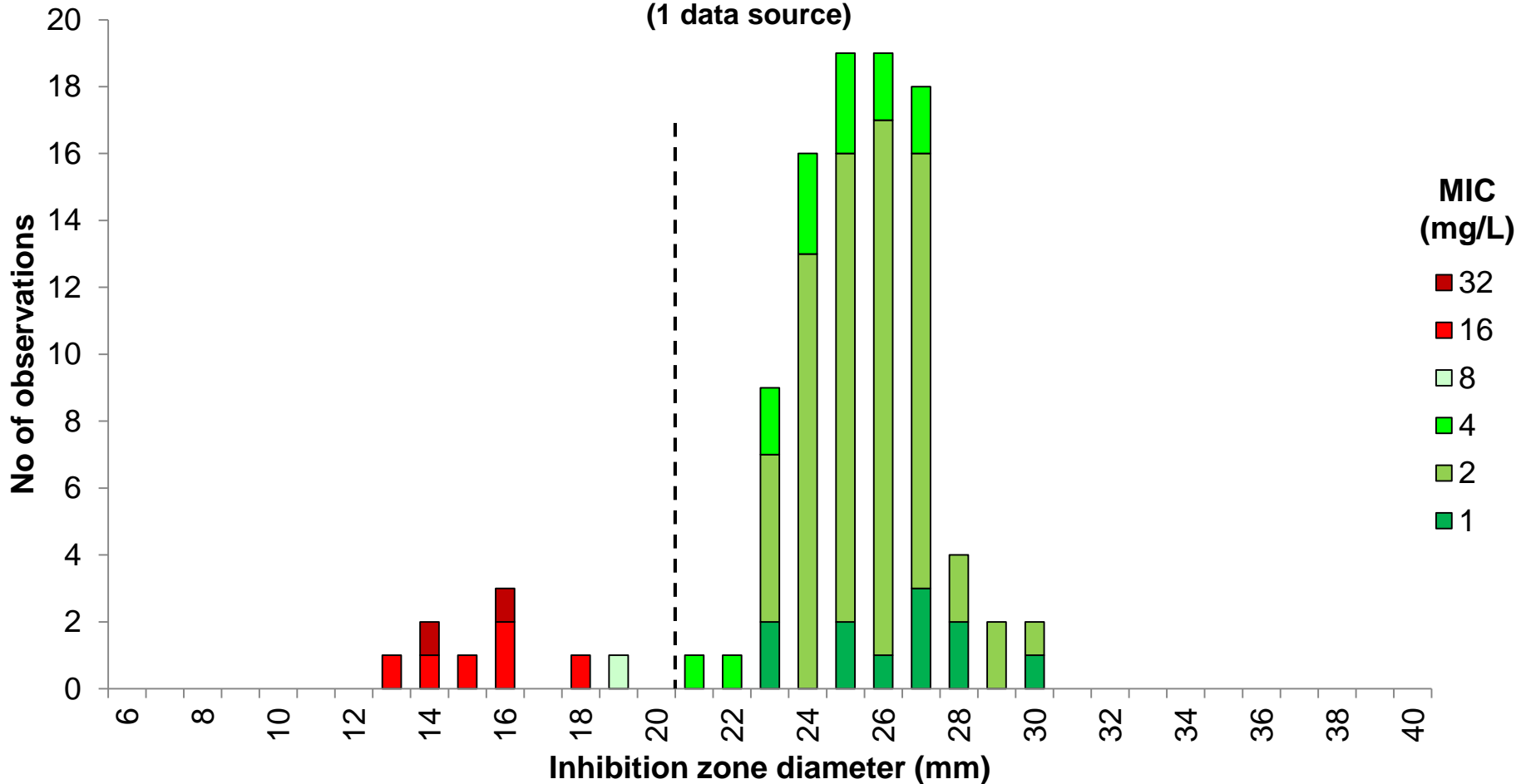
Breakpoints

MIC $S \leq 2$, $R > 2$ mg/L

Zone diameter $S \geq 22$, $R < 22$ mm

Chloramphenicol 30 µg vs. MIC *S. pneumoniae*, 100 isolates

(1 data source)

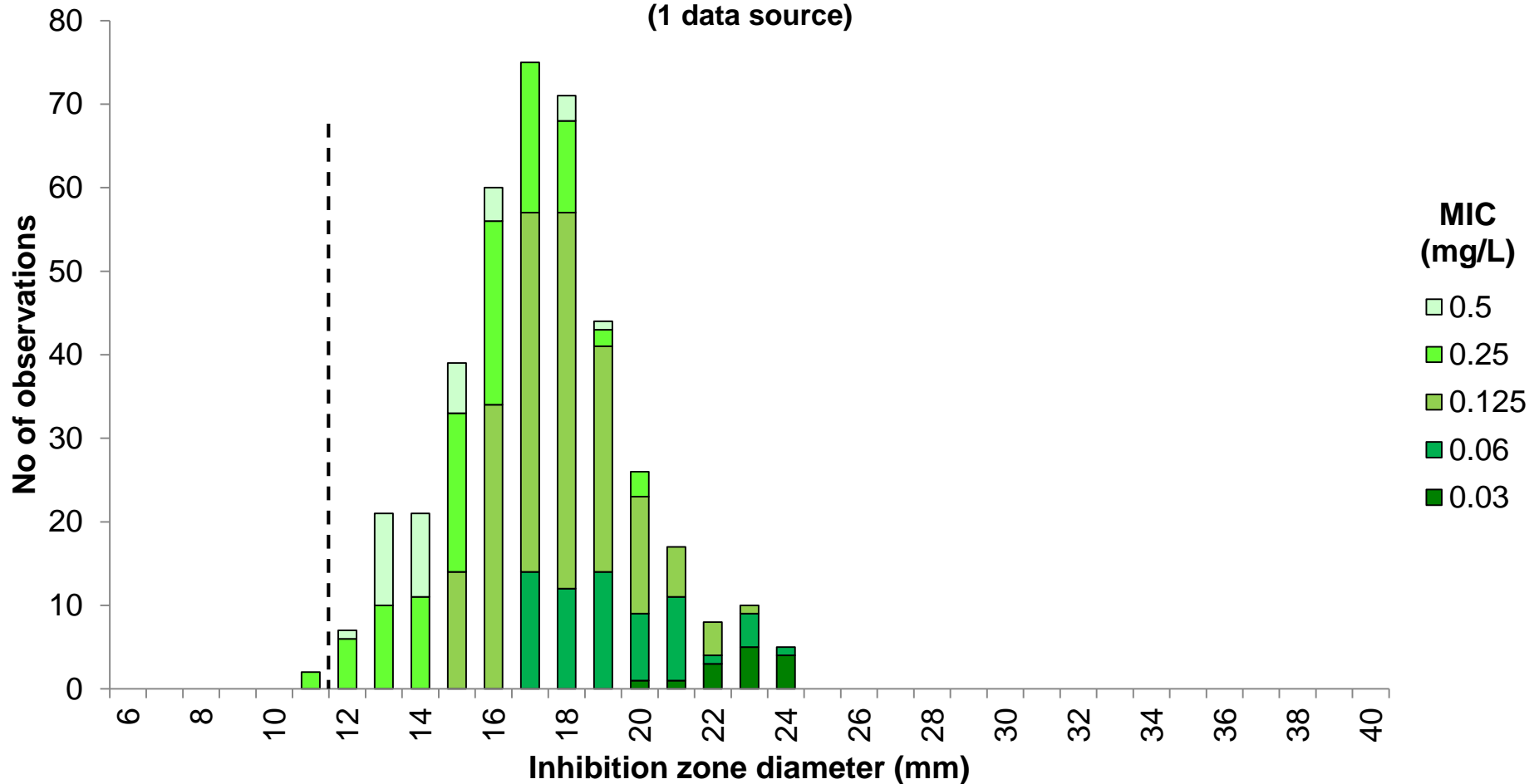


No clinical breakpoints. ECOFFs (MIC 8 mg/L, zone diameter 21 mm) can be used to distinguish wild-type isolates from isolates with acquired resistance.

Lefamulin 5 µg vs. MIC

S. pneumoniae, 102 isolates (406 correlates)

(1 data source)



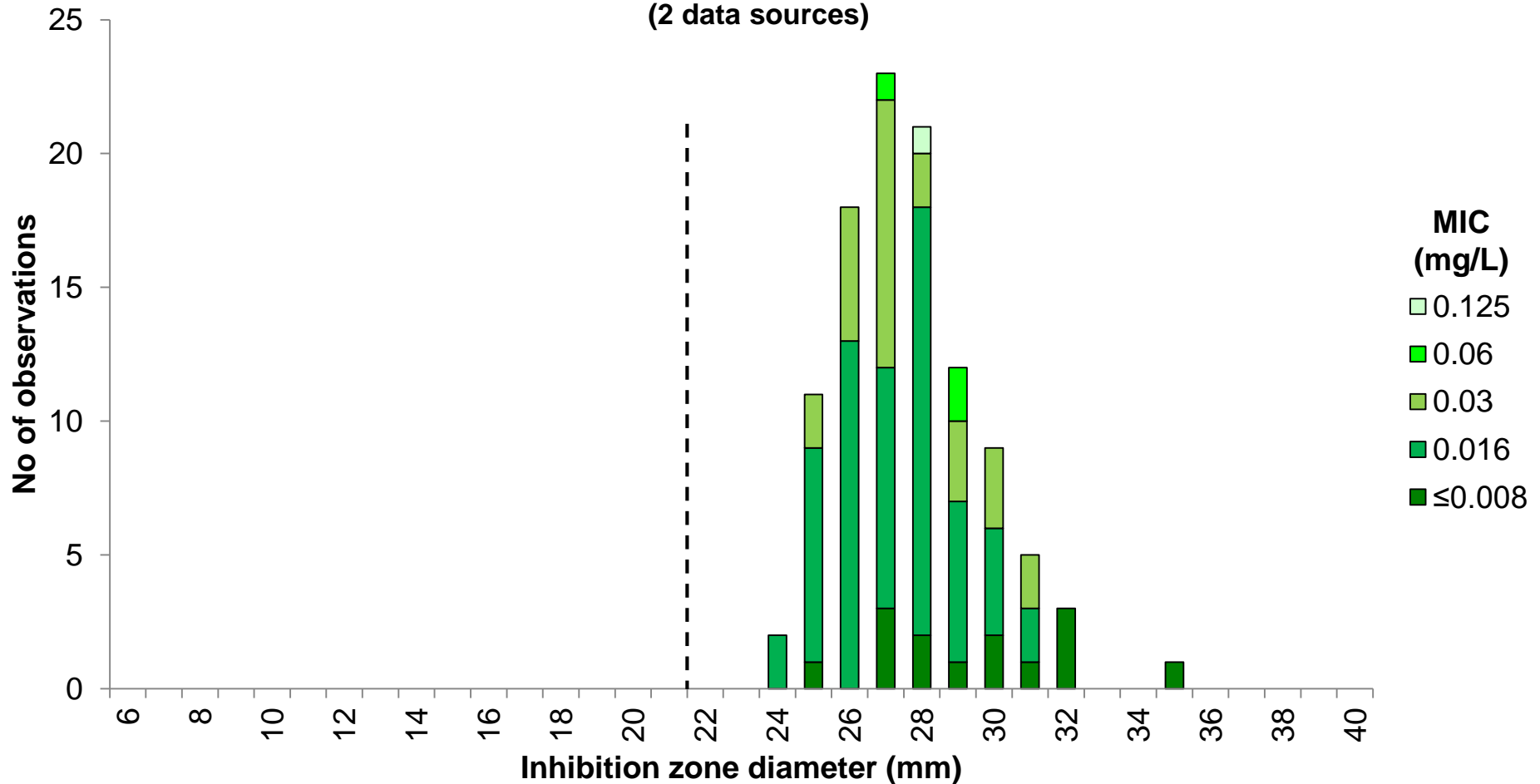
Breakpoints

MIC	S ≤ 0.5, R > 0.5 mg/L
Zone diameter	S ≥ 12, R < 12 mm

Rifampicin 5 µg vs. MIC

S. pneumoniae, 105 isolates

(2 data sources)



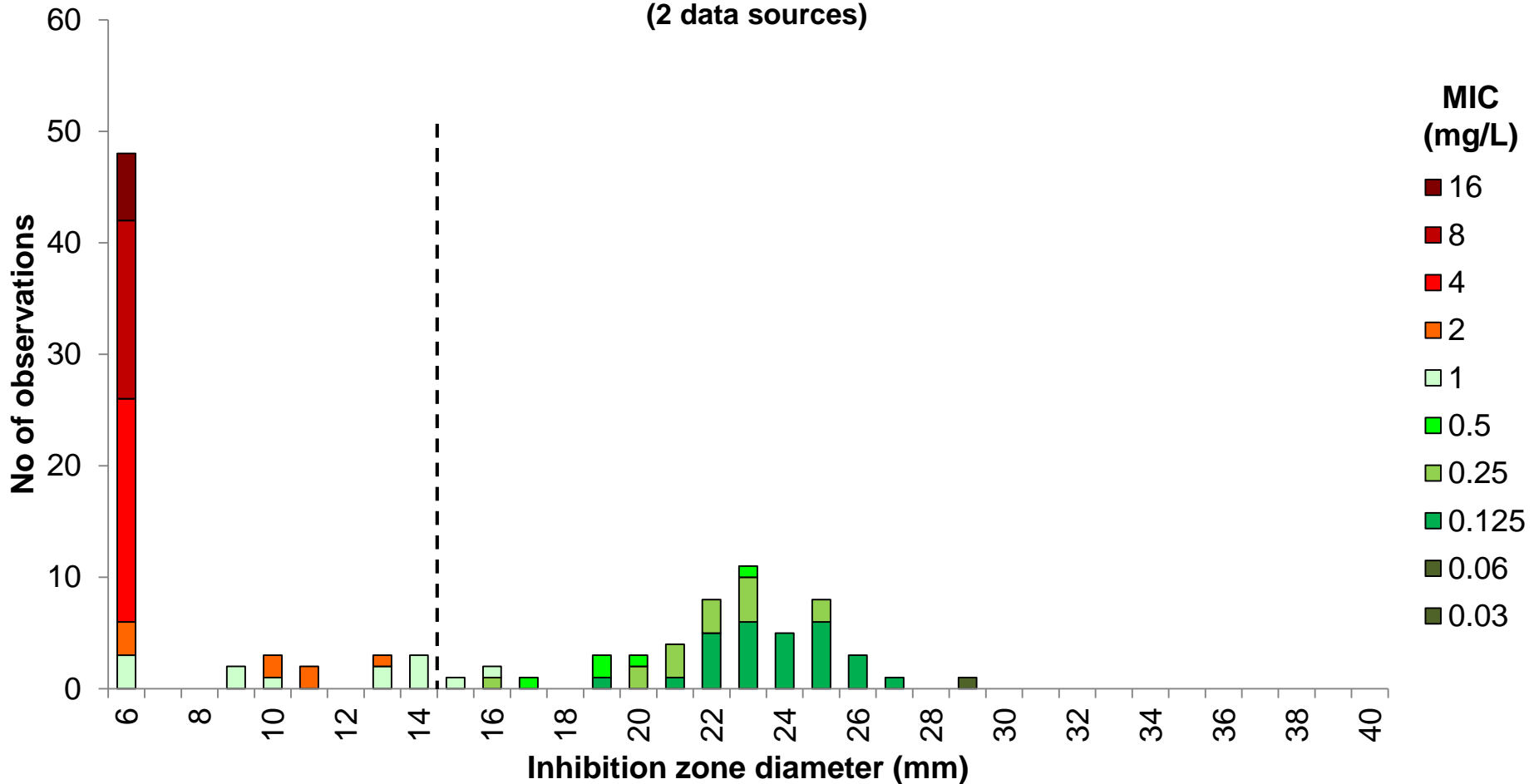
Breakpoints

MIC S ≤ 0.125, R > 0.125 mg/L

Zone diameter S ≥ 22, R < 22 mm

Trimethoprim-sulfamethoxazole 1.25-23.75 μg vs. MIC *S. pneumoniae*, 112 isolates

(2 data sources)



Breakpoints

MIC $S \leq 1, R > 1$ mg/L

Zone diameter $S \geq 15, R < 15$ mm



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