

# AMR Surveillance in Public Hospitals (2012 - 2017)

October 2019

## Background

- The Hong Kong Strategy and Action Plan 2017-2022 was issued in July 2017
- Activity 1.2.1 suggests harmonising AMR surveillance reporting criteria with reference to the Global Antimicrobial Resistance Surveillance System (GLASS), developed by the World Health Organization (WHO)



## Data Scopes

- Blood culture data from HA for year 2012 to 2017 was collected
- Both positive and negative results were included in the analysis, with the focus of six priority pathogens:
  - *Escherichia coli*
  - *Klebsiella pneumoniae*
  - *Acinetobacter* species
  - *Staphylococcus aureus*
  - *Salmonella* species
  - *Streptococcus pneumoniae*
- Non-susceptibility results fulfilling the following condition were excluded from analysis:
  - Non-susceptibility results of an antimicrobial derived from less than 10 isolates per year

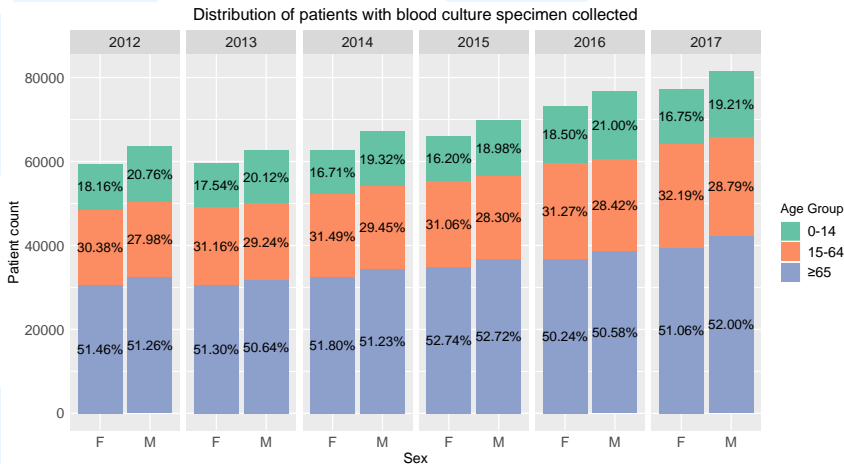
# Methodology

- Methodology from the WHO GLASS Manual for Early Implementation<sup>1</sup> was adopted with local modification
- Location of Onset
  - Location of infection onset is categorised into Hospital-onset and Community-onset
  - When analysing susceptibility results for *Salmonella species* and *Streptococcus pneumoniae*, the location of onset was classified as undifferentiated
    - ▶ They are pathogens primarily causing community-acquired infections, and are rare to cause hospital-associated infections
    - ▶ Information on location of onset is not considered when analysing and interpreting non-susceptibility results of these two pathogens
    - ▶ These results will be interpreted as isolates of onset of unknown location
- Deduplication
  - According to the WHO GLASS Manual for Early Implementation, only one result was reported for each patient per surveyed specimen type and surveyed pathogen
- Non-susceptibility definition
  - An isolate having susceptibility test result of an antimicrobial being "Intermediate" or "Resistant" is considered as showing non-susceptibility to that drug
- When interpreting the antimicrobial susceptibility test results, readers are cautioned that they should also take into consideration of the number of isolates that have the susceptibility test results of concerned



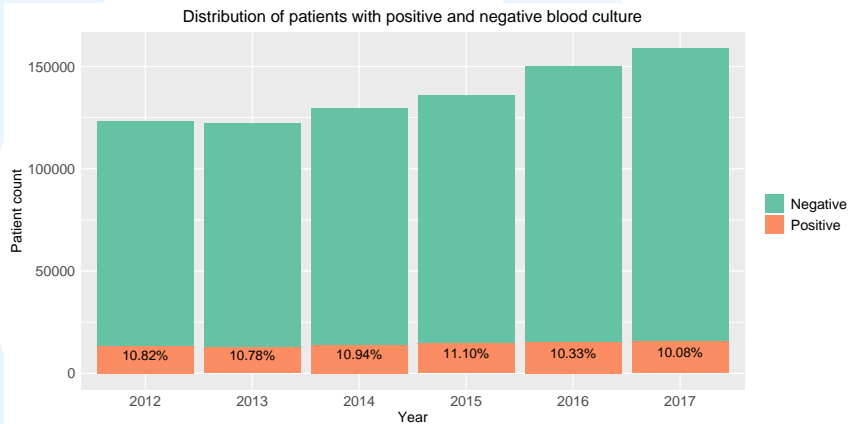
<sup>1</sup><https://www.who.int/antimicrobial-resistance/publications/surveillance-system-manual/en/>

# Results (1) - Patient Characteristics



- Number of patients with blood specimen collected for culture increased from 123,026 in year 2012 to 158,749 in year 2017

## Results (2) - Percentage of patients with positive blood culture



- Percentage of patient with positive blood culture ranged from 10.08% in 2017 to 11.10% in 2015

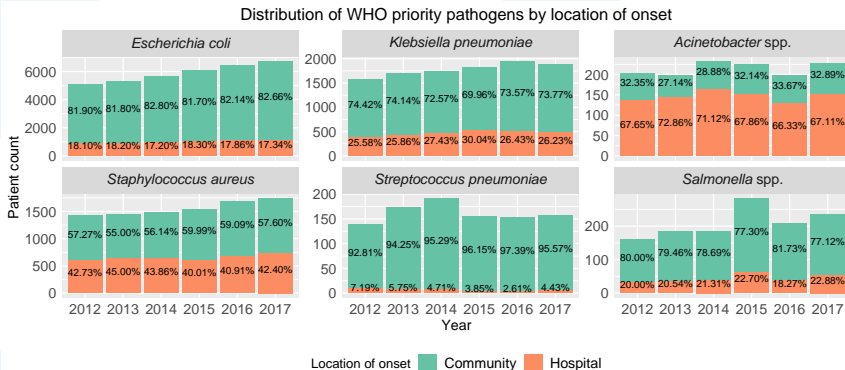
## Results (3) - Distribution of WHO priority organism cultured from blood

Organism	Number and percentage of patients with positive blood culture having WHO GLASS priority pathogens identified from blood					
	2012	2013	2014	2015	2016	2017
<i>Escherichia coli</i>	5,023 (37.74%)	5,232 (39.68%)	5,547 (39.09%)	6,006 (39.78%)	6,334 (40.88%)	6,594 (41.21%)
<i>Klebsiella pneumoniae</i>	1,559 (11.71%)	1,684 (12.77%)	1,715 (12.09%)	1,795 (11.89%)	1,908 (12.31%)	1,865 (11.65%)
<i>Staphylococcus aureus</i>	1,401 (10.53%)	1,422 (10.78%)	1,446 (10.19%)	1,517 (10.05%)	1,658 (10.70%)	1,699 (10.62%)
<i>Salmonella</i> spp.	157 (1.18%)	183 (1.39%)	176 (1.24%)	273 (1.81%)	206 (1.33%)	235 (1.47%)
<i>Acinetobacter</i> spp.	203 (1.53%)	197 (1.49%)	230 (1.62%)	224 (1.48%)	199 (1.28%)	228 (1.42%)
<i>Streptococcus pneumoniae</i>	139 (1.04%)	174 (1.32%)	190 (1.34%)	156 (1.03%)	153 (0.99%)	157 (0.98%)

- Distribution of the six WHO GLASS priority pathogens were similar over the years
- In year 2017, 41.21% of patients with positive blood culture had *Escherichia coli* isolated, followed by *Klebsiella pneumoniae* (11.65%) and *Staphylococcus aureus* (10.62%)



## Results (4) - Distribution of WHO priority pathogens by location of onset



- Distribution of location of onset among the six priority pathogens over the years were stable
- In year 2017, *Escherichia coli* (82.66%) and *Klebsiella pneumoniae* (73.77%) were predominantly of community-onset
- *Acinetobacter* species (67.11%) were predominantly of hospital-onset

## Results (5) - Summary of Findings on Resistance Pattern

- The percentage of non-susceptibility on majority of selected antimicrobials for the six priority pathogens remains stable or with slight decreasing trend during the surveillance period
- Increasing trends were observed among several drug-bug combinations



## Results (6) - *Escherichia coli*

- Non-susceptibility percentage to antimicrobials were lower among *Escherichia coli* isolate of community-onset than those of hospital-onset
- Decreasing trends were observed towards the following antimicrobials among community-onset isolates:
  - Amoxicillin/ clavulanate  
(Range: 26.35% (Year 2017) - 32.52% (Year 2013))
  - Gentamicin  
(Range: 28.28% (Year 2017) - 31.16% (Year 2012))
  - Amikacin  
(Range: 0.42% (Year 2017) - 1.35% (Year 2013))

## Results (6) - *Escherichia coli*

- Decreasing trends were observed towards the following antimicrobials among hospital-onset isolates:
  - Amoxicillin/ clavulanate  
(Range: 38.32% (Year 2017) - 47.11% (Year 2013))
  - Cefuroxime  
(Range: 38.41% (Year 2017) - 48.64% (Year 2012))
  - Cefotaxime  
(Range: 35.59% (Year 2017) - 44.41% (Year 2012))
  - Levofloxacin  
(Range: 39.47% (Year 2017) - 49.67% (Year 2013))



## Results (6) - *Escherichia coli*

- Increasing trend of non-susceptibility to cefepime<sup>2</sup> (Range: 12.46% (Year 2013) to 24.05% (Year 2015)) was observed among community-onset isolates
- Non-susceptibility of carbapenems remained low and stable<sup>3</sup>

















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<sup>2</sup>Readers should take note that a new (revised) cefepime interpretive criteria for Enterobacteriaceae was released by the Clinical & Laboratory Standards Institute (CLSI) in 2014, which may be one of the contributing factors leading to the observed trend of respective non-susceptibility.

<sup>3</sup>No statistically significant upward/ downward trend was observed
















# Results (6) - *Escherichia coli*

## Non-susceptibility Test Result (1/3)

Location of Onset	2012	2013	2014	2015	2016	2017	P-value	
<b>Ampicillin</b>								
Community	73.33%	75.09%	76.33%	75.07%	74.91%	75.85%	1.000	
Hospital	86.83%	85.90%	85.80%	86.04%	85.26%	85.52%	1.000	
<b>Amoxicillin and Beta-Lactamase Inhibitor</b>								
Community	27.34%	32.52%	29.04%	26.48%	27.07%	26.35%	<0.005	
Hospital	44.41%	47.11%	43.56%	43.10%	42.58%	38.32%	0.021	
<b>Piperacillin and Beta-Lactamase Inhibitor</b>								
Community	5.83%	6.95%	5.65%	6.97%	7.20%	4.46%	1.000	
Hospital	15.10%	14.96%	11.66%	15.05%	14.06%	9.50%	0.104	
<b>Cefuroxime</b>								
Community	27.82%	29.36%	30.17%	30.11%	30.09%	29.68%	1.000	
Hospital	48.64%	45.81%	44.28%	46.42%	42.53%	38.41%	<0.005	
<b>Cefotaxime</b>								
Community	25.20%	26.62%	28.25%	28.78%	27.82%	27.41%	1.000	
Hospital	44.41%	41.94%	41.41%	42.65%	39.08%	35.59%	0.016	
<b>Ceftazidime</b>								
Community	13.17%	14.43%	14.41%	16.51%	14.99%	13.87%	1.000	
Hospital	27.24%	25.88%	23.84%	24.32%	23.21%	20.47%	0.067	
<b>Ceftriaxone</b>								
Community	25.86%	25.44%	26.99%	28.23%	27.64%	28.49%	0.319	
Hospital	43.58%	40.62%	37.63%	44.37%	39.93%	35.15%	1.000	
<b>Cefepime</b>								
Community	13.38%	12.46%	19.33%	24.05%	23.59%	22.63%	<0.005	
Hospital	29.04%	24.92%	29.83%	35.28%	33.15%	29.39%	1.000	

# Results (6) - *Escherichia coli*

## Non-susceptibility Test Result (2/3)

Location of Onset	2012	2013	2014	2015	2016	2017	P-value	
<b>Meropenem</b>								
Community	<0.005%	0.06%	0.10%	0.05%	0.04%	<0.005%	1.000	
Hospital	<0.005%	0.51%	0.24%	0.84%	0.74%	0.76%	1.000	
<b>Ertapenem</b>								
Community	0.05%	0.18%	0.09%	0.07%	0.10%	0.04%	1.000	
Hospital	0.63%	0.71%	0.36%	0.52%	0.49%	0.50%	1.000	
<b>Doripenem</b>								
Community	<0.005%	<0.005%	No record	No record	No record	No record	-	
Hospital	No record	No record	No record	No record	No record	No record	-	
<b>Impipenem and Cilastatin</b>								
Community	<0.005%	0.03%	<0.005%	0.02%	0.04%	<0.005%	1.000	
Hospital	<0.005%	0.12%	<0.005%	0.31%	0.21%	0.41%	1.000	
<b>Sulfamethoxazole and Trimethoprim</b>								
Community	43.70%	43.84%	42.27%	44.71%	43.89%	45.34%	1.000	
Hospital	56.55%	53.53%	54.78%	53.53%	54.91%	52.51%	1.000	
<b>Gentamicin</b>								
Community	31.16%	31.01%	28.42%	29.80%	28.90%	28.28%	0.031	
Hospital	39.52%	38.64%	36.25%	36.38%	35.34%	34.17%	0.202	
<b>Amikacin</b>								
Community	1.27%	1.35%	0.81%	0.70%	0.70%	0.42%	<0.005	
Hospital	3.15%	2.69%	1.54%	2.51%	1.57%	1.30%	0.102	
<b>Ciprofloxacin</b>								
Community	32.84%	34.44%	33.09%	34.58%	36.19%	33.05%	1.000	
Hospital	50.89%	53.78%	44.64%	50.72%	46.49%	42.71%	1.000	



## Results (6) - *Escherichia coli*

### Non-susceptibility Test Result (3/3)

Location of Onset	2012	2013	2014	2015	2016	2017	P-value
<b>Levofloxacin</b>							
Community	32.01%	30.81%	31.51%	31.24%	31.19%	30.98%	1.000
Hospital	48.20%	49.67%	45.38%	48.21%	44.80%	39.47%	<0.005
<b>Colistin</b>							
Community	No record	No record	No record	No record	No record	No record	-
Hospital	No record	No record	No record	No record	No record	No record	-

## Results (7) - *Klebsiella pneumoniae*

- Isolates of community-onset show lower percentage of non-susceptibility to antimicrobials than those of hospital-onset
- No significant trends on percentage of non-susceptibility to commonly used beta-lactam/ beta-lactamase inhibitor combinations, including amoxicillin/ clavulanate and piperacillin/ tazobactam, and major parenteral second- and third-generation cephalosporins was observed
  - Except for an increasing trend of cefotaxime (Range: 25.00% (Year 2013) to 35.37% (Year 2016)) among isolates of hospital-onset
- Non-susceptibility of carbapenems remained low during the period



## Results (7) - *Klebsiella pneumoniae*

















- Increasing trends of non-susceptibility to the following antimicrobials were observed and warranted further monitoring:
  - Cefepime<sup>4</sup>
    - ▶ Community-onset isolates  
(Range: 4.76% (Year 2012) - 8.40% (Year 2016))
    - ▶ Hospital-onset isolates  
(Range: 9.25% (Year 2013) - 22.15% (Year 2017))
  - Ciprofloxacin among hospital-onset isolates (Range: 18.42% (Year 2012) - 42.67% (Year 2016))
  - Levofloxacin among hospital-onset isolates (Range: 12.76% (Year 2012) - 22.80% (Year 2017))

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<sup>4</sup>Readers should take note that a new (revised) cefepime interpretive criteria for Enterobacteriaceae was released by CLSI in 2014, which may be one of the contributing factors leading to the observed trend of respective non-susceptibility.













# Results (7) - *Klebsiella pneumoniae*

## Non-susceptibility Test Result (1/2)

Location of Onset	2012	2013	2014	2015	2016	2017	P-value	
<b>Amoxicillin and Beta-Lactamase Inhibitor</b>								
Community	13.42%	13.54%	13.86%	13.98%	13.93%	15.09%	1.000	
Hospital	31.76%	30.39%	32.99%	32.29%	38.09%	36.81%	0.340	
<b>Piperacillin and Beta-Lactamase Inhibitor</b>								
Community	5.81%	5.77%	4.96%	5.30%	4.87%	4.57%	1.000	
Hospital	15.58%	13.79%	14.57%	19.81%	21.49%	15.62%	1.000	
<b>Cefuroxime</b>								
Community	15.28%	15.91%	14.33%	14.53%	16.08%	15.95%	1.000	
Hospital	33.00%	33.56%	32.99%	35.11%	38.36%	37.01%	1.000	
<b>Cefotaxime</b>								
Community	13.16%	12.54%	11.10%	11.83%	12.93%	12.57%	1.000	
Hospital	25.97%	25.00%	26.14%	27.01%	35.37%	32.64%	0.047	
<b>Ceftazidime</b>								
Community	8.37%	8.40%	7.68%	8.48%	7.32%	7.42%	1.000	
Hospital	22.91%	18.39%	17.75%	21.38%	22.79%	25.44%	1.000	
<b>Ceftriaxone</b>								
Community	11.68%	8.90%	8.56%	9.29%	10.89%	8.79%	1.000	
Hospital	21.69%	25.11%	20.54%	22.90%	21.89%	26.12%	1.000	
<b>Cefepime</b>								
Community	4.76%	4.92%	5.01%	7.20%	8.40%	7.35%	<0.005	
Hospital	11.95%	9.25%	16.13%	19.52%	20.33%	22.15%	<0.005	
<b>Meropenem</b>								
Community	0.20%	0.20%	0.19%	<0.005%	0.43%	0.28%	1.000	
Hospital	2.53%	0.56%	0.53%	2.18%	1.23%	0.42%	1.000	

# Results (7) - *Klebsiella pneumoniae*

## Non-susceptibility Test Result (2/2)

Location of Onset	2012	2013	2014	2015	2016	2017	P-value	
<b>Imipenem and Cilastatin</b>								
Community	<0.005%	0.28%	<0.005%	<0.005%	0.16%	0.25%	1.000	
Hospital	0.83%	0.77%	0.48%	0.84%	1.34%	0.50%	1.000	
<b>Sulfamethoxazole and Trimethoprim</b>								
Community	19.45%	17.55%	17.89%	19.55%	20.51%	21.92%	1.000	
Hospital	35.62%	39.92%	33.11%	34.95%	48.28%	42.63%	0.295	
<b>Gentamicin</b>								
Community	5.18%	5.28%	5.20%	4.69%	5.52%	5.51%	1.000	
Hospital	8.93%	10.20%	10.86%	12.84%	14.65%	12.88%	0.230	
<b>Amikacin</b>								
Community	0.85%	0.63%	0.16%	0.39%	0.28%	0.21%	0.339	
Hospital	0.74%	2.04%	0.84%	1.28%	1.95%	1.02%	1.000	
<b>Ciprofloxacin</b>								
Community	11.36%	17.19%	11.35%	12.36%	16.29%	14.12%	1.000	
Hospital	18.42%	22.02%	27.45%	39.05%	42.67%	38.78%	<0.005	
<b>Levofloxacin</b>								
Community	8.40%	7.54%	7.54%	7.24%	7.87%	8.52%	1.000	
Hospital	12.76%	17.39%	14.56%	18.28%	19.52%	22.80%	<0.005	
<b>Colistin</b>								
Community	No record	No record	No record	No record	No record	No record	-	
Hospital	No record	No record	No record	No record	No record	No record	-	







## Results (8) - *Staphylococcus aureus*

- Lower non-susceptibility percentage to oxacillin for isolates of community-onset than those of hospital-onset
- No significant trend on non-susceptibility percentage for oxacillin was observed during the period:
  - Hospital-onset isolate  
(Range: 53.11% (Year 2012) - 59.97% (Year 2016))
  - Community-onset isolate  
(Range: 35.65% (Year 2012) - 40.26% (Year 2016))
- Non-susceptibility percentage to vancomycin remained at less than 0.005% during the surveillance period



## Results (8) - *Staphylococcus aureus*

### Non-susceptibility Test Result (1/1)

Location of Onset	2012	2013	2014	2015	2016	2017	P-value	
<b>Oxacillin</b>								
Community	35.65%	39.20%	38.58%	39.12%	40.26%	37.90%	1.000	
Hospital	53.11%	56.00%	56.19%	54.05%	59.97%	54.22%	1.000	
<b>Vancomycin</b>								
Community	<0.005%	<0.005%	<0.005%	<0.005%	<0.005%	<0.005%	-	
Hospital	<0.005%	<0.005%	<0.005%	<0.005%	<0.005%	<0.005%	-	



## Results (9) - *Salmonella* species

- Increasing trends of non-susceptibility to fluoroquinolones were observed among isolates of undifferentiated location of onset
  - Ciprofloxacin<sup>5</sup>  
(Range: 51.88% (Year 2012) to 76.39% (Year 2017))
  - Levofloxacin<sup>6</sup>  
(Range: <0.005% (Year 2013) to 86.36% (Year 2017))
- An increasing trend of non-susceptibility to ampicillin (Range: 35.03% (Year 2012) to 62.44% (Year 2016)) was observed among isolates of undifferentiated location of onset
- Trends on non-susceptibility percentage of third-generation cephalosporins remained stable<sup>7</sup> among isolates of undifferentiated location of onset, with non-susceptibility percentage at 5.18% for ceftriaxone in 2017
- Non-susceptibility percentage to carbapenems remained at less than 0.005% among isolates of undifferentiated location of onset during the surveillance period









<sup>5</sup>Readers should take note that a new ciprofloxacin interpretive criteria for *Salmonella* species was released in 2012 and modified recommendations to use separate ciprofloxacin interpretive criteria for *Salmonella* species was released in 2013 by CLSI respectively, which may be one of the contributing factors leading to the observed trend of respective non-susceptibility.

<sup>6</sup>Readers should take note that a new levofloxacin interpretive criteria for *Salmonella* species was released by CLSI in 2013, which may be one of the contributing factors leading to the observed trend of respective non-susceptibility.

<sup>7</sup>No statistically significant upward/ downward trend was observed

## Results (9) - *Salmonella* species

### Non-susceptibility Test Result (1/1)

Location of Onset	2012	2013	2014	2015	2016	2017	P-value	
<b>Ampicillin</b>								
Undifferentiated	35.03%	37.70%	50.00%	53.68%	62.44%	59.40%	<0.005	
<b>Cefotaxime</b>								
Undifferentiated	2.33%	2.33%	8.62%	3.45%	6.94%	5.33%	1.000	
<b>Ceftazidime</b>								
Undifferentiated	<0.005%	<0.005%	6.98%	2.47%	4.35%	4.35%	1.000	
<b>Ceftriaxone</b>								
Undifferentiated	<0.005%	8.50%	8.51%	2.65%	6.21%	5.18%	1.000	
<b>Meropenem</b>								
Undifferentiated	No record	No record	<0.005%	<0.005%	<0.005%	<0.005%	-	
<b>Imipenem and Cilastatin</b>								
Undifferentiated	<0.005%	<0.005%	<0.005%	<0.005%	<0.005%	<0.005%	-	
<b>Ciprofloxacin</b>								
Undifferentiated	51.88%	66.48%	64.77%	72.43%	76.10%	76.39%	<0.005	
<b>Levofloxacin</b>								
Undifferentiated	2.04%	<0.005%	3.12%	3.85%	37.04%	86.36%	<0.005	



## Results (10) - *Acinetobacter* species

- Community-onset isolates showed lower non-susceptibility percentage towards antimicrobials than those of hospital-onset
- Decreasing trends with statistical significance were observed for non-susceptibility percentage of the following antimicrobials among hospital-onset isolates:
  - Gentamicin  
(Range: 26.17% (Year 2017) - 50.34% (Year 2013))
  - Minocycline  
(Range: 28.89% (Year 2017) - 75.00% (Year 2012))
- No trend with statistical significance were observed among major groups of antimicrobials, including beta-lactam penicillins, cephalosporins, carbapenems<sup>8</sup>, fluoroquinolones and aminoglycosides

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<sup>8</sup>Readers should take note that a new (revised) imipenem and meropenem interpretive criteria was released by CLSI in 2014, which may be one of the contributing factors leading to the observed trend of respective non-susceptibility.

# Results (10) - *Acinetobacter* species

## Non-susceptibility Test Result (1/2)

Location of Onset	2012	2013	2014	2015	2016	2017	P-value	
<b>Minocycline</b>								
Community	No record	No record	No record	27.78%	9.09%	16.67%	1.000	
Hospital	75.00%	72.22%	57.58%	60.00%	32.56%	28.89%	<0.005	
<b>Tigecycline</b>								
Community	No record	No record	No record	No record	No record	No record	-	
Hospital	72.09%	66.67%	67.86%	78.95%	81.82%	76.92%	1.000	
<b>Ampicillin and Beta-Lactamase Inhibitor</b>								
Community	21.21%	20.37%	17.74%	25.93%	22.81%	21.92%	1.000	
Hospital	43.07%	57.93%	57.32%	56.06%	52.50%	49.66%	1.000	
<b>Piperacillin and Beta-Lactamase Inhibitor</b>								
Community	26.15%	22.64%	23.08%	30.56%	31.25%	28.17%	1.000	
Hospital	55.91%	66.20%	63.35%	62.91%	63.57%	58.33%	1.000	
<b>Ceftazidime</b>								
Community	22.95%	21.57%	18.46%	22.86%	10.77%	14.08%	1.000	
Hospital	38.81%	50.00%	47.85%	42.00%	38.40%	34.69%	1.000	
<b>Cefoperazone and Beta-Lactamase Inhibitor</b>								
Community	21.31%	23.53%	18.46%	25.71%	21.54%	22.54%	1.000	
Hospital	44.03%	59.44%	57.06%	55.63%	55.65%	50.34%	1.000	
<b>Cefepime</b>								
Community	33.33%	26.47%	29.41%	40.74%	25.81%	28.57%	1.000	
Hospital	58.62%	76.19%	70.73%	68.32%	67.21%	71.83%	1.000	
<b>Meropenem</b>								
Community	40.74%	32.14%	27.78%	47.83%	33.33%	28.95%	1.000	
Hospital	61.80%	72.73%	71.19%	66.36%	59.04%	59.14%	1.000	



# Results (10) - *Acinetobacter* species

## Non-susceptibility Test Result (2/2)

Location of Onset	2012	2013	2014	2015	2016	2017	P-value	
<b>Imipenem and Cilastatin</b>								
Community	22.41%	21.28%	21.82%	33.33%	27.42%	26.87%	1.000	
Hospital	46.46%	61.15%	62.09%	63.24%	60.18%	53.62%	1.000	
<b>Gentamicin</b>								
Community	16.67%	16.67%	14.93%	16.67%	8.96%	8.00%	1.000	
Hospital	39.42%	50.34%	45.45%	42.11%	27.91%	26.17%	<0.005	
<b>Amikacin</b>								
Community	6.06%	11.11%	11.94%	12.50%	7.46%	6.67%	1.000	
Hospital	28.47%	40.69%	40.00%	34.21%	21.54%	20.81%	0.059	
<b>Ciprofloxacin</b>								
Community	43.90%	24.32%	26.19%	33.96%	27.08%	32.14%	1.000	
Hospital	52.83%	60.61%	58.00%	58.42%	60.47%	52.00%	1.000	
<b>Levofloxacin</b>								
Community	36.96%	27.03%	23.81%	37.50%	23.26%	25.49%	1.000	
Hospital	53.40%	66.00%	66.41%	64.55%	55.68%	55.24%	1.000	
<b>Colistin</b>								
Community	<0.005%	No record	<0.005%	4.17%	<0.005%	<0.005%	1.000	
Hospital	<0.005%	<0.005%	<0.005%	1.67%	<0.005%	<0.005%	1.000	









## Results (11) - *Streptococcus pneumoniae*

- Trends on non-susceptibility percentage of the following antimicrobials among isolates of undifferentiated location of onset did not show statistical significance
  - Penicillin  
(Range: 0.66% (Year 2015) - 1.96% (Year 2017))
  - Cefotaxime  
(Range: 0.89% (Year 2017) - 7.63% (Year 2015))
  - Ceftriaxone  
(Range: 1.16% (Year 2015) - 7.23% (Year 2013))
  - Levofloxacin  
(Range: <0.005% (Year 2012) - 1.34% (Year 2017))
- Non-susceptibility percentage of erythromycin remained high (Range: 69.53% (Year 2012) to 80.56% (Year 2014)) among isolates of undifferentiated location of onset
- An increasing trend of non-susceptibility percentage towards sulfamethoxazole/ trimethoprim (Range: 46.98% (Year 2013) to 70.00% (Year 2017)) was observed among isolates of undifferentiated location of onset

# Results (11) - *Streptococcus pneumoniae*

## Non-susceptibility Test Result (1/1)

Location of Onset	2012	2013	2014	2015	2016	2017	P-value	
<b>Penicillin</b>								
Undifferentiated	1.46%	1.81%	1.09%	0.66%	0.69%	1.96%	1.000	
<b>Cefotaxime</b>								
Undifferentiated	2.38%	6.67%	4.84%	7.63%	0.93%	0.89%	1.000	
<b>Ceftriaxone</b>								
Undifferentiated	3.28%	7.23%	4.95%	1.16%	2.13%	4.65%	1.000	
<b>Sulfamethoxazole and Trimethoprim</b>								
Undifferentiated	48.65%	46.98%	60.67%	62.14%	57.04%	70.00%	<0.005	
<b>Erythromycin</b>								
Undifferentiated	69.53%	71.25%	80.56%	72.11%	76.76%	73.43%	1.000	
<b>Levofloxacin</b>								
Undifferentiated	<0.005%	0.59%	0.54%	<0.005%	1.34%	1.34%	1.000	



## Limitations

- **Case identification** of patients with bloodstream infections related to the diagnostic practices and the frequency and timing of blood culture
- Categorization of **hospital-onset/ community-onset** is based on the operational definition
  - Clinical information are not considered
- **Clinical breakpoints** may change over time and cannot be addressed by this report
- Panels of AST applied by different laboratories may vary
  - Result of particular pathogen-antimicrobial combination may bias toward laboratories performing a major proportion of that antibiotic susceptibility test



## Conclusion (1)

- Generally speaking, non-susceptibility on majority of selected antimicrobials for the six WHO GLASS priority pathogens remains stable or with slight decreasing trend during the surveillance period
- Increasing trends are also observed among several drug-bug combinations that may warrant further monitoring and investigation



## Conclusion (2)

- Nevertheless, readers should bear in mind that AMR remains a major threat in the world and Hong Kong is of no exception.
- High non-susceptibility percentages in conventionally used antimicrobials among some common pathogens was observed, which renders some of the first-line antibiotics ineffective in treating infections caused by these pathogens, for example:
  - Oxacillin non-susceptibility among *Staphylococcus aureus*
  - Ceftriaxone/ cefotaxime non-susceptibility among *Escherichia coli* and *Klebsiella pneumoniae*
- In addition, some of the non-susceptibility figures were higher when compared with that of overseas countries, for example:
  - Proportion of *Staphylococcus aureus* being oxacillin-resistant in UK is lower than that of Hong Kong

# What can I do to combat AMR?

## For General Public

- Proper use of antibiotics
  - Do not demand antibiotics from your doctor
  - Follow your doctor's advice when taking antibiotics
  - Do not stop taking antibiotics by yourselves even if you are feeling better
  - Do not take leftover antibiotics
  - Do not share your antibiotics with others
  - Do not self-purchase antibiotics without a prescription
- Practise frequent hand hygiene, especially before eating and taking medicine, and after going to the toilet
- Ensure your vaccination is up-to-date
- Maintain cough etiquette, wear a mask if you have respiratory symptoms



# What can I do to combat AMR?

## For Healthcare Workers

- Antibiotics are precious resources against infections. Healthcare workers play an essential role in preserving them:
  - Prescribe antibiotics in accordance with therapeutic guidelines in consideration of clinical situations
  - Educate your patients
    - ▶ To take antibiotics as prescribed and always complete the full course of medication
    - ▶ Discuss about the importance of appropriate antibiotic use and the dangers of AMR where appropriate
    - ▶ Talk about how to prevent infections and their spread. For example, vaccination, maintain good personal hygiene and hand hygiene
  - Apply best practice of infection prevention and control, and to practise frequent hand hygiene
  - Receive seasonal influenza vaccine