# Interoperability of IIS in the EU

Findings from EU-JAV Work Package 5: Strengthening IIS Interoperability in Europe

**Tamara Buble,** Croatian Institute of Public Health (CIPH)

AIB Technical Meeting 2026: Vaccine records and recall systems in Europe to strengthen adult vaccination

Antwerpen, 7 May 2026

Co-funded from the European Union's Health Programme under Grant Agreement no. 801495

EU-JAV
EUROPEAN JOINT ACTION ON VACCINATION
2018 – 2022

# WP5: Immunisation information systems to strengthen surveillance of vaccine coverage

- Core mission: delivering and sharing concrete tools for stronger national responses to vaccination challenges
- Strengthening European cooperation
- Strengthening interaction of IIS
- Improving vaccine data systems, supply management, and research collaboration
- Increasing public trust in vaccines

- Assess the interoperability of immunization information systems in Europe
- Develop a tool to estimate vaccine coverage data
- Develop an online platform to visualize and share the data
- Conduct a feasibility study for a coordinated cross border MMR vaccination campaign
- Study reminder systems

# Methods

- Two surveys in 20 countries
- **Survey 1** (2019, repeated 2022, 17 responded)
  - adapted from ECDC 2017 survey[1]
  - IIS implementation status, data quality, data collection
- **Survey 2** (2022, 10 responded)
  - focused on interoperability and cross-border data exchange capabilities compliance with the European Interoperability Framework (EIF)[2]
  - interoperability across technical, semantic, and organizational levels
  - barriers and enablers for cross-border health data exchange

1) European Centre for Disease Prevention and Control. Immunisation information systems in the EU and EEA - Results of a survey on implementation and system characteristics. Stockholm: ECDC; 2017
2) European Commission. New European Interoperability Framework: Promoting seamless services and data flows for European public administrations. Luxembourg: Publications Office of the European Union; 2017.

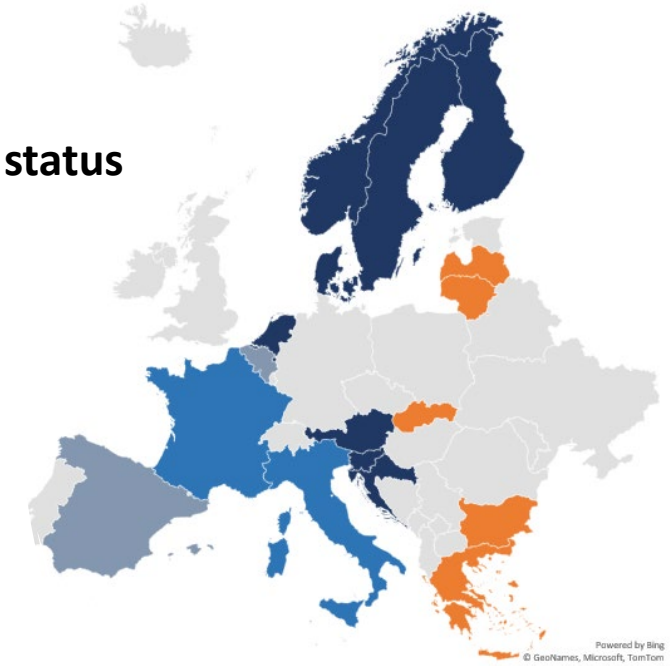
# Main findings

**Implementation landscape:**

- **10/17 countries** operational IIS (8 national, 2 regional: Italy, Spain), **2** in pilot phase, **5** without IIS
- **COVID-19 acceleration**: Austria and Croatia have developed nwe systems 2019 -> 2022, Spain created REGVACU,  Belgium scaled Vaccinnet

**Data quality and coverage:**

- **Completeness**: 60-95% for routine vaccinations (wide variation)
- **Private sector gap**: Only 6/12 IIS capture private provider data
- **Historical limitations**: Most systems cover only past 5-10 years
- **Population linkage**: 9/12 linked to registries; 3/12 cannot calculate accurate coverage




**Data collection:**

- **Legal basis**: Mandatory reporting (9/12) vs. Voluntary (3/12: France, Netherlands, Spain)
- **Vaccine identification**: Mostly manual entry (8/12); limited automation (barcode 4/12, RFID 2/12)
- **Core data universal**: Date, product, dose, batch, provider
- **Variable collection**: Healthcare worker status (5/12), adverse events (8/12), contraindications (4/12)

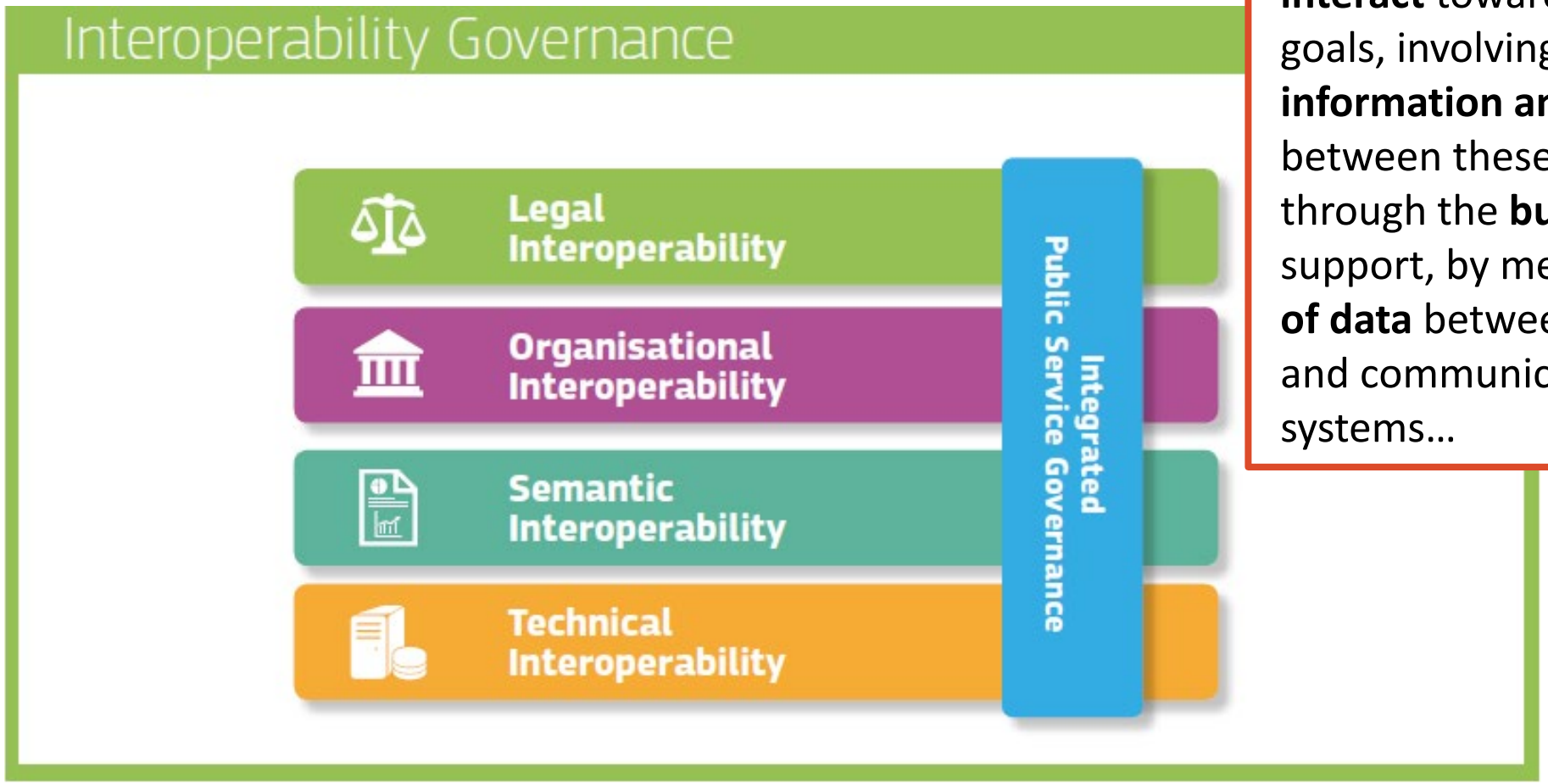
## Tehnical interoperability gaps

- Vaccine coding inconsistency: Mix of ATC codes, SNOMED CT, and local classification systems—no unified standard
- Identification methods vary: Manual entry, barcode scanning, RFID—different levels of automation across countries
- No real-time data exchange infrastructure: Countries cannot query each other's systems in real-time
- Subnational fragmentation: regional IIS’s + related registries that cannot communicate with each other
- Limited API standardization: HL7 FHIR adoption incomplete; most systems use proprietary interfaces

## Semantic interoperability gaps

- Data element definitions differ: "Vaccination date" may mean administration date, recording date, or reporting date depending on country
- Population denominators inconsistent: 3/12 countries lack linkage to civil/healthcare registries
- Foreign vaccination recording: Only 8/12 countries can record vaccinations administered abroad
- Dose numbering ambiguity: Primary series vs. booster definitions not harmonized (especially problematic for COVID-19)

# Interoperability layers (nEIF)




…the ability of organisation to **interact** towards mutually beneficial goals, involving the **sharing of information and knowledge** between these organisations, through the **business processes** they support, by means of the **exchange of data** between their information and communication technology (ICT) systems…

European Commission. New European Interoperability Framework: Promoting seamless services and data flows for European public administrations. Luxembourg: Publications Office of the European Union; 2017.
Available at: https://ec.europa.eu/isa2/sites/default/files/eif_brochure_final.pdf

# Minimum viable interoperability standard (MVIS)

**Foundational elements (already present in most systems):**

- Unique person identifiers (personal identification number, healthcare ID, immigration number)
- Population denominators: systems linked to civil or healthcare registries
- Core vaccination data (universally collected across all systems):
  - Vaccination date
  - Vaccine product name/type
  - Dose number in series
  - Batch/lot number
  - Administering provider/location

# MVIS: required technical standardization

- **Secure API infrastructure**:
  - Real-time query capabilities for cross-border lookups
  - Authentication/authorization mechanisms (similar to DCC Gateway model)
  - Privacy-preserving data minimization protocols
  - Transport security (TLS encryption, secure endpoints)
- **HL7 FHIR Standard – technical layer:**
  - RESTful API protocols for data exchange
  - Standardized messaging mechanisms between national systems
  - Interoperable endpoints and service definitions

# MVIS: required semantic standardization

- **Uniform coding system**:
  - Primary: ATC classification for international comparability
  - Supplementary: Mapping tables to SNOMED CT and local product codes
  - Mandatory linking between national codes and international standards
- **HL7 FHIR standard – semantic layer:**
  - Structured resource definitions for vaccination records (Immunization, Patient resources)
  - Common vocabulary bindings and terminologies
- **Common data model – agreed minimum dataset:**
  - Beyond core fields, include: target disease, vaccination setting (primary care, pharmacy, hospital, mass campaign), manufacturer, route of administration
- **Harmonized definitions**:
  - "Vaccination date" = administration date (not recording/reporting date)
  - Primary series vs. booster dose classification
  - Valid dose criteria (minimum intervals, age requirements)
- **Foreign vaccination protocols**: Standardized process for recording vaccines administered outside country

# MVIS: required legal and organisational standardization

- **Mandatory data collection legislation**: Legal requirement for healthcare providers to report all vaccinations, including private sector providers
- **Cross-border data sharing agreements**:
  - GDPR-compliant framework for health data exchange -> EHDS
  - Mutual recognition of vaccination records
  - Clear data protection impact assessments
- **EU-level governance structure**: Central coordination body responsible for common standards
- **Clear institutional responsibilities**: Single national authority accountable for IIS operations and data quality

# Key messages

- **Technical problems can be solved**: DCC proved EU-wide interoperability can work (> 2 billion certificates). The barriers preventing sustainable cross-border vaccination data exchange are political and financial, not technical.
- **The opportunity**: COVID-19 demonstrated rapid deployment is possible with political will. European Health Data Space provides the legal groundwork for permanent cross-border health data exchange and sustainable governance structures.

# Thank you!

# Literature


- Buble T. European Joint Action on Vaccination (EU-JAV); WP5 – Report on interoperability of IIS in the EU area (Deliverable 5.2). Work package 5 – Task 5.1. Brussels: European Joint Action on Vaccination; 2022.
- European Centre for Disease Prevention and Control. Designing and implementing an immunisation information system. Stockholm: ECDC; 2018.
- European Centre for Disease Prevention and Control. Immunisation information systems in the EU and EEA: results of a survey on implementation and system characteristics. Stockholm: ECDC; 2017.
- European Commission. New European Interoperability Framework: promoting seamless services and data flows for European public administrations. Luxembourg: Publications Office of the European Union; 2017.