Antimicrobial Consumption and Use Monitoring

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CAPTURA
Capturing data on Antimicrobial resistance Patterns and Trends in Use in Regions of Asia

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Antimicrobial use & consumption monitoring

Fundamentals of AMC and AMU

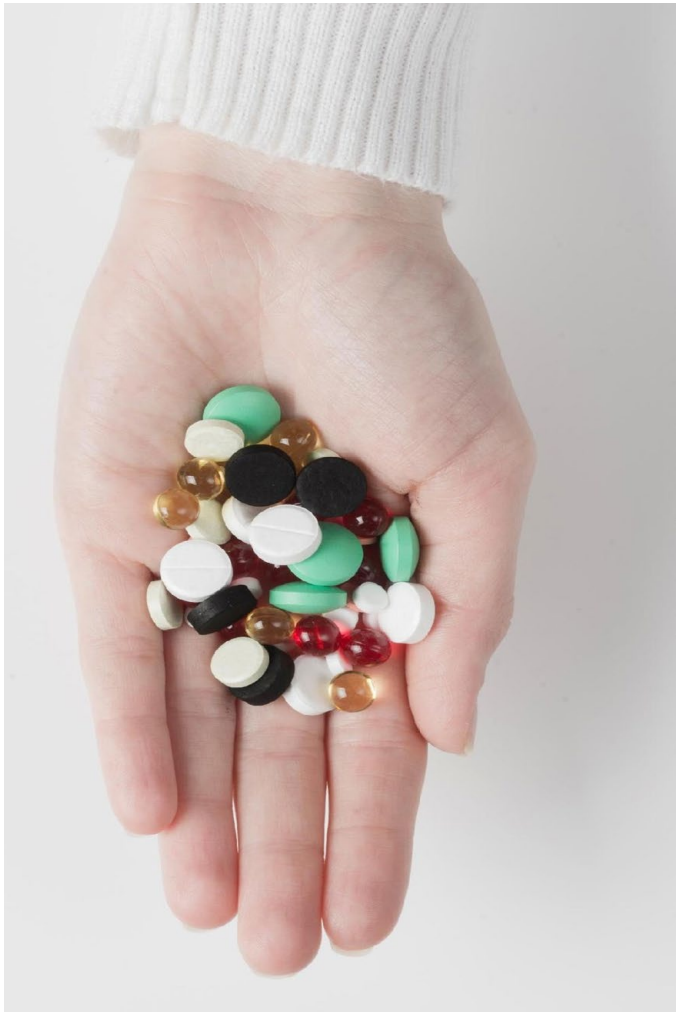
Antimicrobial consumption and use

Why do we measure consumption and use?

Improve appropriate use and curb misuse and overuse

- AMR is driven by many complex factors, but **overuse and misuse of antibiotics** are among the leading causes

- Measuring and analysing the consumption and use of antibiotics is a critical step that will inform the development of appropriate strategies to improve the use of antibiotics **at all levels of the health system** (national, regional, hospital, community)

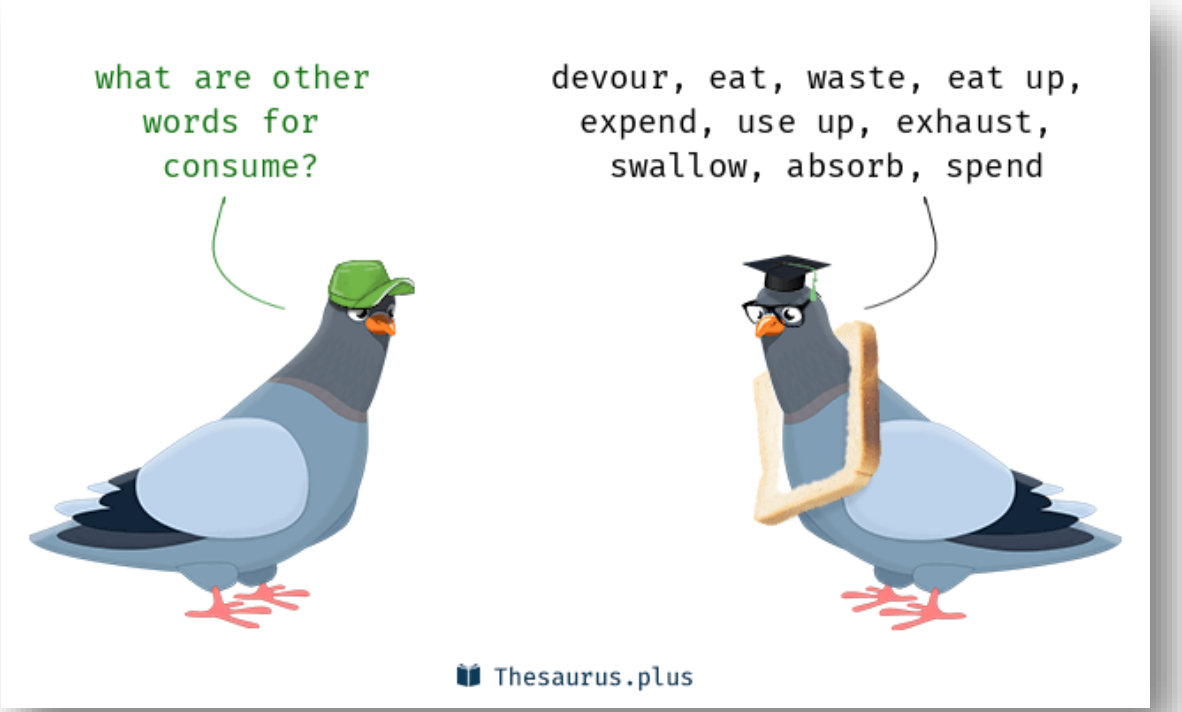


Antimicrobial Consumption and use

Consumption and use monitoring? Isn't this the same?

While the terms are very similar, in the domain of drug monitoring they have a different meaning

'Estimated consumption' and 'Actual use' of antibiotics would be a more precise term



Antimicrobial Consumption and use

‘Estimated consumption’ and ‘Actual use’ monitoring serve different purposes

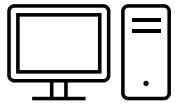
	Antimicrobial Consumption data	Antimicrobial Use data
Definition	What is used? How much is used?	How are antimicrobials being used?
Level	Aggregated data	Individual-level data
Sources	Usually based on sales of antimicrobial medicines, e.g. import, central procurement, wholesalers, or commercial sources	May be derived from e.g. prescription records, medical records or insurance claims
Estimate	A proxy estimate of the actual use of antimicrobials	Provides more accurate estimates on actual use of antimicrobials
Coverage	Easier to obtain complete data coverage for the country	Can be difficult to obtain complete data coverage for the country. Normally a sample of the population.
Purpose	Good for estimating quantity of antimicrobial medicines	Good for assessing how antimicrobial medicines are prescribed or used for stewardship purposes
Complexity	Good starting point for countries with limited resources or experience in surveillance of medicines use	More resource intense data collection but provides more information
Assessment	Lower threshold to start, focus on quantity and suitable for macro interventions	Higher threshold to start, focus on quality and suitable for micro level interventions

Curation and analysis of AMC & AMU data

Antimicrobial consumption and use

CAPTURA's approach to working with AMU/AMC data

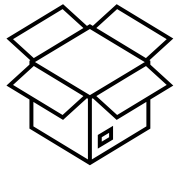
Data Transfer Agreement & prioritisation of datasets



Electronic data mSupply/Excel

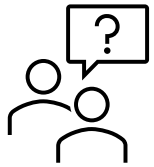
Warehouse

Data curation and analysis process



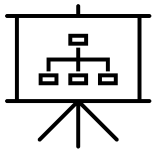
Data downloaded to Team Dropbox

Assessment for data quality and usefulness (RDQA - AMC)



Preliminary sharing of results to discuss queries & assumptions

Two-way process to sort out pending issues



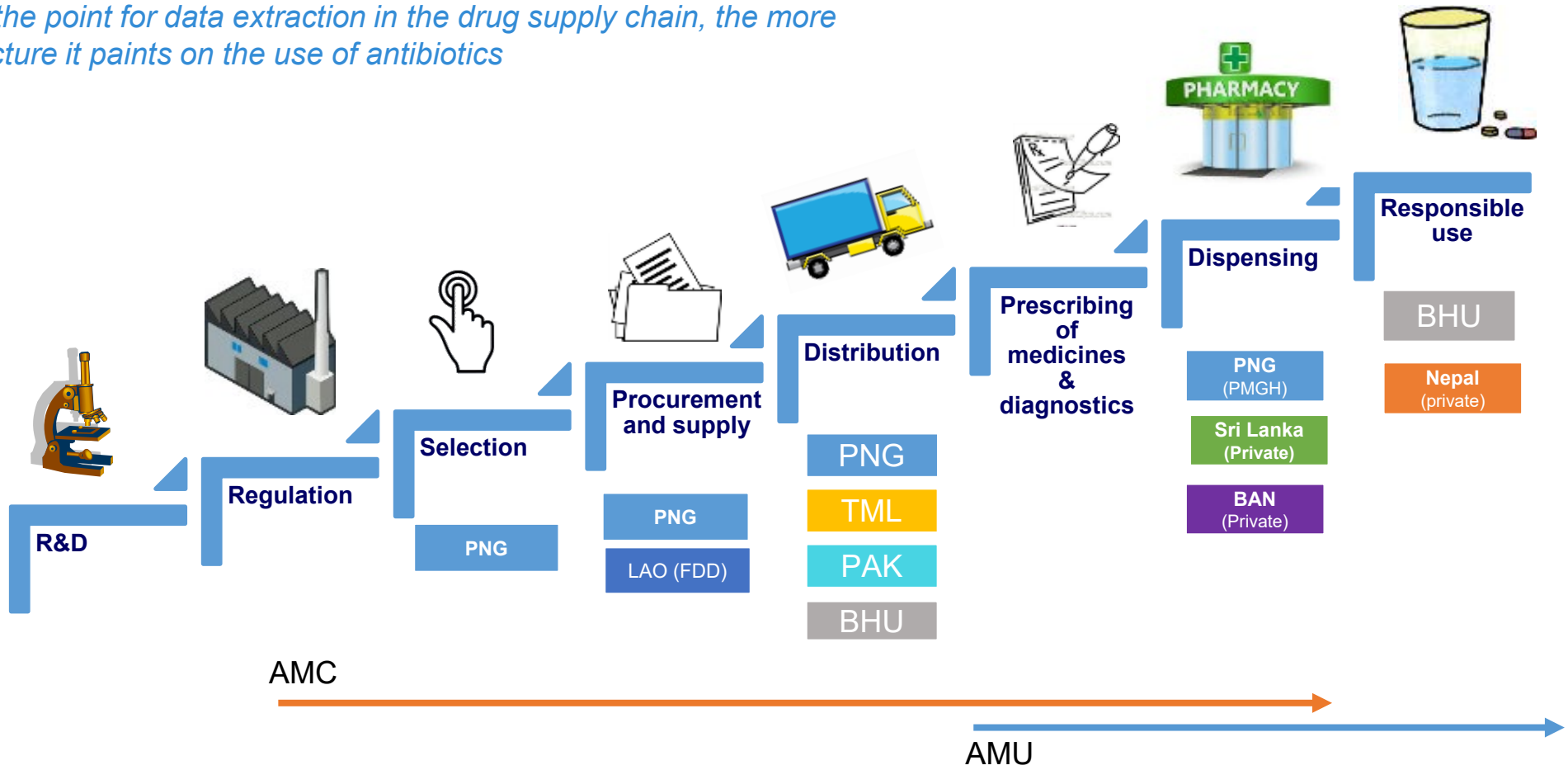
Finalizing analysis & sharing of results

Antimicrobial Consumption and Use

Measuring along the supply chain

AMC and AMU draw from different sources

The higher the point for data extraction in the drug supply chain, the more accurate picture it paints on the use of antibiotics

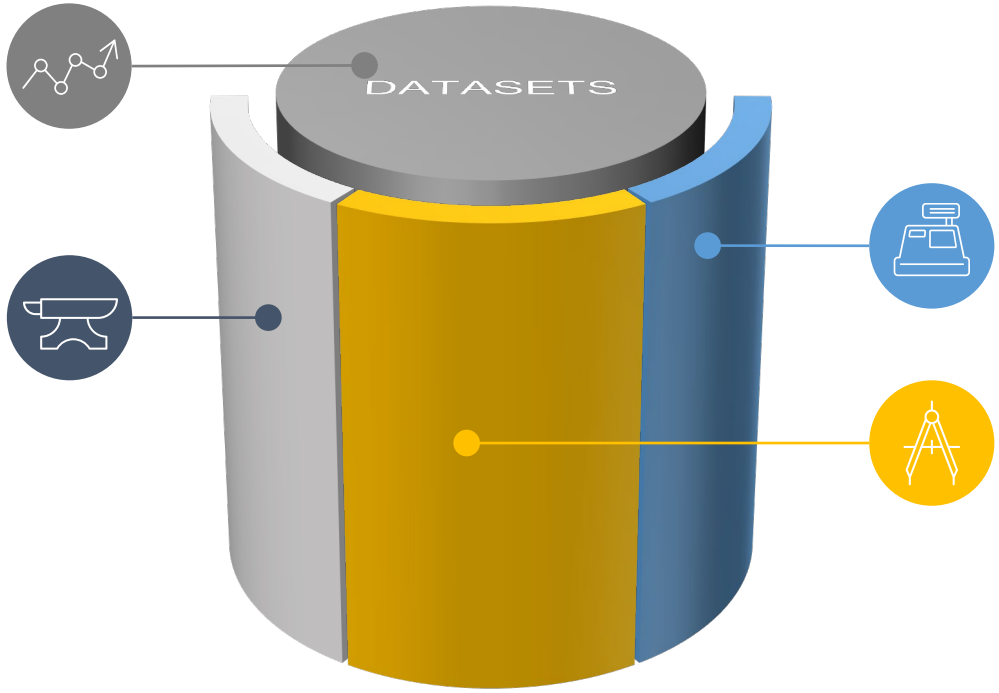


Antimicrobial Consumption and Use

Dataset characteristics & observations during curation

Datasets were received from various facilities; each was uniquely shaped & coded.

Generally, key AMC variables had been recorded & other useful variables could be derived from other sources



Necessary to read through the data & other supplementary materials shared by the in-country data owners and collectors (sometimes incomplete)

Absence of data dictionaries

WHO ATC/DDD methodology for curation and analysis was essential to advance the curation/analysis process.

Antimicrobial Consumption and Use

AMC data analysis framework

Key steps in data curation to enable analysis

Step 1

Exploration:

- Read through the variables, observations & supplementary materials
- Filter out any item that is not an antibiotic
- Split any clustered information into separate variables (name, strength, form, RoA, units)

Step 2

Clean up:

- Name(s) of the substance(s)
- Strength per item (in gram)
- Route of administration
- Number of items per package
- Assign ATC codes
- Number of packages (specify time period)

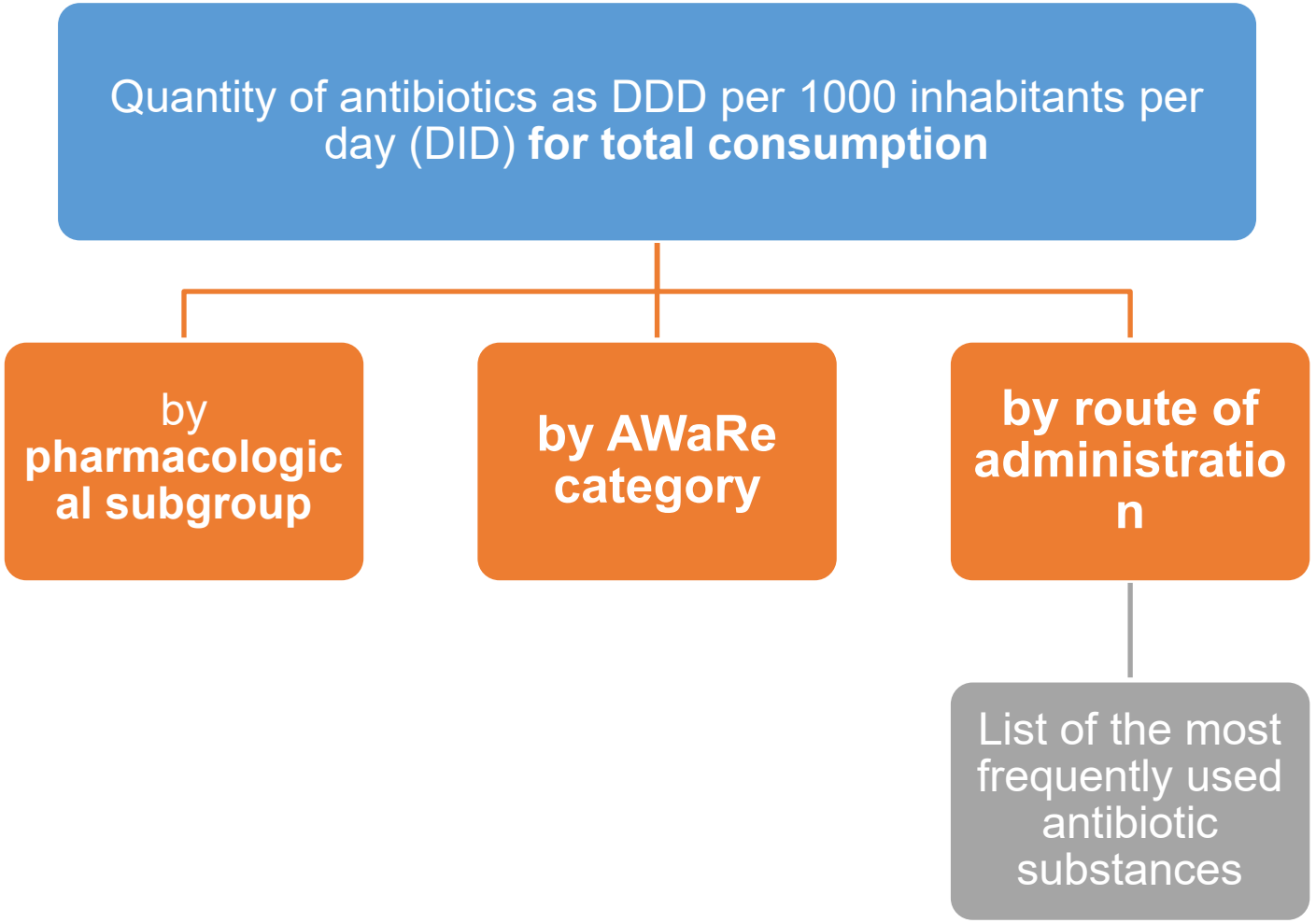
Step 3

Calculations:

- Pack Content & Quantities
- Merging of available population data (as denominators)
- Defined Daily Dose (DDD) standardized by 1000 inhabitants per day (DID)

Antimicrobial consumption and use

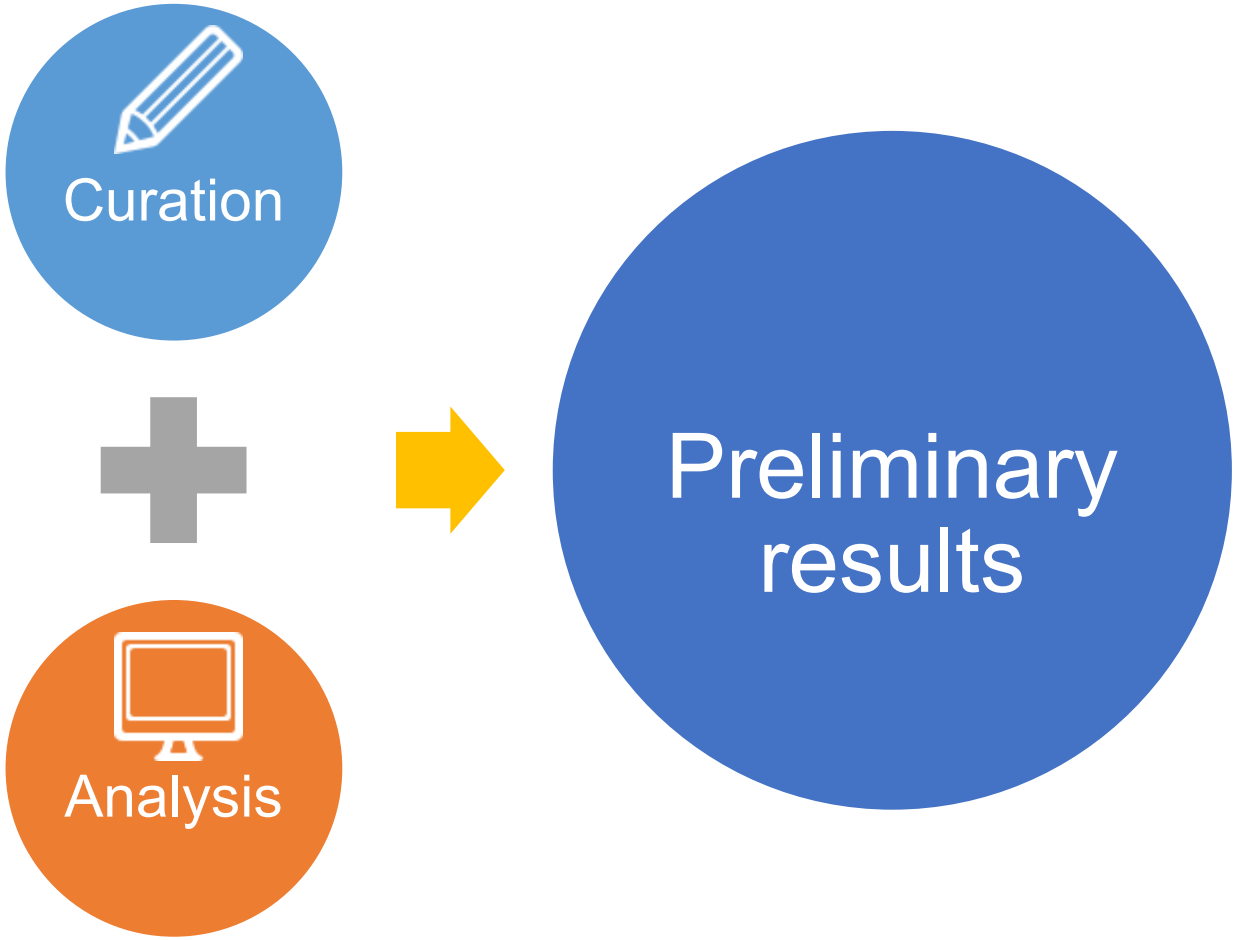
AMC data analysis framework



- The data has also been disaggregated by district/province if available
- The WHO ATC/DDD coding system version 2019 version has been used to process the data.

Antimicrobial consumption and use

Regional observations on data sharing and feedback from countries



Correlation

Generally, the CAPTURA analysis correlates well with the experiences of clinicians and pharmacists on consumption of antibiotics in country.

Data &knowledge gaps

A retrospective analysis combined with staff turnovers in LMICs makes it challenging to fill knowledge or data gaps

standardization

Importance of standardization - curation and analysis can be done in a matter of days. Poorly structured datasets could take weeks.

Outliers

Some properly curated and analysed datasets yield outlier results. Likely a data extraction issue and very challenging to retrace its cause.

CAPTURA's key findings on AMC & AMU

CAPTURA’s key findings on national level AMC

Antimicrobial consumption and use

Key findings on antimicrobial consumption patterns

Antimicrobial consumption patterns in CAPTURA countries are complex and diverse

Across CAPTURA countries suggests there are margins for improvement of prescribing and dispensing practices.

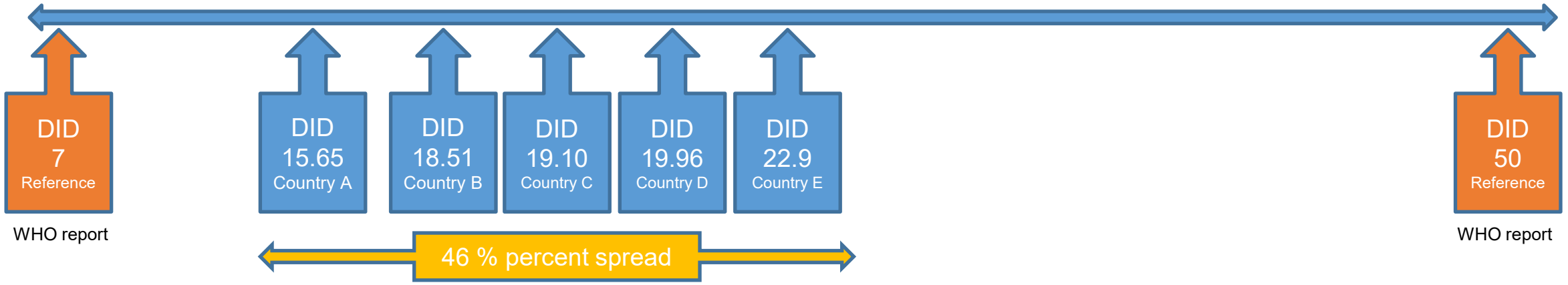
Significant exposure to Watch/broad-spectrum antibiotics is observed, accelerating resistance.

AMC monitoring systems in most South/South-East Asian countries are starting to emerge

Antimicrobial consumption and use

Antimicrobial consumption patterns: Total national consumption

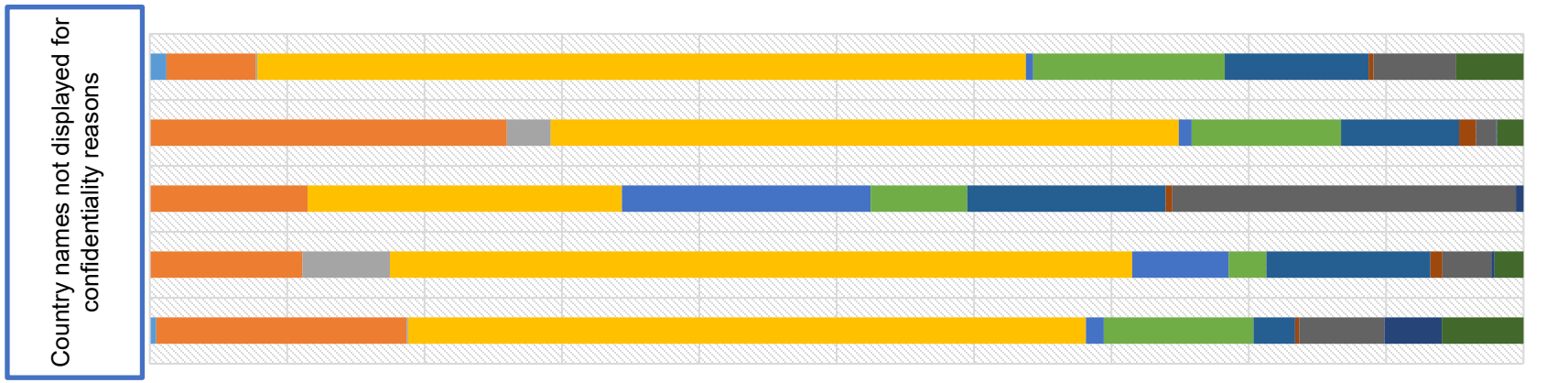
- A wide variation in total (national) antimicrobial consumption



- These findings are based 2018/2019 data for each country

Antimicrobial consumption and use

Antimicrobial consumption patterns: by pharmacological subgroup



	BHU	LAO	PAK	PNG	TML
A07A	0.5%	0.0%	0.0%	0.0%	1.2%
J01A	18.2%	11.1%	11.5%	26.0%	6.5%
J01B	0.1%	6.4%	0.0%	3.2%	0.1%
J01C	49.4%	54.0%	22.9%	45.7%	56.0%
J01D	1.3%	7.0%	18.1%	0.9%	0.5%
J01E	10.9%	2.8%	7.0%	10.9%	13.9%
J01F	3.0%	11.9%	14.4%	8.6%	10.5%
J01G	0.3%	0.9%	0.5%	1.2%	0.4%
J01M	6.2%	3.6%	25.0%	1.5%	6.0%
J01R	0.0%	0.0%	0.0%	0.0%	0.0%
J01X	4.2%	0.2%	0.6%	0.1%	0.0%
P01A	6.0%	2.1%	0.0%	1.9%	4.9%

- These findings are based on 2018/2019 data for each country

- A wide variation in types of antibiotics consumed across countries

Antimicrobial consumption and use

Antimicrobial consumption patterns: Oral antibiotics

	Country A	
1	amoxicillin	34.22%
2	ampicillin	18.07%
3	doxycycline	6.77%
4	azithromycin	6.47%
5	thiamphenicol	6.00%
6	erythromycin	5.87%
7	cefalexin	5.79%
8	tetracycline	4.85%
9	sulfamethoxazole and trimethoprim	2.89%
10	ofloxacin	2.85%

	Country B	
1	amoxicillin	42.00%
2	doxycycline	19.43%
3	sulfamethoxazole and trimethoprim	11.61%
4	metronidazole	6.35%
5	cloxacillin	5.74%
6	ciprofloxacin	5.36%
7	nitrofurantoin	4.16%
8	erythromycin	3.22%
9	norfloxacin	0.75%
10	cefalexin	0.51%

	Country C	
1	amoxicillin	38.63%
2	doxycycline	26.67%
3	sulfamethoxazole and trimethoprim	11.15%
4	erythromycin	6.03%
5	amoxicillin and beta-lactamase inhibitor	4.22%
6	flucloxacillin	3.27%
7	chloramphenicol	2.89%
8	azithromycin	2.79%
9	metronidazole	1.97%
10	ciprofloxacin	1.51%

	Country D	
1	amoxicillin and beta-lactamase inhibitor	12.98%
2	doxycycline	11.50%
3	ciprofloxacin	11.22%
4	cefixime	10.85%
5	levofloxacin	9.52%
6	amoxicillin	7.82%
7	sulfamethoxazole and trimethoprim	7.44%
8	azithromycin	6.70%
9	clarithromycin	5.13%
10	cefradine	2.90%

	Country E	
1	amoxicillin	47.12%
2	sulfamethoxazole and trimethoprim	14.20%
3	erythromycin	8.19%
4	cloxacillin	7.54%
5	doxycycline	6.61%
6	ciprofloxacin	5.91%
7	metronidazole	5.02%
8	azithromycin	1.89%
9	Nystatin	1.22%
10	amoxicillin and beta-lactamase inhibitor	1.16%

•These findings are based on 2018/2019 data for each country. % total of oral consumption

- Oral consumption data gives an insight in out-patient consumption
- Figures are breakdown as part of total oral consumption.
- Generally speaking, oral antibiotics take up 90% of total consumption

Antimicrobial consumption and use

Antimicrobial consumption patterns: Parenteral antibiotics

	Country A	
1	ampicillin	31.66%
2	ceftriaxone	15.35%
3	cloxacillin	13.68%
4	amoxicillin	13.28%
5	streptomycin	9.38%
6	kanamycin	5.70%
7	metronidazole	5.20%
8	gentamicin	4.50%
9	ceftazidime	0.85%
10	ciprofloxacin	0.35%

	Country B	
1	procaine benzylpenicillin	49.31%
2	ampicillin	12.06%
3	ceftriaxone	9.59%
4	cloxacillin	6.52%
5	benzylpenicillin	4.59%
6	gentamicin	4.20%
7	metronidazole	3.96%
8	cefazolin	2.96%
9	ciprofloxacin	2.19%
10	benzathine benzylpenicillin	1.79%

	Country C	
1	streptomycin	40.09%
2	chloramphenicol	15.18%
3	benzylpenicillin	13.61%
4	benzathine benzylpenicillin	8.97%
5	gentamicin	7.53%
6	ceftriaxone	3.73%
7	amoxicillin	3.56%
8	flucloxacillin	3.18%
9	metronidazole	2.12%
10	ampicillin	0.58%

	Country D	
1	ceftriaxone	28.58%
2	ciprofloxacin	26.36%
3	lincomycin	15.87%
4	cefotaxime	3.68%
5	amikacin	3.36%
6	gentamicin	3.10%
7	kanamycin	3.01%
8	cefradine	2.99%
9	cefoperazone and beta-lactamase inhibitor	2.86%
10	ceftazidime	1.20%

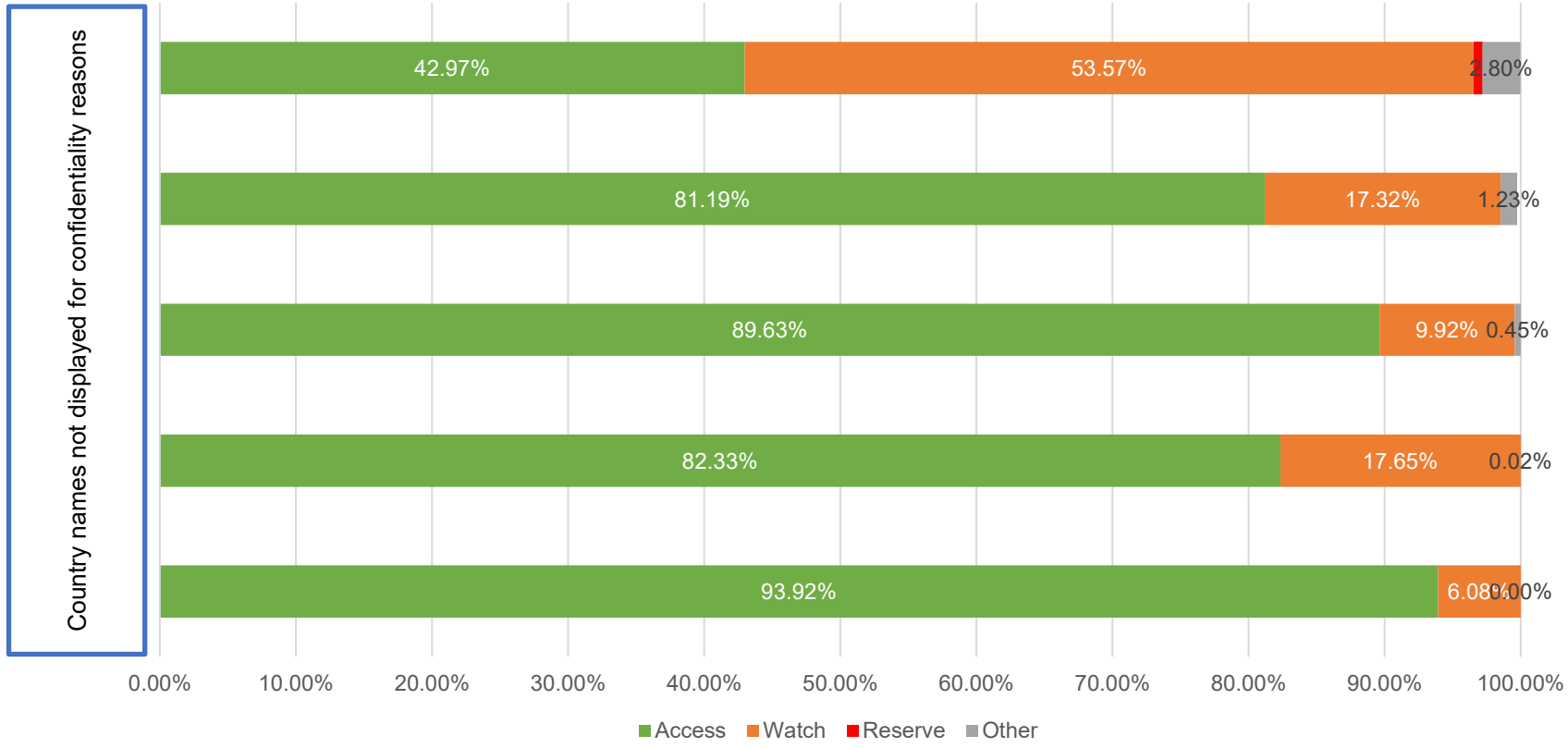
	Country E	
1	streptomycin	27.53%
2	ampicillin	24.28%
3	ceftriaxone	17.62%
4	procaine benzylpenicillin	9.99%
5	cloxacillin	8.23%
6	gentamicin	4.86%
7	benzathine benzylpenicillin	4.73%
8	benzylpenicillin	1.42%
9	vancomycin	0.39%
10	cefixime	0.37%

- Parenteral data gives an insight in in-patient consumption
- Greater differences in consumption patterns of parenteral antibiotics vs oral antibiotics

•These findings are based on 2018/2019 data for each country. % total of parenteral consumption

Antimicrobial consumption and use

Antimicrobial consumption patterns: AWaRe categories



- **WHO suggests that by 2023, 60% of all antibiotics consumed must come from Access** - the group of antibiotics at lowest risk of resistance.
- Evidence shows that to promote responsible use of antibiotics, Access antibiotics should make up at least 60% of national consumption.
- Most CAPTURA countries are on track to meet this.

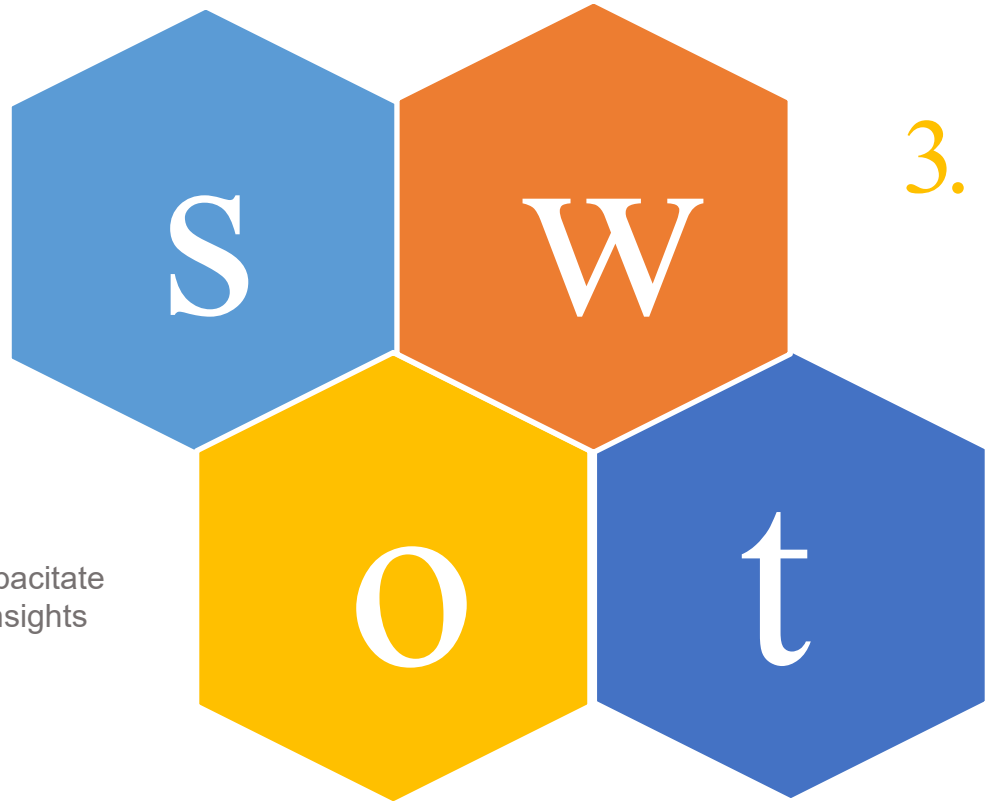
•These findings are based on 2018/2019 data for each country

Antimicrobial consumption and use

Antimicrobial consumption monitoring systems: SWOT analysis

1. **Data is available**
   Countries use existing data collection mechanisms and tools to monitor consumption and AMC is anchored in NAPs

2. **Structure and Institutionalize data**
   Relatively modest efforts to capacitate countries can yield important insights

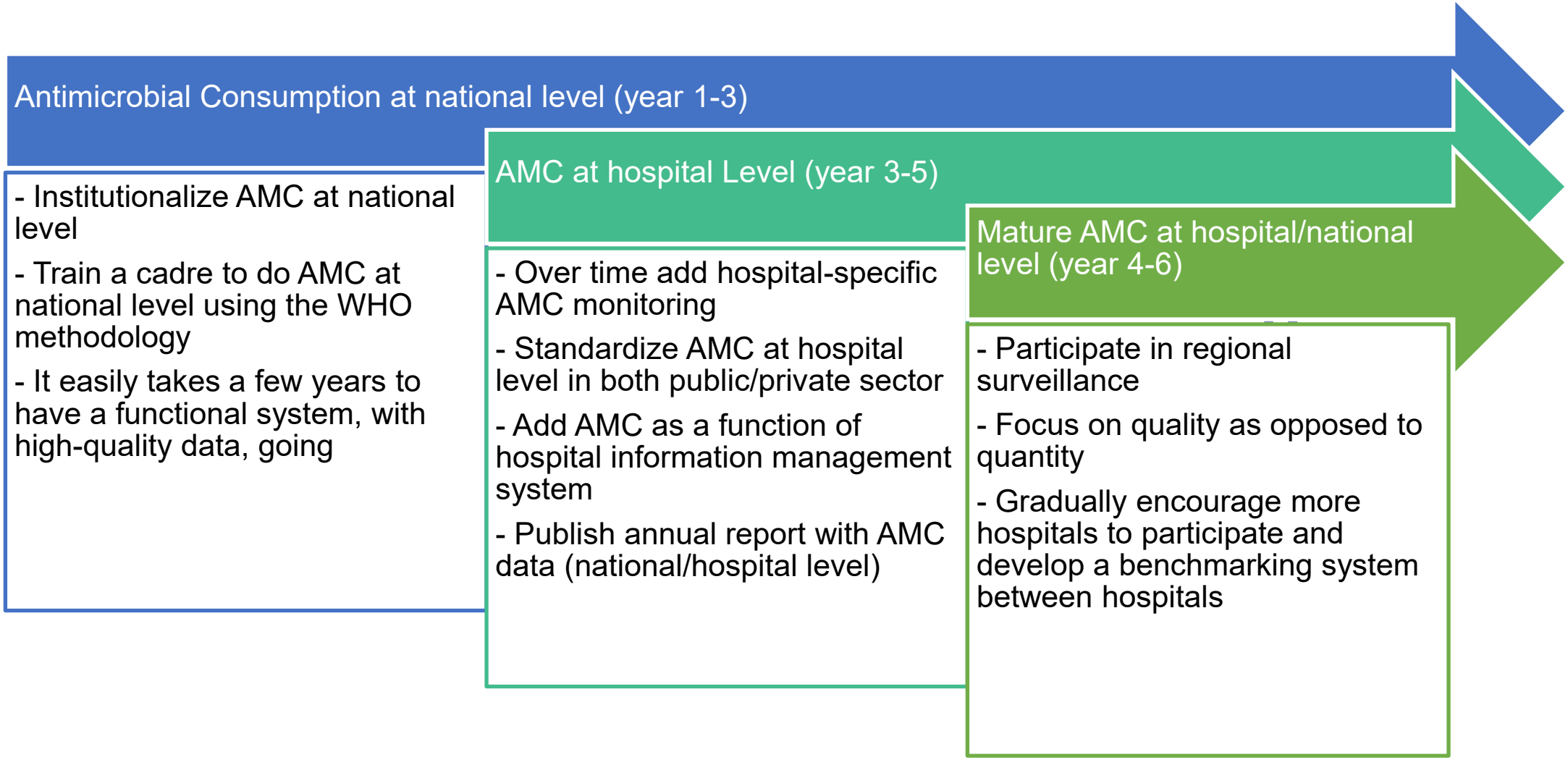


3. **Data largely unstructured**
   While the data is there, the absence of systems and structures leads to data quality and completeness issues

4. **Lack of resources**
   AMC tends to be the little brother of AMR surveillance and is likely to have to compete for resources

Antimicrobial Consumption and use

Antimicrobial consumption monitoring systems: Way forward



CAPTURA’s key findings on AMU

Antimicrobial consumption and use

AMU data analysis framework

Key indicators

- Antimicrobial prevalence in various wards
  - (% of patients on antimicrobials as part of total # patients)
- Proportional antibiotic use by pharmacological subgroup
  - Based on the total number of prescriptions
- Therapeutic (community and hospital acquired infection) & prophylactic (medical/surgical) antimicrobial use
- Most commonly used antibiotic agents (top 10 and by AWaRe categories)
- Quality indicators for antibiotic use
  - Reason in notes
  - Guideline compliant
  - Stop/review date documented

Antimicrobial consumption and use

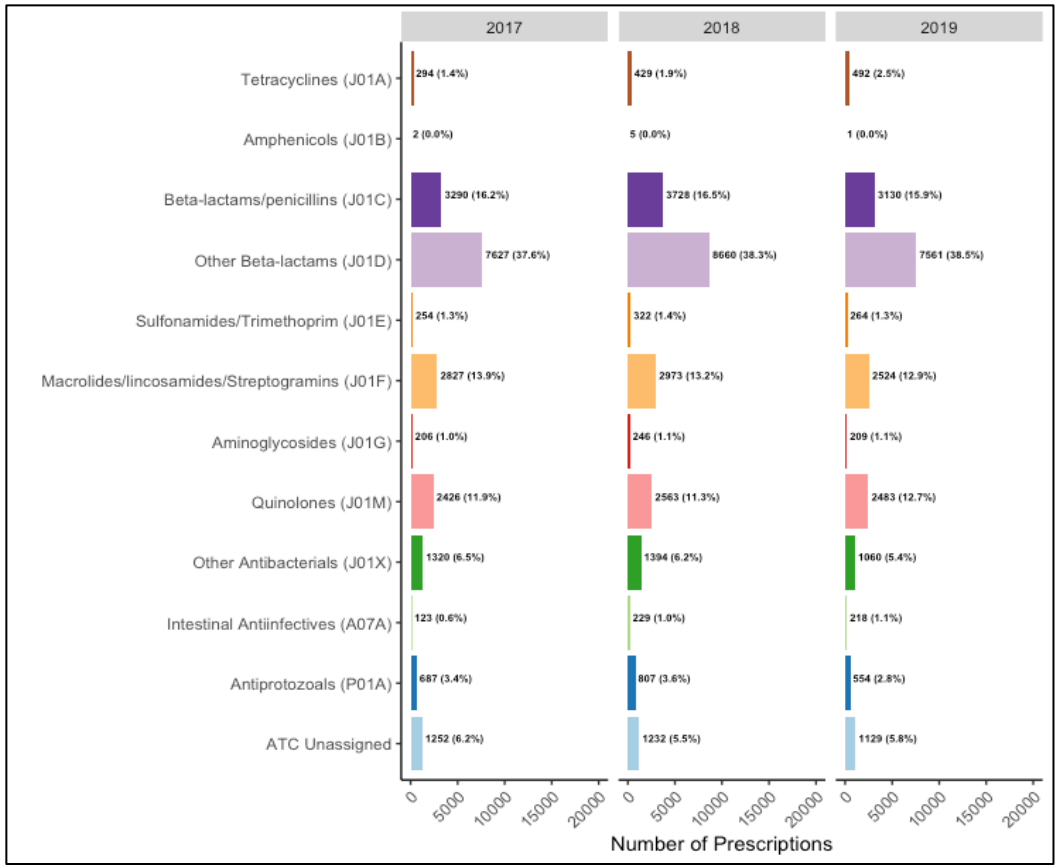
Key findings on antimicrobial consumption use patterns

- CAPTURA only received AMU data from a few facilities
- Given the complex undertaking of conducting AMU surveillance, it is expected AMU is in its infancy in CAPTURA countries
- It is difficult to draw any key findings from the data CAPTURA curated and analysed
- CAPTURA shared findings with individual facilities

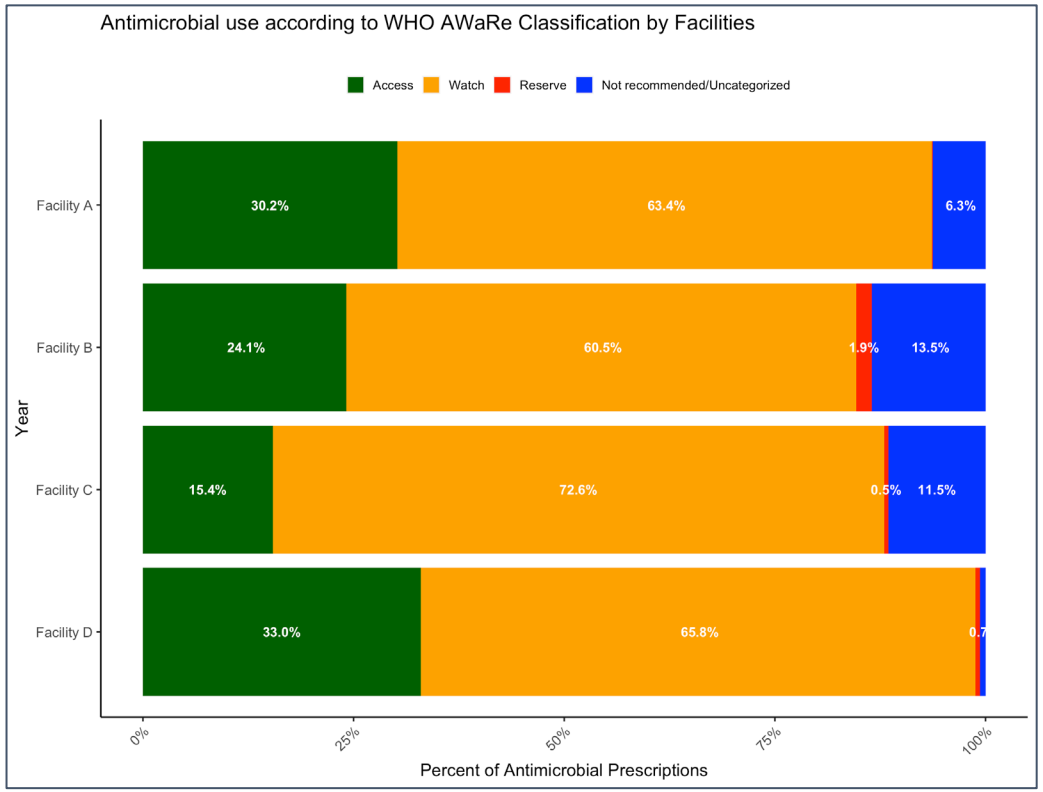
Antimicrobial consumption and use

Example of AMU analysis CAPTURA supported

AMU by pharmacological subgroup (aggregated facilities, by year)



AMU by AWaRe categorization



Antimicrobial Consumption and use

Developing country led AMU systems

Antimicrobial use at hospital (year 1-3)

- Adopt a common AMU framework with linkages to NAP
- Initiate a small-scale PPS at selected hospitals (baseline)
- Focus on quality as opposed to quantity
- Gradually encourage more hospitals to participate and develop a benchmarking system between hospitals

AMU at hospital Level (year 3-5)

- Consistently replicate PPS at hospitals
- Evaluate antimicrobial prescribing practices and survey performance indicators in hospitals
- Design hospital interventions and identify targets

AMU at hospital level (year 4-6)

- Institutionalize AMU as part of hospital accreditation
- Develop a benchmarking system between hospitals
- Continue to evaluate antimicrobial prescribing practices and AMU performance indicators in hospitals

Antimicrobial Consumption and use

Overview and way forward

Focus Area	Desires future state	Current state	Identified Gap	Opportunities for Action
Antimicrobial Consumption Monitoring (national)	• All countries monitor annually large consumption trends and these trends feed into national stewardship/policy	• Data is available, but only very few countries have a designated AMC monitoring system in place at national level	• Lack of institutionalization and standardized approach to AMC nationally	• Institutionallze approach • Introduce and apply standardized methodologies and IT tools • Annual publication of results
Antimicrobial Consumption Monitoring (hospital level)	• Consumption monitoring informs decision at facility level and helps inform development of stewardship policies and treatment guidelines	• Selected facilities monitor consumption, but unclear if and how informs daily practice	• Lack of standardized approach and hospital information systems not well equiped to also have AMC funciton	• Per country, have a sentinel surveillance network with mix of hospitals to monitor AMC • Community of Practice
Antimicrobial Use Monitoring	• Consumption Use monitoring is periodically used to inform dispensing and treatment protocols (mainly at facility level)	• Selected PPS activities available, but proper AMU is largely inexesistent in the Region.	• Complexity of AMU (lack of resources, framework, understanding) makes it challenging to implement in CAPTURA countries.	• Introduce small scale PPS AMU studies with a focus on establishing AMU as an activity
Cross cutting issues	• AMR and AMC/AMU analysis to go hand in hand • Trained experts in AMC and AMR	• AMU/C and AMR operate largely in separate spheres • No trained AMC experts in country	• Limited data sharing and joint analysis / integrated surveillance	• Given the complex nature of this undertaking, consider a regional project on linking AMC and AMR data • Train a cadre on AMC/AMU