

European Centre for Diseases Prevention and Control

European carbapenem-resistant Enterobacterales surveillance including *Klebsiella pneumoniae*

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European Antimicrobial Resistance Genes Surveillance Network (EURGen-Net) established in 2017



Aim

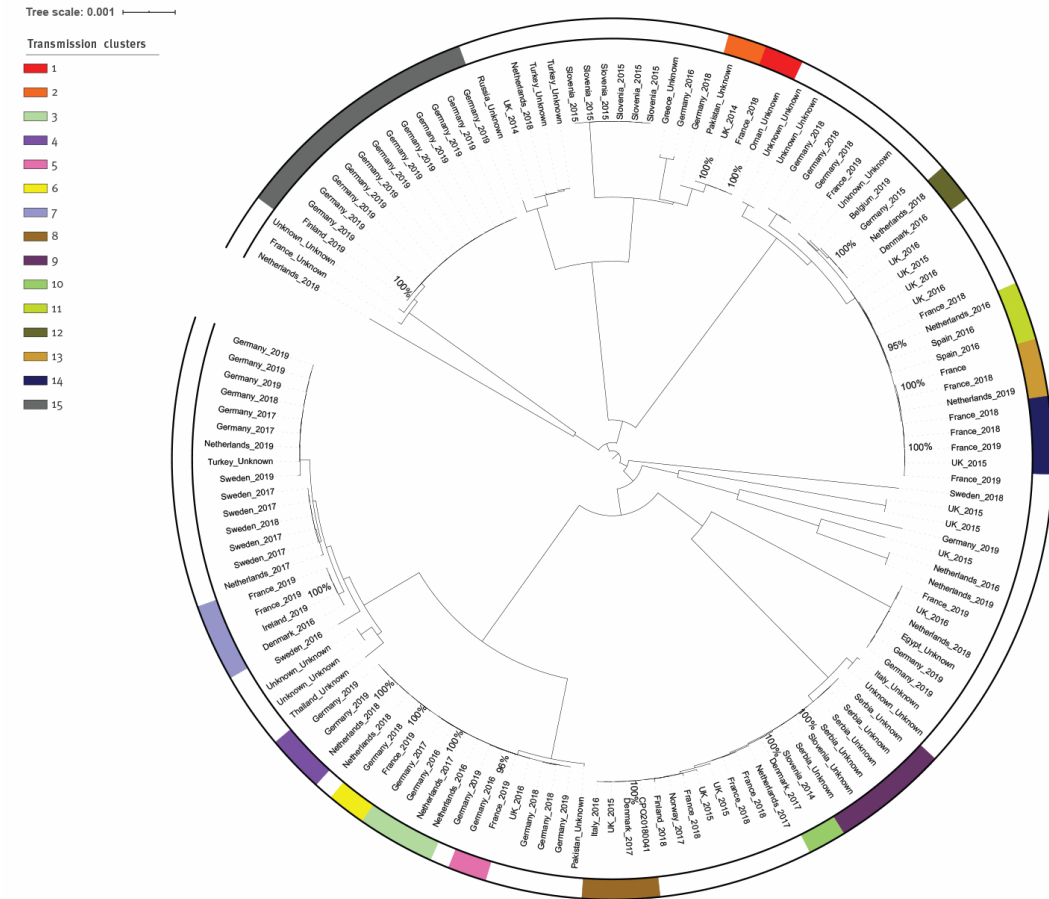
- Genomic surveillance of multidrug-resistant pathogens of public health importance in 36 countries

Objectives

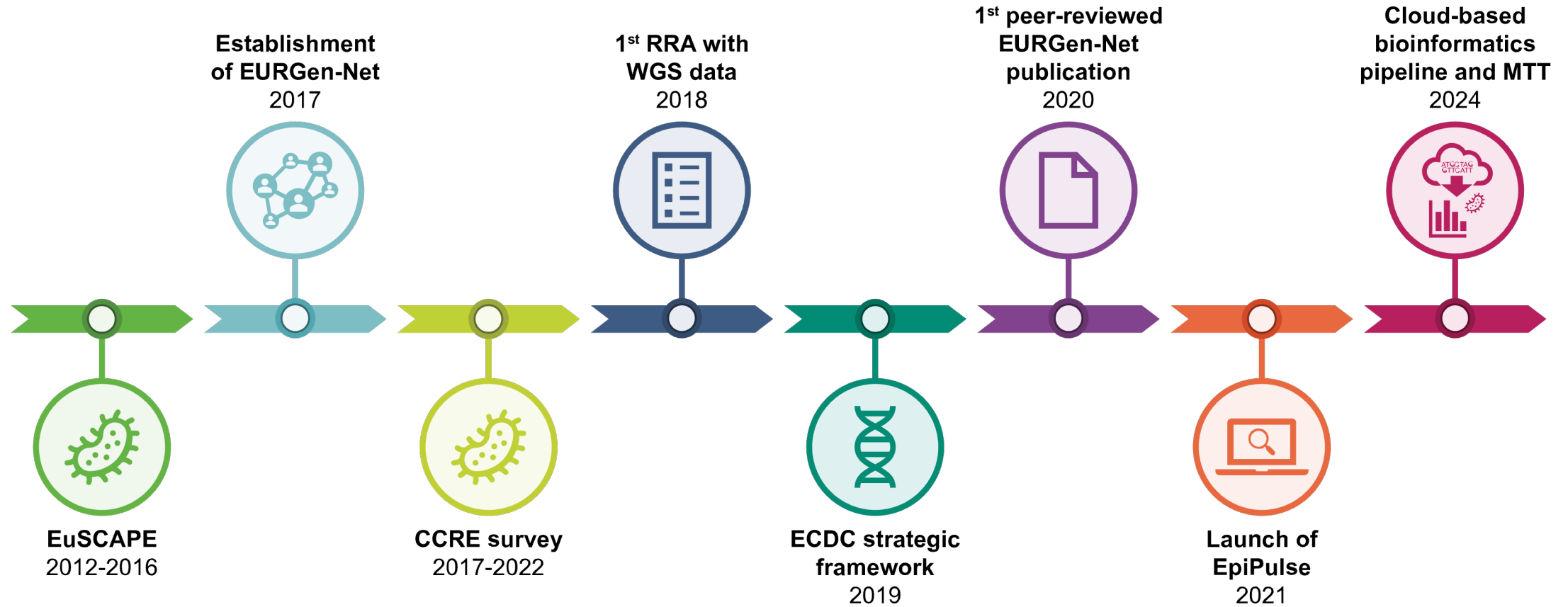
- To monitor the occurrence and geographic distribution of high-risk lineages and resistance genes of public health importance
- To support cross-border investigations of outbreaks and emerging resistance
- To assist the development of technical capability and proficiency for genomic surveillance

Main activities

- Multinational structured surveys
- Investigations and risk assessments based on national whole genome sequencing data



Timeline of surveillance of carbapenem-resistant Enterobacterales (CRE) at ECDC

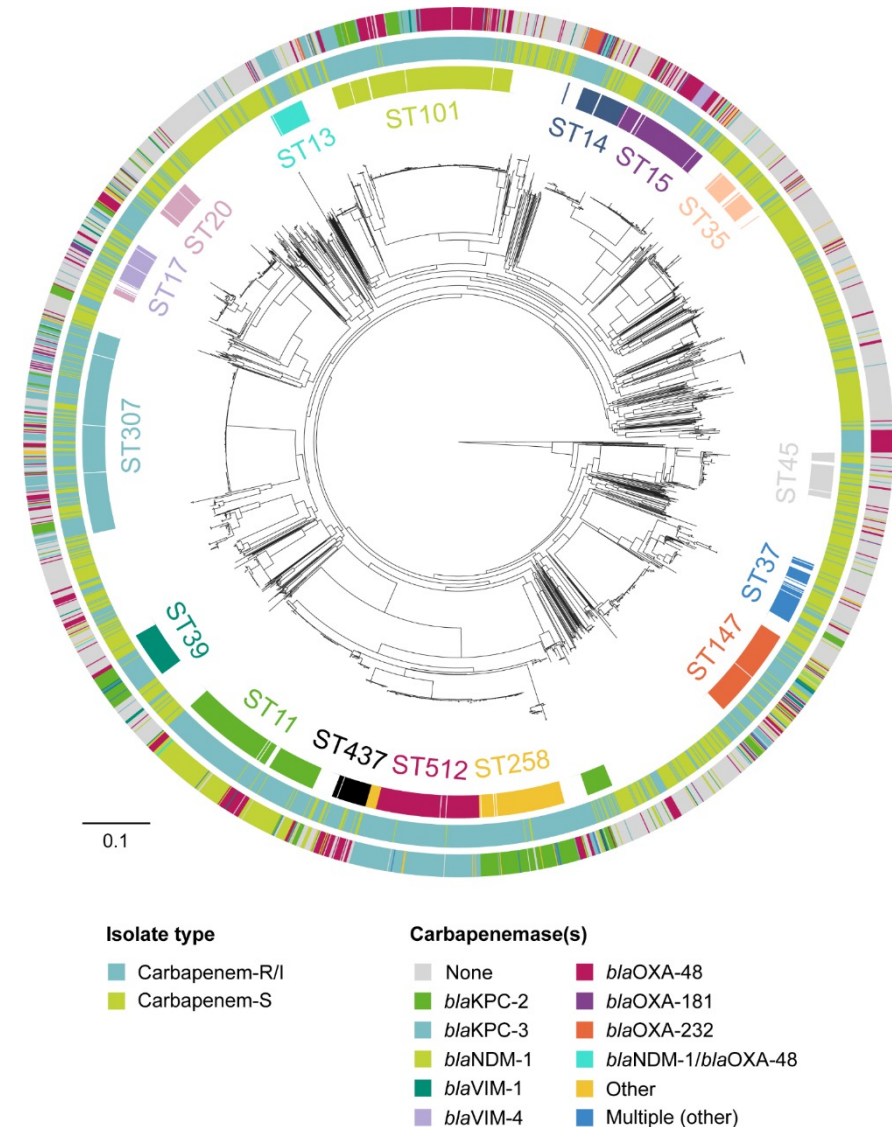


Set-up of ECDC CRE surveillance

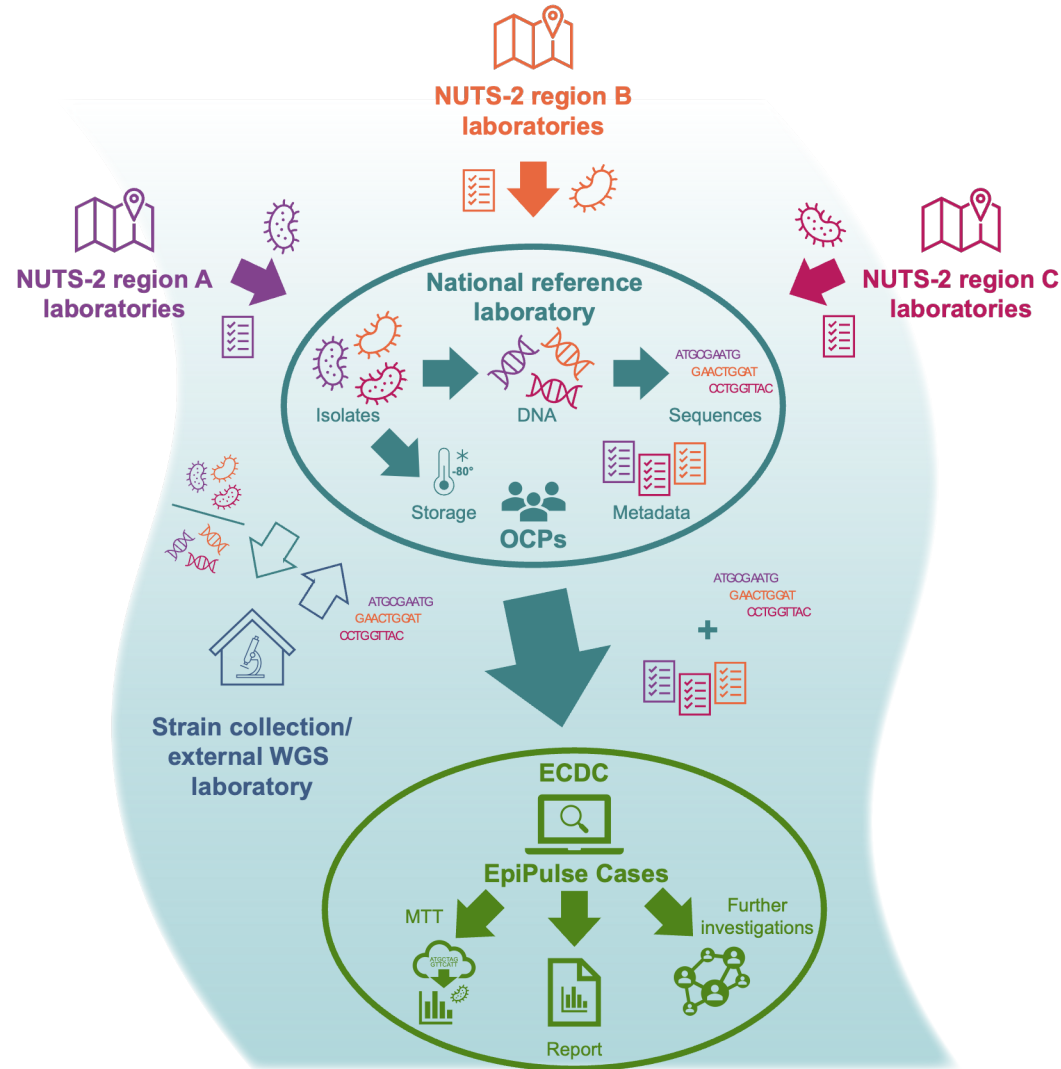
- 1. Large-scale structured surveys** with standardised inclusion criteria and harmonised data collection
 - EuSCAPE, CCRE survey, CRE25 survey
- 2. Outbreak/emerging resistance investigations** using national WGS data triggered by EpiPulse alerts or survey findings
 - hypervirulent *Klebsiella pneumoniae* (hvKp) ST23
 - multi-country mosaic virulence-resistance plasmid spread in *K. pneumoniae* ST147, ST392, ST45
 - CCRE survey follow-up study on *K. pneumoniae* in Greece

CCRE survey 2019

- Isolates with clinical, epidemiological and WGS data from **323 hospitals** in **36 European countries**:
 - 2973 *K. pneumoniae* species complex
 - 548 *Escherichia coli*
- **Major findings:**
 - increase of *bla*_{NDM-5}-carrying *E. coli* in EU/EEA
 - emergence of the new clade of *K. pneumoniae* **ST39** carrying *bla*_{KPC-2} in Greece
 - increase of *K. pneumoniae* **ST307**
 - insights into the geo-temporal spread of *K. pneumoniae* **ST11**



CRE25 – European survey of carbapenem-resistant Enterobacterales 2025



- **Simplified** and **faster** protocol with elements facilitating future transition to routine genomic surveillance
- Leveraging **national WGS data** where possible with central WGS support service as a back-up option for countries without sufficient WGS capacity
- **Direct WGS upload** to EpiPulse Cases platform and piloting of **interim analysis**

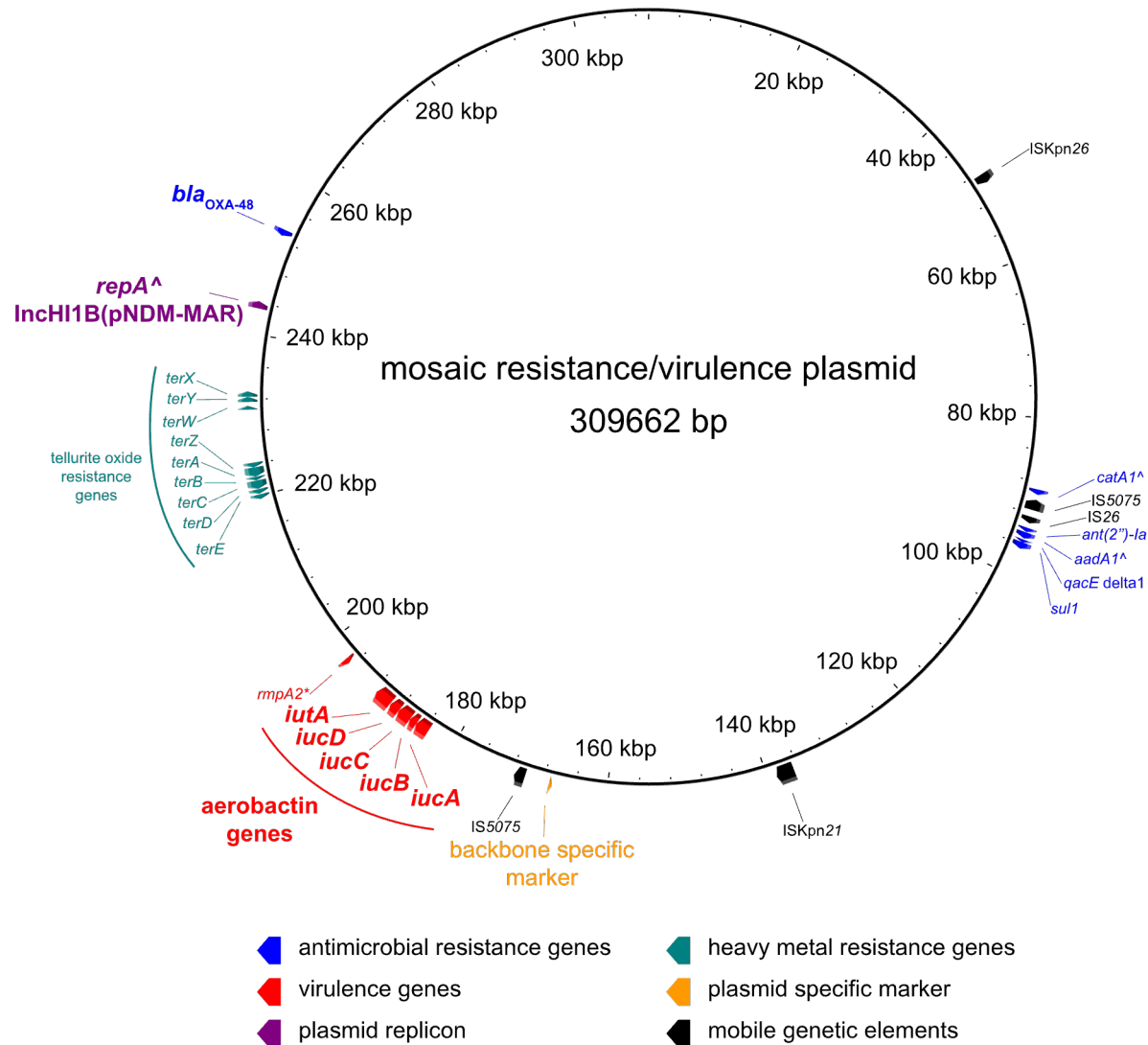
Hypervirulent *K. pneumoniae* (hvKp) ST23 K1 carrying carbapenemase genes



Cluster	No. of isolates	No. of SNPs	Country	Year of isolation	Carbapenemase gene(s)	Epidemiological information
C1	74	0-38*	Ireland	2019–2023	None or <i>bla</i> _{OXA-48} or <i>bla</i> _{OXA-181}	Investigation confirmed transmission in a network of healthcare facilities including acute care hospitals and residential facilities in the south-east of Ireland with sporadic related cases in other regions likely related to patient transfer.
C2	2	7	Lithuania	2022	<i>bla</i> _{KPC-2}	Cases in two different hospitals ~5 months apart.
C3	4	1-10	Latvia	2022	None	Cases in the same hospital over a period of ~4 months.
C4	7	2-38	France	2018–2021	<i>bla</i> _{OXA-48}	Cases in four different hospitals in the same region of France over a period of three years, considered to represent travel-related introductions.
C5	6	0-17	Ireland	2020–2022	<i>bla</i> _{OXA-48}	Cases in at least two different hospitals of the same region in Ireland over a period of two years.

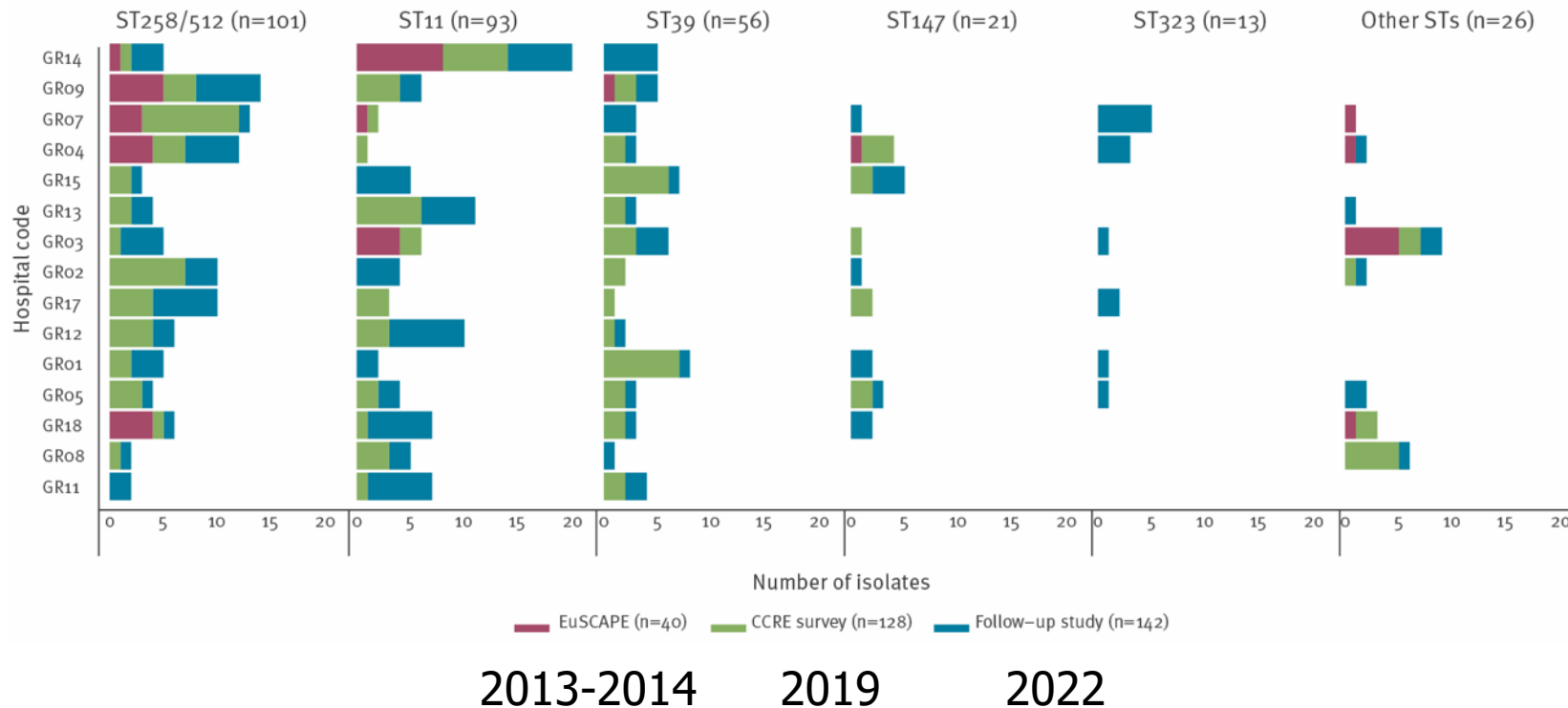
- Genomic surveillance confirms **healthcare-associated spread** of hvKp in Ireland
- This indicates an **added threat** due to spread of more virulent *K. pneumoniae* lineages in addition to resistant lineages in the EU/EEA
- **Updated** ECDC rapid risk assessment on hvKp

Cross-border spread of a mosaic IncHI1B(pNDM-MAR) plasmid in *K. pneumoniae*



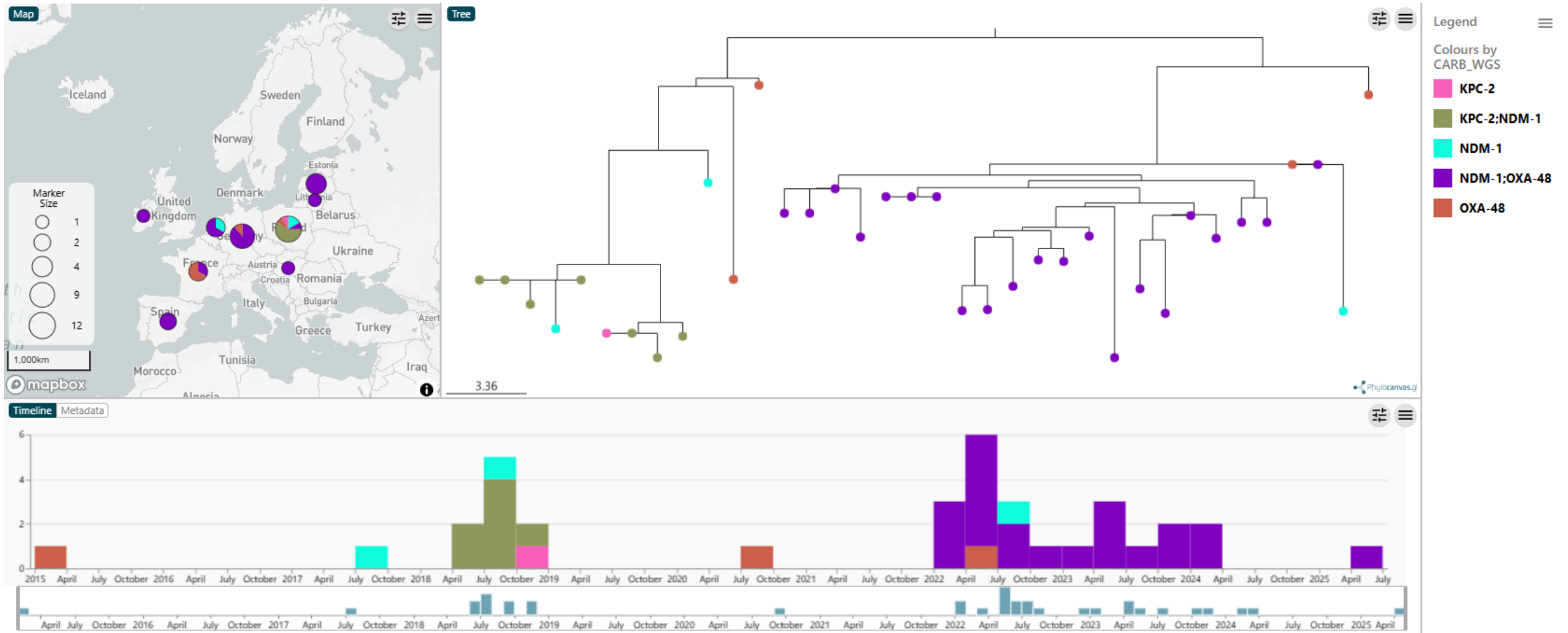
- **Mosaic** resistance (**OXA-48**) and virulence (**aerobactin**) plasmid was detected in **14 countries** confirming cross-border spread
- First EURGen-Net investigation leveraging **long-read sequencing** technologies for plasmid detection
- Mosaic plasmid may spread **undetected** due to lack of plasmid and virulence marker surveillance

Spread of carbapenemase-producing *K. pneumoniae* high-risk lineages in Greece



- Continuous emergence and transmission of high-risk lineages of *K. pneumoniae* in endemic situations
- It allows for rapid distribution of new resistance mechanisms

Molecular typing tool demonstration



Thank you