



# **AMR in the hospital environment, evaluation, and impact**

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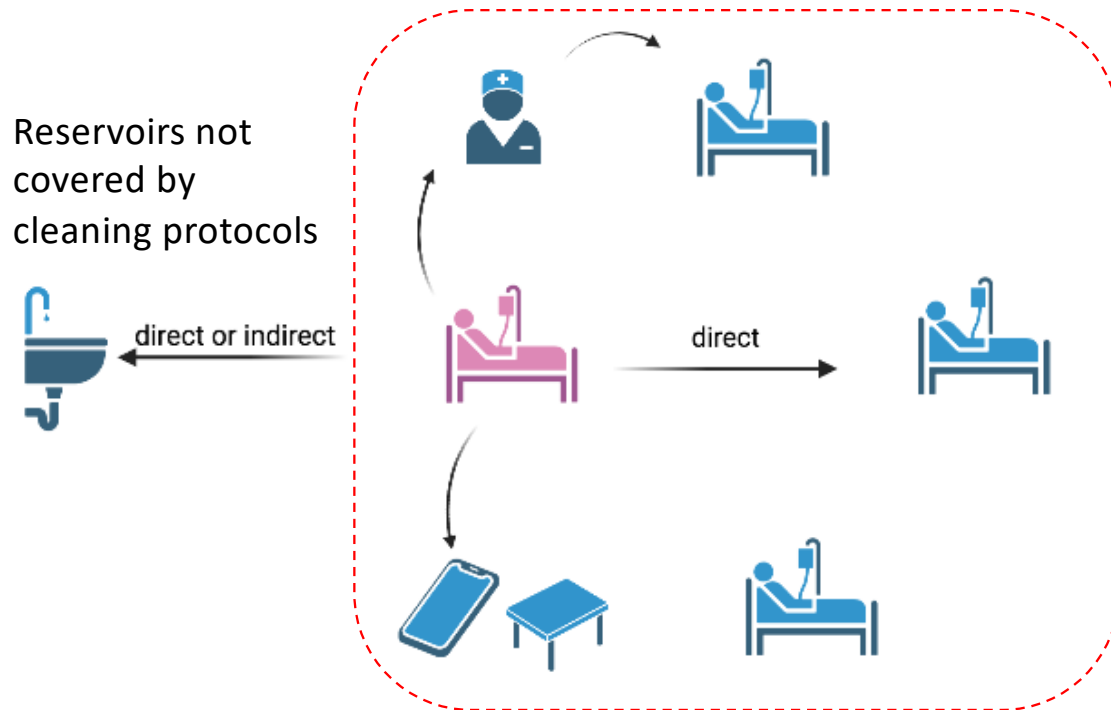
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# Questions about hospital environment and AMR/infection control

- Is environmental monitoring of multi-resistant pathogens useful?
- When should I suspect an environmental source?
- How to plan environmental sampling?

# Immediate surrounding area of patients colonized



## Multimodal IPC strategies

- Hand hygiene
- Surveillance for asymptomatic colonization
- Contact precautions
- Environmental cleaning

# Is environmental monitoring of multi-resistant pathogens useful?



**Guidelines for the prevention and control of carbapenem-resistant Enterobacteriaceae, *Acinetobacter baumannii* and *Pseudomonas aeruginosa* in health care facilities**

The panel recommends that surveillance cultures of the environment for CRE-CRAB-CRPsA may be considered when epidemiologically indicated.

*Conditional recommendation, very low quality of evidence*

## *Recommendation 7*

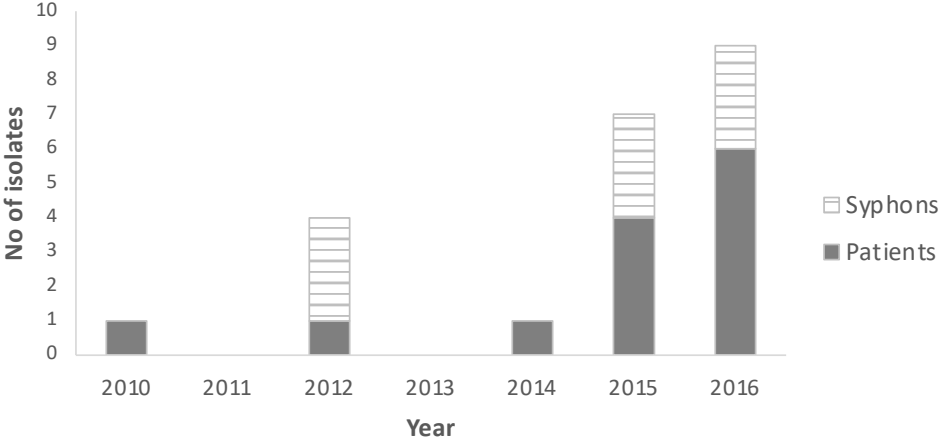
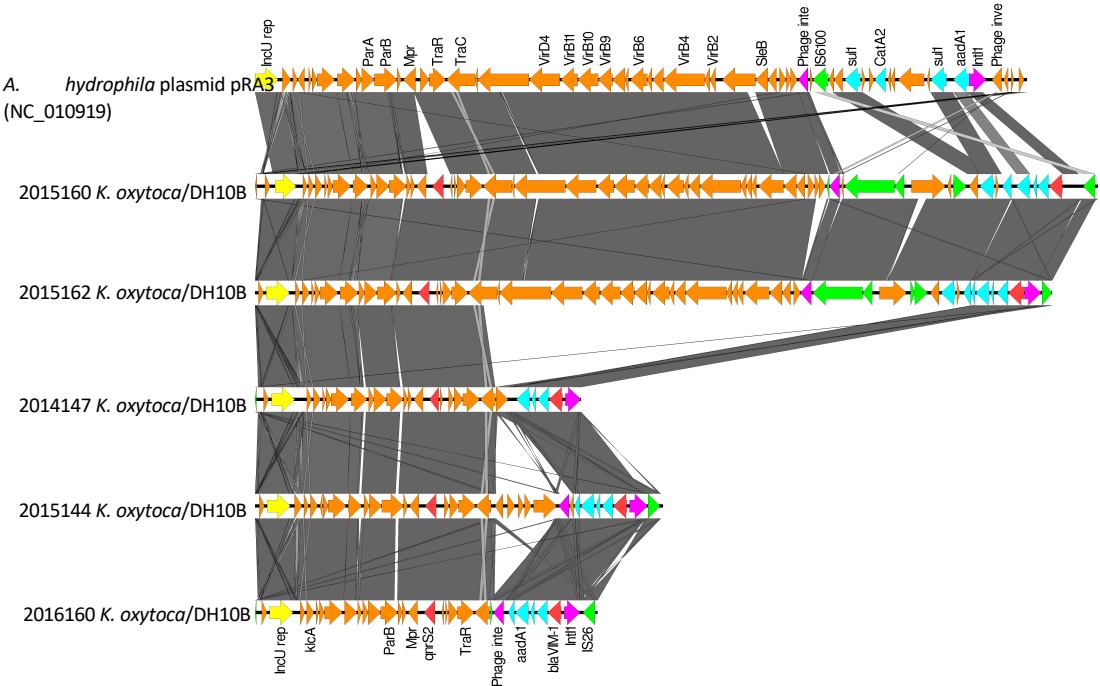
Outbreaks of **CRPsA** colonization/infection among patients appeared to be more commonly associated with environmental CRPsA contamination involving water and waste-water systems, such as **sinks and taps** (faucets).

What about *K. pneumoniae*, *E. cloacae*?

2017

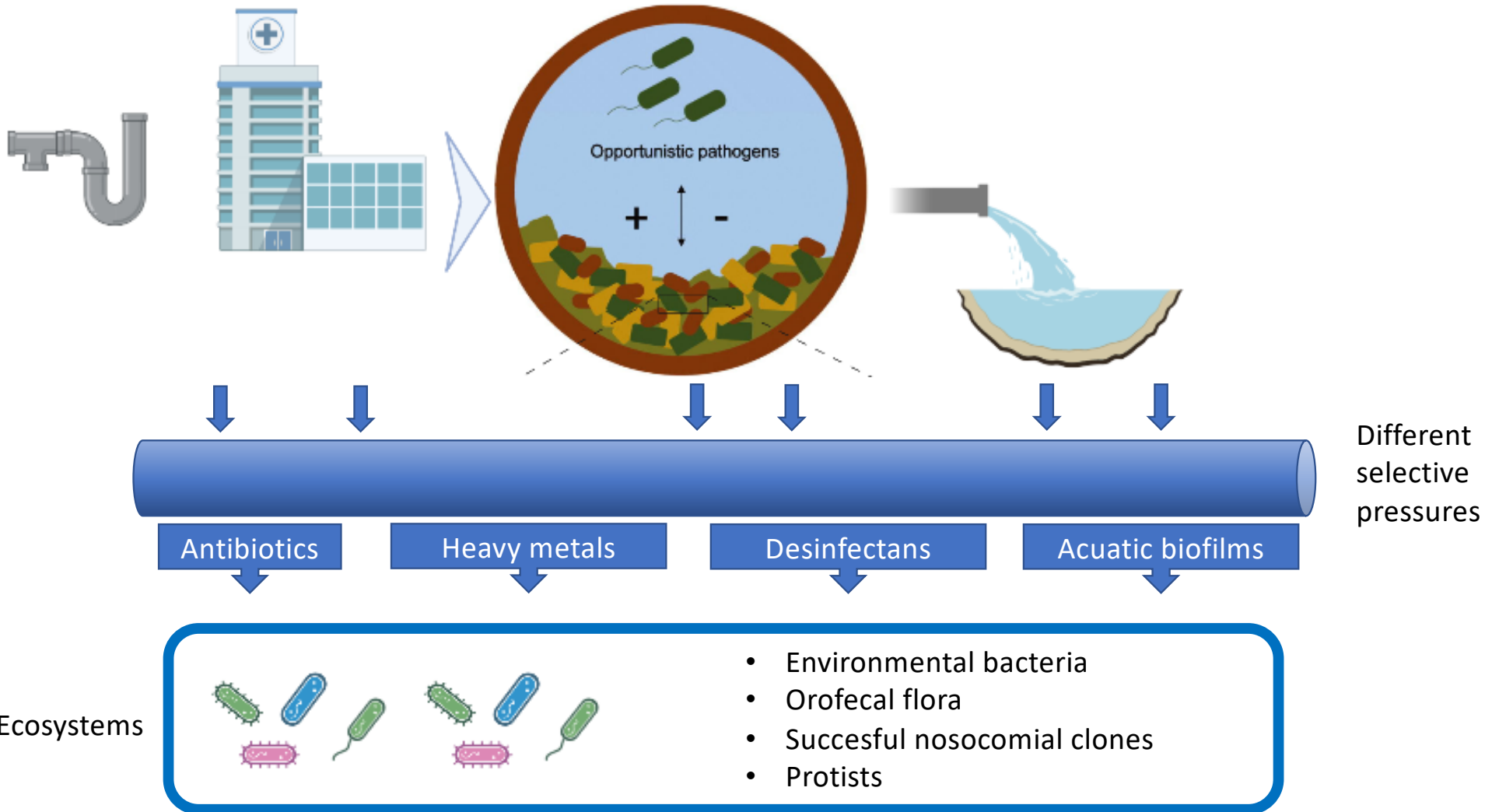
# 1. Persistent colonisation of siphons, but also of pipes.

*K. oxytoca* ST202/VIM-1+qnrS1  
 >30 SNPs of difference between isolates



ICU-A	BOX-7		
	BOX-10		
ICU-B		BOX-1	BOX-1
		BOX-2	
		BOX-6	BOX-6
			BOX-7
		NC	NC

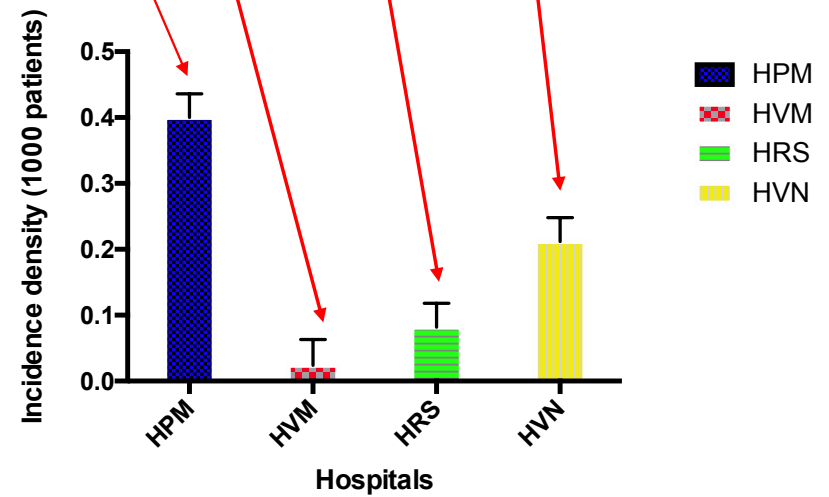
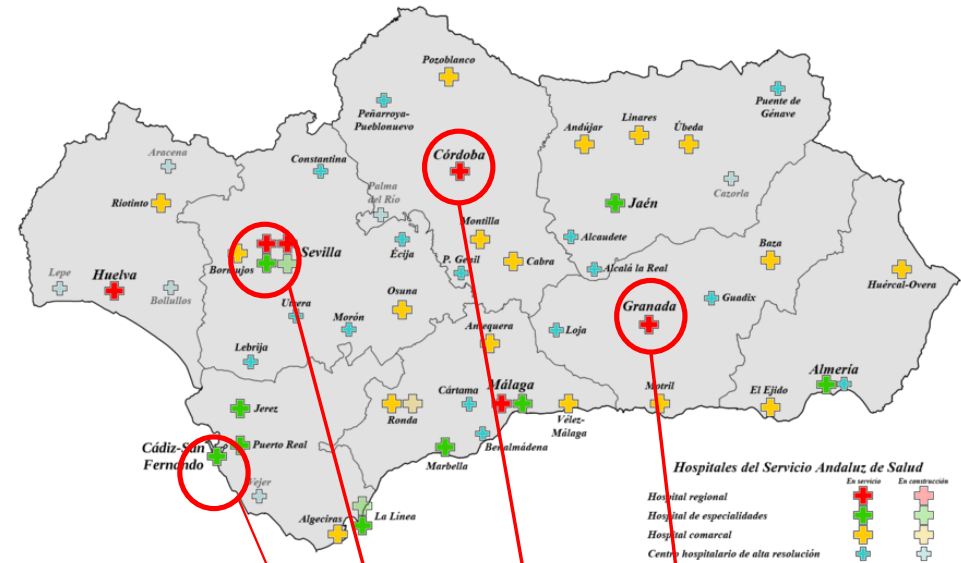
- Sinks of every box were not connected to each other
- Independent drains to a common collector



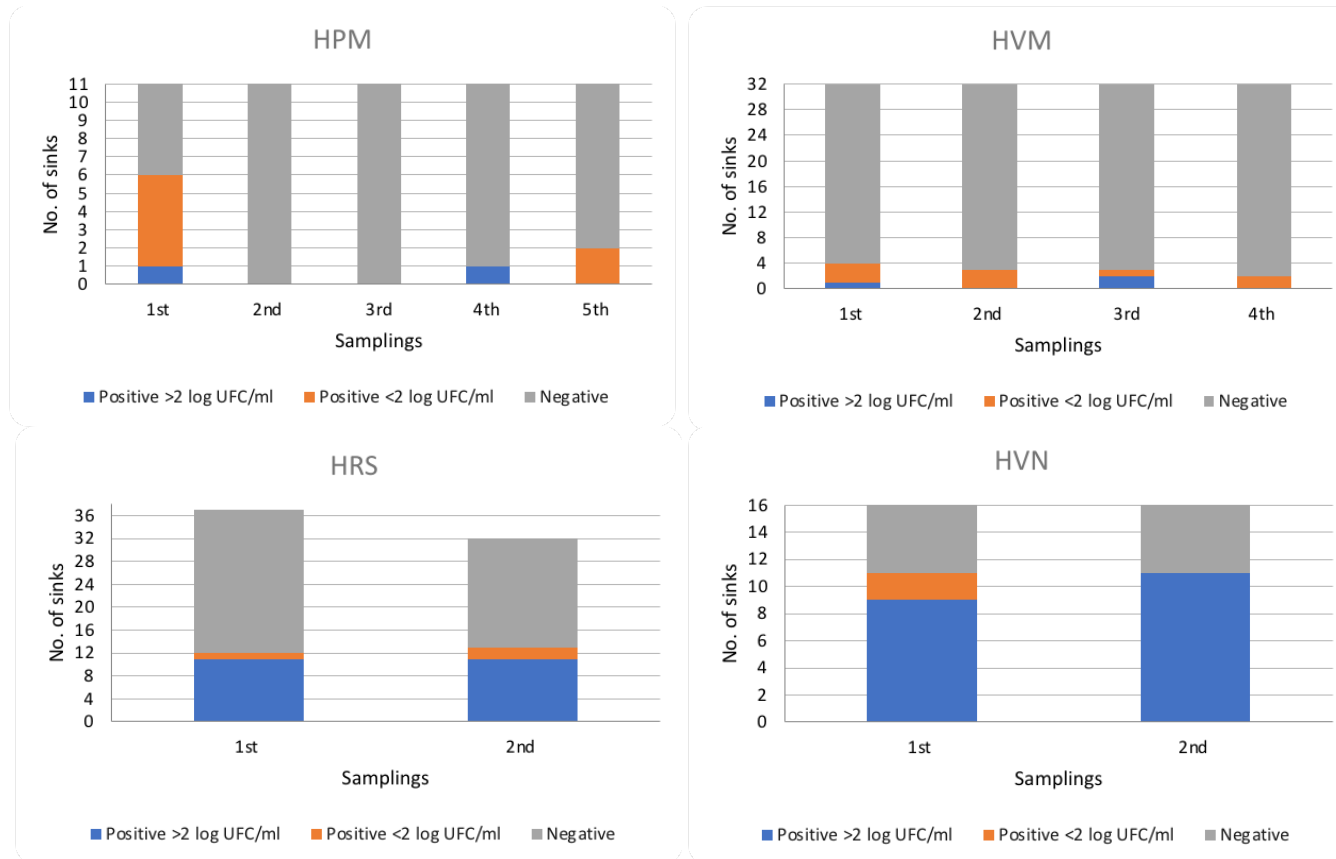
# Canalis project

4 hospitals

- **Different** Incidence Density of Carbapenemase infection cases
- **No current outbreaks** at the ICU
- No current disinfections interventions



## 2. Universal CRE colonisation of the siphons of the 4 ICUs





## 2. Universal and persistent of some clones

Few cases of patient colonization, difficult to trace with the siphon

	No. of different positive siphons											
	Months											
	1	2	3	4	5	6	7	8	9	10	11	12
<b>HRS</b>												
→ <i>K. pneumoniae</i> ST512	1			2	2	1	2	1	3	1		3
<i>K. pneumoniae</i> ST3362			1					1				
<i>K. oxytoca</i> ST329								1	1			
<i>E. cloacae</i> ST523			1	1	3				1	2		3
<i>C. freundii</i> ST95				1				2	3			
<i>E. cloacae</i> ST24									1			2
<i>P. aeruginosa</i> ST155		1		6	7			2	3	1		2
<i>P. putida</i> ST122				1				1				
<i>P. putida</i> ST115		1		6	7			2	3	1		2
<b>HVM</b>												
<i>K. oxytoca</i> ST202			1	3	3			2	1		2	5
<i>K. pneumoniae</i> ST392	1				1		1	1	1			4
→ <i>K. pneumoniae</i> ST512						1	1					
<i>P. putida</i> ST119						1						1
<b>HPM</b>												
<i>E. cloacae</i> ST96	2							1				
<b>HVN</b>												
→ <i>C. freundii</i> ST125	2	2	1									
<i>P. aeruginosa</i> ST253	2		2		2	3			4	1	1	1
<i>P. putida</i> ST115	1	1	1									
<i>P. putida</i> ST103				2	2							
<i>P. putida</i> ST17				1	4	2	1	2	1	3	1	1
<i>P. putida</i> ST15	1	2	1									

# When to suspect environmental reservoir involvement?

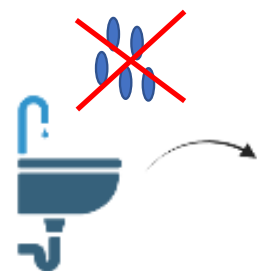
## Characteristics of scenarios

- Outbreaks that are sustained over time **like waves** of the same lineage
- Hypothetical endemics
- **Re-emergence** of lineages after successful interventions
- Several different species or lineages with **identical genetic platform**

### Factors affecting

- Use of sinks
- Locations of sinks
- Bacterial load
- Drainage

TIME



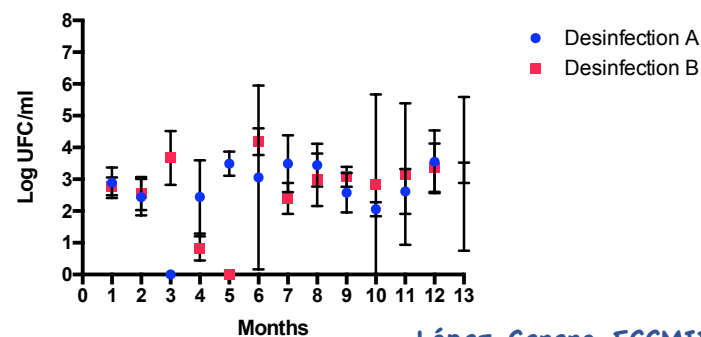
No aerosols transmission

**Droplets** transmission

Kotay SM, et al. *Appl Environ Microbiol.* 2019

WAVES

### Regeneration after desinfection

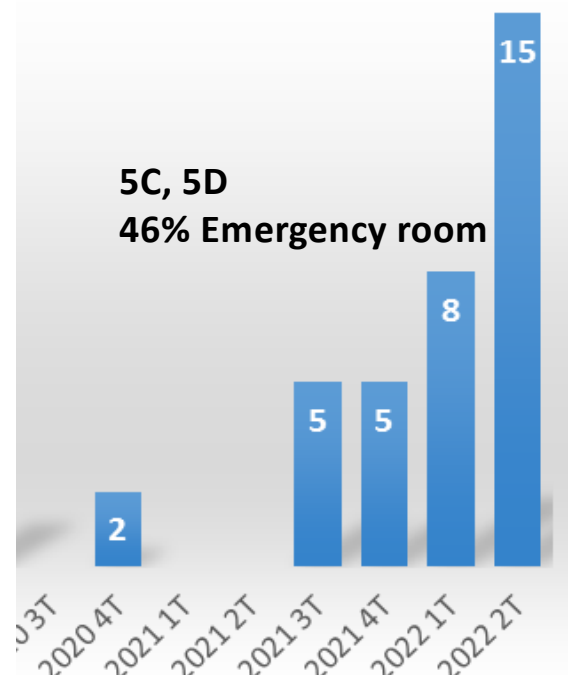
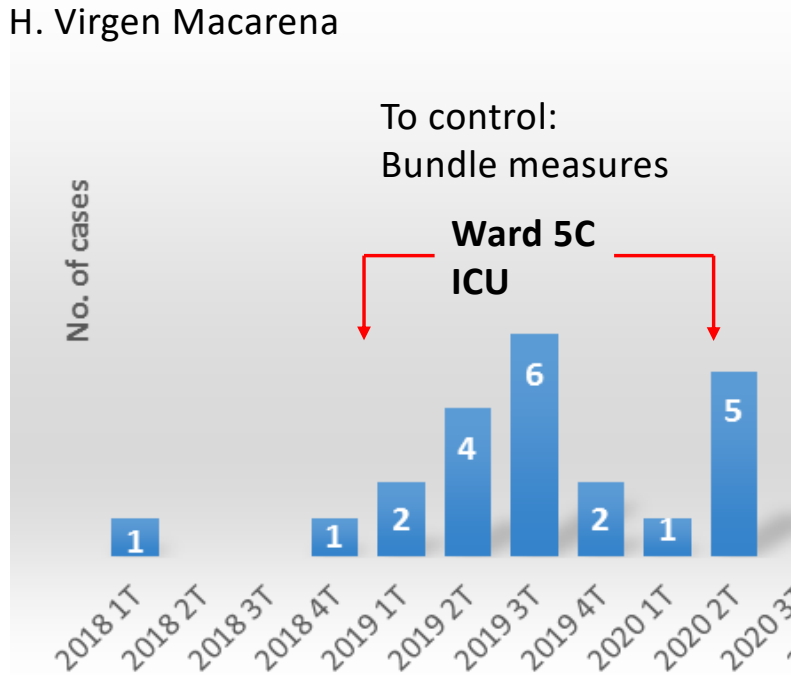


López-Cerero ECCMID 2019

# How to plan environmental sampling?

- The importance of targeted sampling

*K. pneumoniae* ST15/VIM-1+OX—48+CTX-M-15  
H. Virgen Macarena



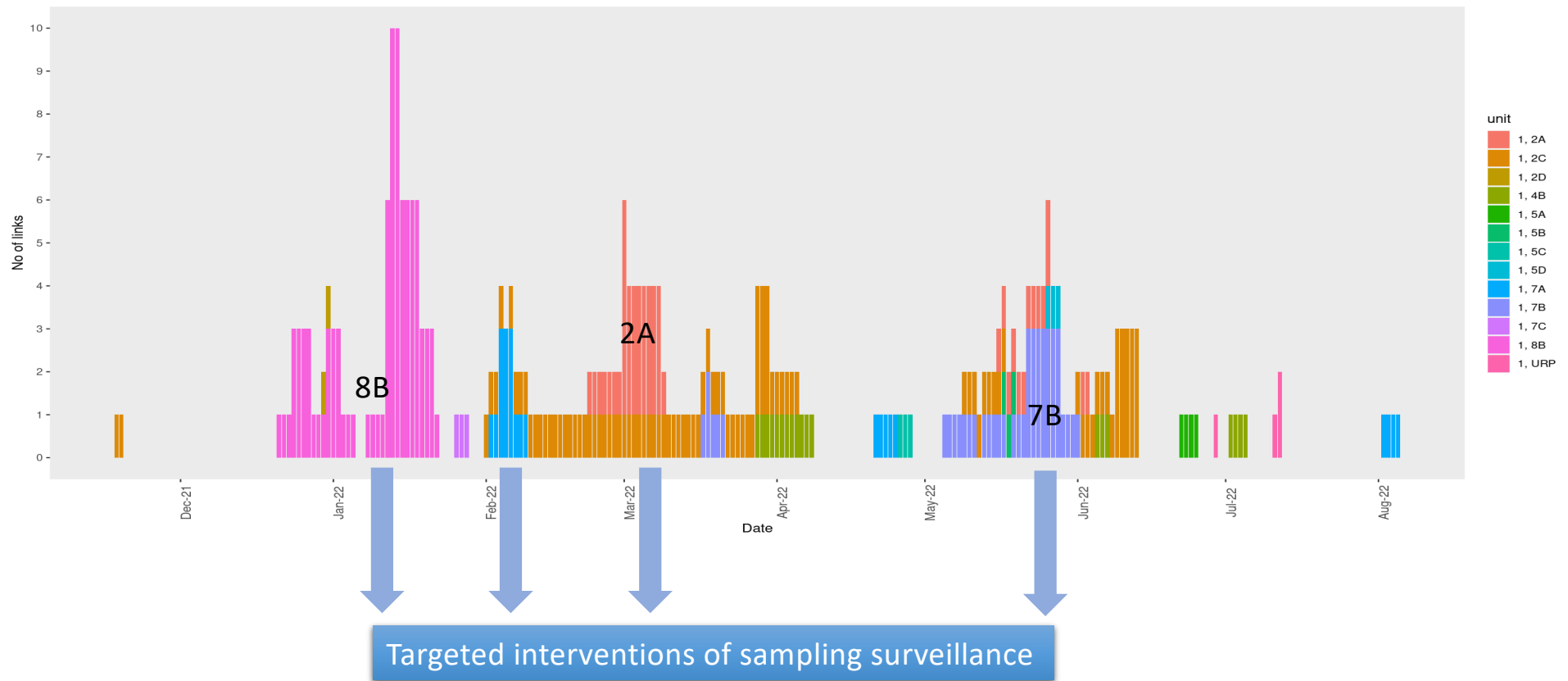
- Does the outbreak occurring in 5C and 5D?
- Should we go to these wards to look for hidden reservoirs?

Look for links one year before the occurrence of the second wave

No. links between patients: coincidence of 2 positive patients in the same ward at the same time

([https://nrar.shinyapps.io/epilinx\\_web/](https://nrar.shinyapps.io/epilinx_web/))

### Epicurve based on direct epilinks



Julio 2023, Medellin

# Targeted sampling: the outbreak was previous

