Pool-testing for surveillance of key bacterial resistance genes in infants' stools

- Highest proportion of spared analyses for antibiotic resistant bacterial colonization prevalence ≤10%
- Pooling less efficient for antibiotic resistant bacterial colonization prevalence above 20%

Pool-testing strategies to guide antibiotic resistant colonisation surveillance in European neonatal units

Study sponsored by Penta Child Health Research

Objectives:

To explore the efficiency of a pooling strategy for surveillance of key bacterial resistance genes in infants' stools, based on prevalence observed in cross-sectional surveys conducted across European neonatal units as part of a feasibility study for a large-scale infection prevention and control trial.

Methods:

- Simulation on **antibiotic resistant colonization prevalence (0-78%)** observed in cross-sectional surveys conducted in European neonatal units (24 NICUs in 8 European Countries, **pool size by unit 1-36**) as part of a feasibility study for a large-scale infection prevention and control trial (**NeoDeco**).
- Antibiotic resistant bacterial colonisation was defined as the detection of **at least one target resistance gene in stools by PCR (Figure 2)**.
- Comparison of the expected number of pooled plus de-pooling analyses performed in each scenario with analysing each sample individually.

Figure 1: Distribution of number of patients per survey (4 surveys total) in each site included in the analysis, by prevalence.

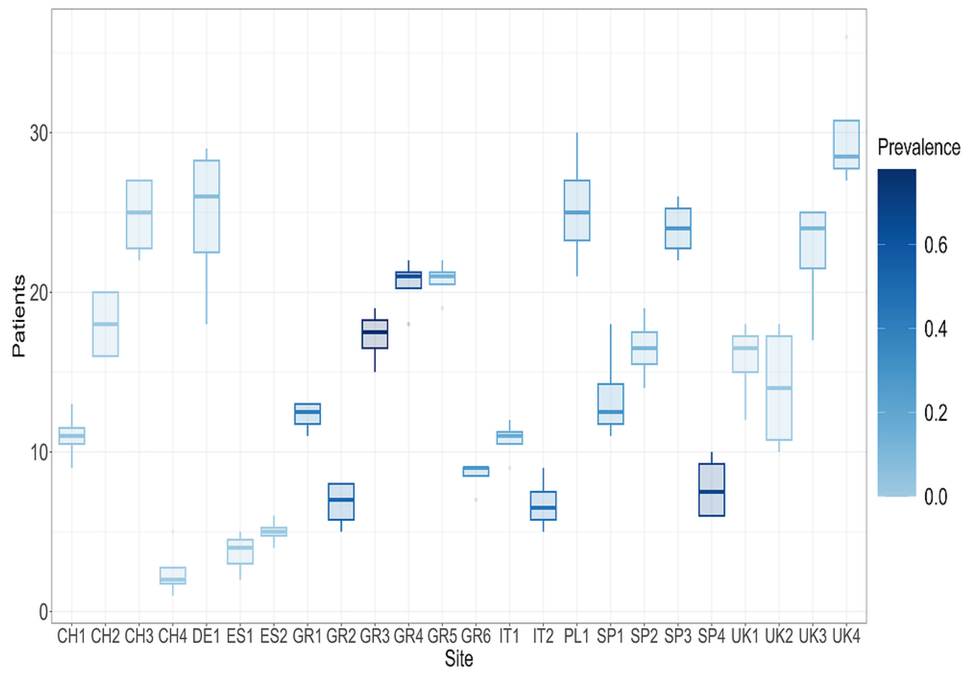


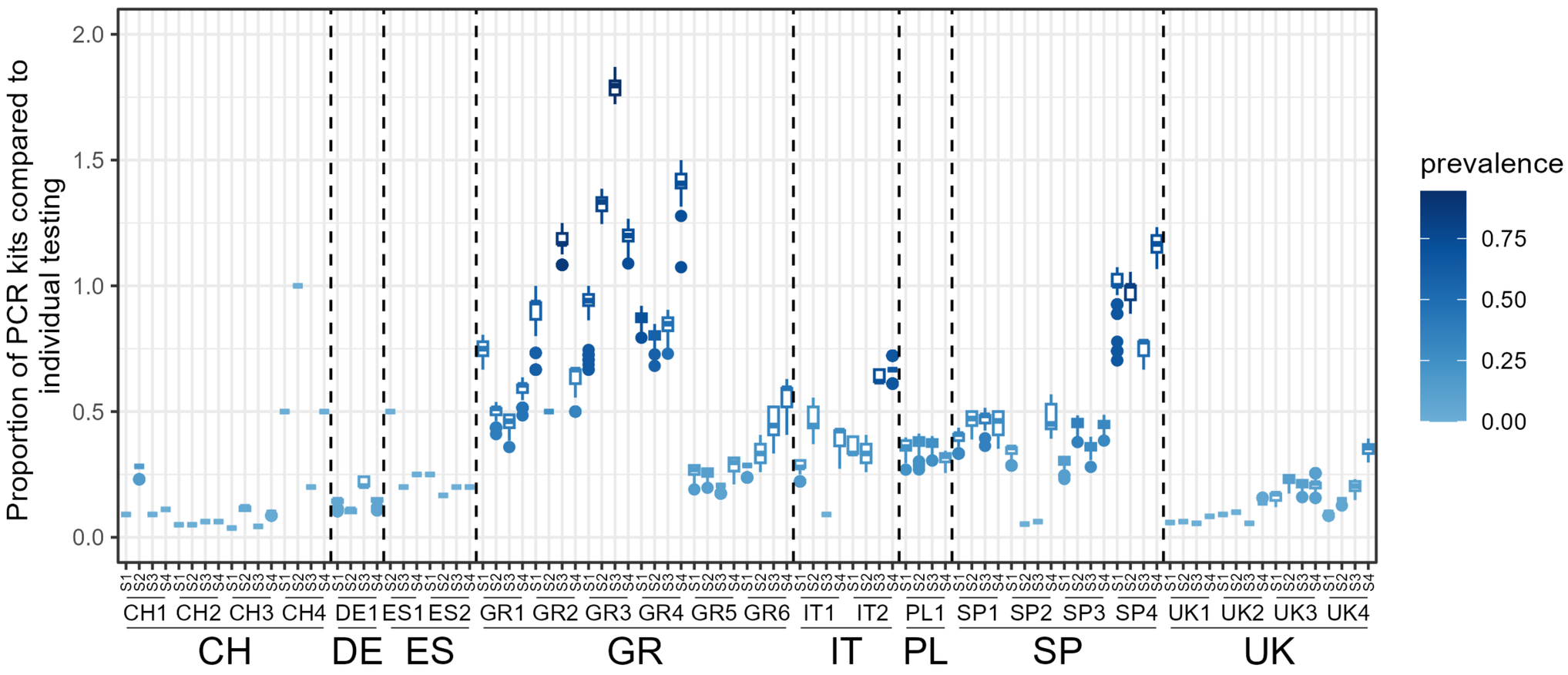
Figure 2: PCR assays and gene targets

Gene target	Assay
vanA vanB	VRE (Geneproof)
bla_{KPC} bla_{NDM} bla_{VIM} bla_{IMP} bla_{OXA-48}	Carbaplex-IVD PCR (Bruker)
bla_{CTX-M} group1 bla_{CTX-M} group9	Ba04646149_s1, Ba04646127_s1 (ThermoFisher)

Results:

- For low (**≤10%**), intermediate (**11 – 20%**) and high (**>20%**) prevalence settings **PCR assay use** was on average reduced by **83%** (IQR: 80 – 94%), **73%** (IQR: 69 – 77%), and **31%** (IQR: 13 – 58%) **with pooling** (**Figure 3**).
- Scenarios with at least a 75% reduction in testing had a variable resistant bacterial colonisation prevalence between 0 and 17% due to stochasticity of sample distribution during de-pooling and number of patients in the pool.
- For higher prevalence, smaller pool sizes or individual testing might be more efficient and resource-saving.

Figure 3: Proportion of PCR assays required following the pooling strategy compared to individual testing, grouped by survey in each site and coloured by prevalence.



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