

► Social Protection Spotlight

September 2026

Interoperable information systems for public health insurance

Key points

- Interoperability of social protection information systems (IS) refers to the ability of two or more IS to securely exchange, interpret and utilize data in a structured, authorized and, where required, real-time manner.
- Interoperability is essential to the effective administration and delivery of benefits of public health insurance schemes, including for claims management, which depends on intensive data exchanges with service providers and the broader health sector.
- Interoperable IS are also strategic enablers of comprehensive and adequate social protection. They are essential to maximizing seamless beneficiary management across benefits and institutional boundaries.
- Although its potential is often not fully realized, interoperability can support broader policy goals such as universal coverage. This can be achieved, for example, by facilitating systematic linkages and transitions between social assistance and social insurance schemes.
- Interoperability solutions do not require schemes to harmonize parameters (such as policies regarding eligibility criteria or benefits levels) to exchange data. However, a minimum level of harmonization, semantic alignment and, ideally, streamlining of business processes, remain necessary. For instance, dynamic social registers can, under certain conditions, facilitate the exchange of socio-economic data which enables tailor-made identification of beneficiaries, according to distinct eligibility criteria.
- Interoperable IS enable the exchange of data between different policy sectors to provide a comprehensive picture of individuals' living conditions and needs. In doing so, they facilitate policies addressing the social determinants of health equity.
- Institutional collaboration is a prerequisite of interoperability. Countries seeking to make efficiency gains should adopt specific measures to enhance coordination across relevant institutions.
- The advantages of interoperable IS illustrate that social protection and health systems can be mutually reinforcing, when they are well coordinated.

Background

Information systems (IS) are not only key to the daily business processes of public health insurance, but also to reaching strategic policy targets, by acting as tools to support inclusive policies (ILO 2020, 2026).

IS facilitate the collection, storage, processing, transformation, analysis and sharing of information,

supporting the administration of public health insurance schemes (ILO 2026). Many countries are currently implementing schemes and policies which depend on IS to effectively reach universality, as well as to achieve greater scope of coverage and adequacy of benefits (ILO 2026).

As key enablers of business processes, IS facilitate public health insurance workflows between diverse operational functions and institutions (see Box 1). Conversely, when IS

are not well designed or when they do not function properly, they can disrupt these workflows.

► **Box 1. The role of IS for public health insurance**

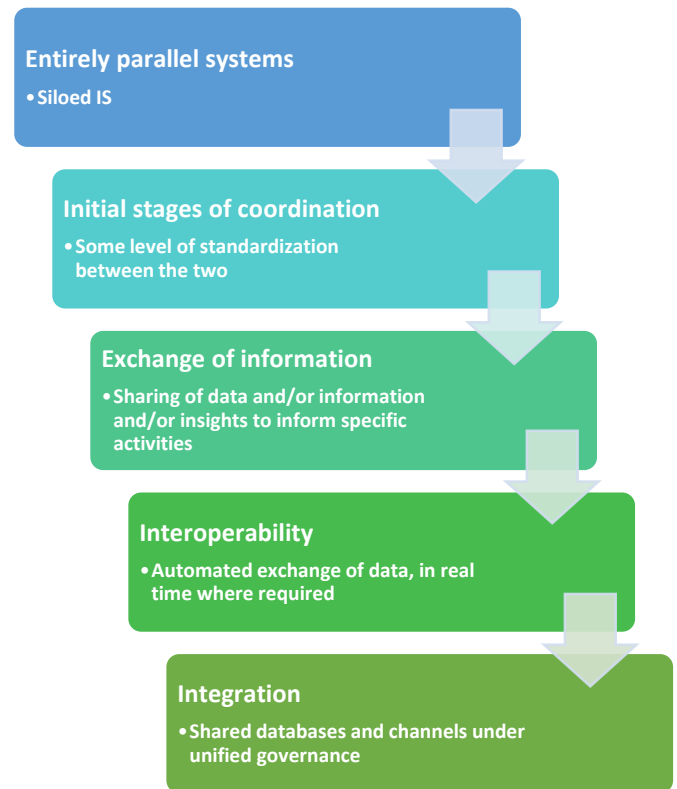
As the backbone of public health insurance schemes, IS support all operational functions of a health insurance institution, comprising:

- **Administrative functions related to the interface with beneficiaries:** Outreach and awareness raising; identification and determination of eligibility; registration, enrolment and beneficiary management; registration compliance; contribution determination and payment (when applicable); access to healthcare benefits; and complaints and grievances mechanisms.
- **Back-office functions:** Collecting government transfers and contributions (when relevant); risk pooling; management of provider networks and quality assurance; claims management; and monitoring and evaluation (M&E).

Source: ILO (2026).

Exchanges between IS are aimed at enhancing the performance of operational functions of public health insurance – for example, by enabling the identification of beneficiaries across social protection schemes, collecting unified contributions for different schemes and tax regimes, and better managing claims through exchanges with the health IS. Various degrees of exchange can take place, ranging from the initial stages of coordination to interoperability, to sharing databases under unified governance through full integration (UNICEF 2021) (figure 1).

► **Figure 1: Degrees of exchange between social protection IS**



Source: Authors, based on insights from UNICEF (2021).

In this context, interoperability refers to “the ability of information systems that operate independently of one another to exchange data seamlessly when authorized to do so” (Birdsall 2025a). Full integration of certain tools and databases is a possible way to pool resources and make efficiency gains. However, interoperability is both more cost-effective and easier to implement, as it limits the governance and data ownership challenges associated with fully integrated systems.

Interoperability materializes across four distinct dimensions:

- technical (data formats and exchange protocols);
- semantic (shared definitions and classifications),
- organizational (aligned processes and agreements);
- legal (authorizing frameworks and data sharing).

All of these dimensions of interoperability must be in place for automated data exchange to function in practice.

In the context of public health insurance, IS interoperability faces challenges stemming from two main factors:

- While all social protection schemes process administrative information, public health insurance is required to manage substantial volumes of heterogeneous data, related to personal and medical information, health services performance and payment types. Such data comes from different stakeholders and entities (such as public and private service providers and supervising agencies). This involves systems operating under different data formats and coding classifications, resulting in semantic differences. This level of complexity requires significant efforts towards standardization.
- Interoperability extends beyond purely technical considerations – it is heavily determined by institutional architecture and policy decisions. Institutional coordination, incentivized by legal frameworks, decision-makers and managers, and supported by conducive tools, are critical factors that affect interoperability.

Other factors that can affect interoperability of IS in any context include:

- **Organizational factors**, which involve aligning business processes, data definitions and governance across institutions with different workflows and data management practices. Effective interoperability requires agreement on common definitions, authoritative data sources, and shared procedures for data validation, updating and error correction.
- **Technical factors**, which concern the integration of heterogeneous IS, including legacy applications, commercial software, open-source platforms and custom-built solutions. These often use incompatible data formats and exchange protocols. Achieving interoperability requires shared data and communication standards, standardized interfaces (APIs) and integration architectures that support secure and efficient information exchange across diverse systems.

While efforts to promote IS interoperability are often driven by operational efficiency considerations, there is growing recognition of social protection as a key determinant of health and health equity – this may strengthen the interest of health policymakers in using interoperable systems to better address the socio-economic conditions of individuals and households.

Although safeguards are essential when sharing personal data across institutions, increasing engagement of the health sector in expanding social protection coverage could further accelerate the development of interoperability mechanisms across countries (WHO 2025).

Enhanced coordination across social protection programmes, as well as between social protection, health and other relevant sectors, is increasingly recognized as instrumental to achieving poverty- and health-related Sustainable Development Goals (USP2030 2023). Breaking institutional silos requires the right administrative tools to be adopted for effectively coordinating policy and institutional frameworks (ILO, Forthcoming). In this context, interoperable IS are key enablers of greater coordination.

This brief highlights the rationale and conditions for IS interoperability in the context of public health insurance schemes. It outlines the advantages of interoperable IS and highlights the key institutional factors that need to be implemented in order to maximize the returns of interoperability.

Interoperable IS for public health insurance: the last mile towards universal and comprehensive schemes

This section examines how integration and interoperability materialize in the context of public health insurance schemes. Each connection requires technical, semantic, organizational and legal interoperability layers. Timing models range from synchronous verification (identity, entitlements) to batch exchange (tax reconciliation, statistics).

Integration and interoperability to facilitate identification and contribution payments

In many contexts, public health insurance schemes collaborate with other social protection programmes to support their delivery chain, specifically for eligibility determination, access to services and revenue collection.

Eligibility determination

Working across governmental programmes to share identification efforts is vital (Learning Collaborative on Population Targeting 2022). By exchanging information on socio-economic characteristics across schemes and sectors, interoperability enables comprehensive multidimensional support, across health, social or care sectors for example. It can also contribute to the extension of social (health) protection coverage, especially to hard-to-reach population groups such as informal economy workers and their families (Barca and Chirchir 2019).

Consolidated social protection and cross-governmental data repositories play a critical role in identifying and enrolling populations not yet covered by public health insurance (ISSA 2019; OECD 2024a). By linking health insurance records with administrative databases (such as civil registration, national identification, tax, employment, and integrated beneficiary registries), insurance institutions can identify eligible but unenrolled individuals, verify eligibility and determine appropriate contributory categories, without requiring beneficiaries to repeatedly provide the same information. This administrative data-sharing approach reduces enrolment barriers, improves targeting accuracy, lowers administrative costs and promotes consistency across social protection programmes (ILO 2021a).

For population groups that are not well represented in administrative databases, social registries provide complementary socio-economic information to assess eligibility and contribution levels. Their effectiveness, however, depends on the completeness and timeliness of the underlying data, as well as robust governance frameworks that ensure quality, legal compliance, privacy protection and secure information sharing (Leite et al. 2017; Grosh et al. 2022).

Examples of interoperability for data repositories include the following:

- In Türkiye, the universal health insurance scheme register, which identifies households eligible for contribution subsidies, is integrated with the social register of social protection (SGK) programmes. It is estimated that this integration is responsible for the coverage of around 30 per cent of those in the social registry (Guven et al. 2025).

- Similarly, in Thailand, the establishment of an interoperable national health insurance beneficiary registry between the three national health social protection schemes has been pivotal – it identified gaps in coverage which determined eligibility for the universal health coverage scheme (UCS) – a non-contributory social health insurance scheme aimed at protecting the previously uncovered population (ILO 2015; Barca 2017; Transform 2017; ILO 2021b). This demonstrates how interoperability can help in bridging the gap between social insurance and social assistance schemes.

Yet, limitations of social registries are substantial. Considerations such as exclusion errors can translate into a lack or loss of social protection coverage, time lags between registry updates and entitlement status, and misalignment between household-based poverty data and individual social protection entitlements. These significant drawbacks can be partly addressed through strong update cycles, grievance mechanisms and individual-level validation.

While there are no silver bullets, recent digital advances have improved the potential of interoperable social registers to provide dynamic eligibility information to different social protection schemes, including public health insurance (see box 4). Such mechanisms ultimately hold potential to promote adequacy of benefits and inclusiveness of social protection systems, provided they are designed properly.

► Box 4: Interoperable and dynamic: the case of the Imibereho social register in Rwanda

Interoperability creates opportunities for social registers to apply different eligibility criteria. A case in point is Rwanda, which used to rely on the *Ubudehe* system, classifying households into three groups according to their socio-economic status. This system was used for community-based health insurance schemes and other social protection schemes, which were thus subject to the same eligibility criteria. The country recently transitioned to the *Imibereho* programme. The new programme marks a move towards greater flexibility and adaptability of the social register to the needs of social protection programmes. It captures essential demographic and socio-economic

information about all Rwandan individuals and households, generates poverty rankings encompassing all Rwandan households, and, based on the criteria of each social protection programme, defines different lists of eligible households

Sources: World Bank (2020); Tessier and Bergthaller (2025); World Bank Group (2025).

Going further, countries have recently made great strides in IS interoperability for coverage expansion, particularly in the context of the informal economy, which is often difficult to reach. These connections range from linkages to full integration and unique identification numbers and databases (Asian Development Bank 2016). For example:

- IS can support identification by linking different types of individual data. In China, the health insurance IS supports identity recognition based on ID cards and social security cards (Li et al. 2020).
- More sophisticated IS use synchronised databases and unique personal identification numbers across social protection schemes and national ID information databases. In Viet Nam, the Government implemented a Digital Social Insurance application (VssID) which includes population data, together with identification and electronic authentication to replace individual social security numbers (Ministry of Science and Technology 2025). For this purpose, the National Insurance database and the National Population Database were connected. VssID allowed the authentication of more than 99 per cent of the population in August 2025 (Báo Tuyên Quang 2025). Digital health insurance card images were displayed directly on official government mobile apps to facilitate healthcare access (Ministry of Science and Technology 2025).
- In Burkina Faso, the National Universal Health Insurance Fund (CNAMU) currently checks the databases of the National Social Protection Fund (CNSS) and the Autonomous Pension Fund for civil servants (CARFO) through an Application Programming Interface (API) to pre-identify eligible members within the formal economy. As a second step, those who are eligible must undergo

biometrics data collection to be considered members of the CNAMU.

Increasingly, countries see the value in expanding interoperability, not only to identify potential beneficiaries, but also for their enrolment, particularly in the case of hard-to-reach population groups. In these cases, coordination between public health insurance and social protection schemes – and beyond, with all agencies and programmes collecting administrative data for the population – is paramount.

Automatic enrolment

Real-time exchange of information from various institutions facilitates up-to-date data for administrative enrolment. The use of interoperable IS for automatic enrolment into public health insurance is still nascent in low- and middle-income countries. Yet it holds great potential to seamlessly extend coverage of a comprehensive set of benefits to address income security and access to healthcare, particularly for the informal economy.

In Indonesia, enrolment of the non-contributory membership segment (known as PBI, comprising the poor and vulnerable) to the national health insurance scheme (BPJS-K) is administratively managed through interoperability between population registration systems and national social assistance databases (Office of Assistant to Deputy Cabinet Secretary for State Documents & Translation 2021). Effective coverage through BPJS-K is now near universal (ILO 2024).

In Türkiye, the Integrated Social Assistance Information System (ISAIS) collects real-time data across agencies to identify eligible but uncovered individuals and households. These individuals are automatically registered by the Social Security Institution (SGK), which then requires them to apply to a social assistance office within one month for contribution assessment (Demiroz and Dansuk 2022).¹

Interoperability for automatic enrolment increases the importance of collecting and providing reliable and up-to-date data as well as robust interpretation tools. Failure to achieve high-quality standards in this regard can hinder access to entitlements for people who qualify, but whose socio-economic characteristics are poorly assessed. In the

¹ Council of Ministers (2011), Regulation on the Procedures and Principles Regarding the Income Determination, Registration and Monitoring Process within the Scope of General Health Insurance, 2011/2512.

case of interoperability, a single error in data collection and interpretation can impact access to a range of social protection benefits, undermining the right to social (health) protection.

Access to healthcare services

The interoperability of identification systems is not only instrumental to identifying population groups that should be enrolled, but also to the portability of benefits and effective access to healthcare. In Ghana, the use of so-called “Ghana cards” ensures effective access to providers nationally (see box 3).

► Box 3: Interoperable identification systems in Ghana

Beneficiaries of Ghana’s National Health Insurance Scheme (NHI) can access health services by simply presenting their national ID card (Ghana card). This is made possible through biometric data collection by the NHI Authority at the time of registration, which ensures interoperability with a national register. This modality also facilitates portability of benefits: while access to health services was limited to the beneficiary’s district prior to the initiative, they can now access health services nationally.

Sources: Jubilee House Communication (2020); CIPESA and HSPRC (2024).

Unique identification numbers or interoperability thereof, facilitated by digitalization, are increasingly being used by public health insurance schemes, and represent an opportunity for rapid coverage extension – including to workers in the informal economy (Mills et al. 2019). In the Republic of Korea, a unique 13-digit Resident Identification Number (RIN) is included on the national ID card, as well as on population register record cards (World Bank and DIAL 2018; Kang et al. 2019). This RIN must be provided to obtain administrative documents and other government services. The National Health Insurance (NHI) then uses the RIN as a unique patient identifier for Electronic Health Records, thereby providing an interface with the health information system and using IDs as an authentication tool.

Revenue collection

Public health insurance schemes typically rely on various sources of funds to secure predictable, sustainable and equitable financing. Interoperability has a crucial role to play in financial management by ensuring seamless social

contributions and tax revenue collection. In some cases, the public health insurance institution collects social security contributions directly and therefore requires information on employers and members’ income levels. In other cases, contributions are collected centrally and redistributed between social protection schemes, in which case the public health insurance institution needs access to beneficiary information. Finally, in the context of Government transfers, public health insurance IS provide information for planning and financial management purposes.

• Social security contributions

In countries where the formal economy is large, public health insurance institutions often benefit from sister agencies or funds that collect social contributions on their behalf, and more broadly, for all social protection schemes. In France, a National Fund, known as *Caisse Nationale* (URSSAF) has been introduced to collect all social contributions as well as some taxes earmarked for social protection, with a high degree of automation (Enoff and McKinnon 2011). It then redistributes funding for distinct branches of social security to responsible institutions. The URSSAF recently adopted a wide Application Programming Interface (API) implementation policy to ensure seamless data sharing with all of the social protection institutions (Chandeze 2021).

For public health insurance institutions that delegate contribution collection to third parties, it is important to ensure that they can still access data on contributors and beneficiaries and can rely on the information they require to provide access to benefits. In some countries, contribution collection through another Ministry or agency can lead to a lack of clarity on individual entitlements. Social protection schemes can also have different entitlements rules (for example, in terms of number of dependents). To ensure efficiency in collection, good governance through collaborative systems is required, whereby several institutions work together and create an integrated or interoperable system for collecting contributions, and share data on beneficiaries (Enoff and McKinnon 2011; Muntalima et al. 2024).

Payment systems interoperability also has the potential to facilitate seamless connections between social assistance and social insurance schemes. In Ghana, the Livelihood Empowerment Against Poverty (LEAP) Programme under the Ministry of Gender, Children and Social Protection, and the National Health Insurance Scheme (NHIS) both use a mobile money interoperability system – the Ghana

Interbank Payment and Settlement Systems Limited (GhIPSS) (Nsiah-Boateng et al. 2023). The GhIPSS has been created to reduce the cost of initiating transactions across networks and to process the payment of benefits and the collection of contributions (Alliance for Financial Inclusion 2018). While LEAP beneficiaries do not pay contributions to NHIS, this fully interoperable mobile payment system holds great potential for real-time (see box 5 below), automated checks of beneficiaries. This creation of systematic connections between social assistance and social insurance can promote social protection extension.

► **Box 5: Diverse data exchange frequencies and interoperability models**

"Real time" is commonly associated with interoperability. In reality, interoperable data exchange encompasses multiple timing patterns and exchange models, each chosen according to functional needs:

- **Synchronous (true real time):** A system sends a request to another and waits for an immediate response before continuing. This model is essential when a decision must be made instantly, such as verifying a person's identity or eligibility at the point of service or confirming active insurance coverage before accepting a claim.
- **Asynchronous (near real time):** Data is exchanged within seconds or minutes, but the initiating process continues without waiting for a response. This approach is well suited to event-driven updates, such as notification of a new enrolment or reflecting a contribution payment that has changed membership status.
- **Batch exchange:** Data is transferred at predefined intervals (nightly, weekly or monthly). This is sufficient for many routine business processes, including reconciling contribution records with tax authority data, updating social registries or populating M&E dashboards.
- **Ad hoc (on-demand) exchange:** Data is shared on a one-off or occasional basis under an agreed data-sharing arrangement. Typical use cases include compliance cross-checks, audits, fraud investigations and actuarial analyses.

Among the four models described above, real-time exchange is the most demanding one, requiring

constant connectivity, high system availability and stronger security. Implementing it universally across systems raises costs and increases a system's fragility without commensurate benefit. Good interoperability design matches the timing model to the function – for example, synchronous exchange only where the use case genuinely requires an instant answer, and batch where periodicity suffices.

Source: HL7 International (2023).

• **Government transfers**

When safeguarding government transfers that contribute to ensuring the financial sustainability of a public health insurance scheme, coordination with Ministries of Finance can be very beneficial. Depending on the nature of the public health insurance scheme, integration can also occur.

Financial Management Information Systems (FMIS)² can be designed as centralized systems granting access to government entities, or as decentralized in their management (OECD 2024b). While the design, modalities and potential uses of FMIS vary from one country to another, they are typically able to serve public health insurance IS. FMIS can potentially govern multiple accounts related to public health insurance, including: the accounts of the Treasury or other institutions from which government transfers to public health insurance originate; the accounts of social security institutions pooling contributions; the accounts of public health insurance institutions; and the accounts of public health providers (OECD 2024c).

In supporting the management of timely government funds transfers, FMIS can play a highly significant role in enabling the proper functioning of public health insurance schemes. They also hold potential to facilitate efficient revenue mobilization, though this has not yet been fully utilized and would require more investigation and awareness-raising at the country level. The case of Montenegro, a context where the formal economy is dominant, provides an example of the full integration of revenue collection IS, with accounts of most government entities under a Treasury Single Account (box 6).

² An FMIS is an Information Technology (IT) system, the components or modules of which enable a government to implement its financial management functions.

► **Box 6: Full integration of revenue collection IS through treasury operation system in Montenegro**

In 2011, Montenegro introduced the unified collection of social security contributions and personal income tax, endowed to the National Tax Administration and transferred to the Treasury Single Account. The Health Insurance Fund was included in the treasury operation system within the Treasury Single Account.

This integration allowed the Health Insurance Fund to receive regular updates on revenue collections and expenditure, enhancing transparency and enabling more effective financial planning.

Additionally, the Statistical Office of Montenegro (MONSTAT) publishes reports on the income and expenditures of the Health Insurance Fund, contributing to greater financial transparency.

Source: World Bank (2013).

Interoperability with the health sector

Public health insurance institutions can coordinate with the health sector for identification purposes to extend population coverage and access to services. They can also coordinate to i) enhance service delivery and quality, and ii) to better plan and prepare for upcoming healthcare needs.

Relationships with providers

Ensuring the delivery of available, accessible, acceptable, and quality healthcare services requires access to adequate information on health providers and delivered services.

In this context, public health insurance institutions worldwide seek to gain easy and ideally real-time access to healthcare providers and health sector information. This can be facilitated by creating bridges with Health Management Information Systems (HMIS). A HMIS is tasked with collecting, storing, analysing and evaluating data related to health at multiple levels, from health facility to administrative, district, regional and national levels (Lippeveld et al. 2019). Enhancing interoperability between public health insurance IS and HMIS can improve claims management through verification and reconciliation, consolidated reporting and payment.

Conversely, fragmentation in health purchasers' IS can lead to adverse consequences, including duplications,

heavy administrative burdens on health workers and complications in data collection and analysis (Nwaononiwu et al. 2024). All of these factors contribute to reducing efficiency and quality in health care service delivery.

Complete interoperability between public health insurance IS and national HMIS remains uncommon. Yet some countries have started important initiatives in this regard. In the Philippines, PhilHealth ties provider HMIS records to insurer payment and accreditation workflows. Through an Electronic Claims Submission Service and online provider/claims portals, hospitals and clinics can submit and track claims electronically if they have a Hospital HMIS in place (Rico 2018; Wee-Co et al. 2022). In addition, the Department of Health and PhilHealth are building a National Health Data Repository to consolidate health data systems through common standards and guidelines (Department of Health and Philippine Health Insurance Corporation 2022; Marcelo et al. 2025).

Estonia provides a notable example of interoperability between health and public health insurance IS (see box 7).

► **Box 7: Facilitating data exchanges for health in Estonia**

In Estonia, X-Road is an open-source software employed for secure and efficient data exchanges among various public and private organizations, including in the healthcare sector (European Commission, n.d.). The Estonian Health Insurance Fund (EHIF), which manages a mandatory health insurance scheme protecting over 95 per cent of the population, participates in an eGovernment platform by collecting beneficiary information in a specified registry (the Health Insurance Registry), accessible via X-road (World Bank 2015). This registry includes information on health insurance status, beneficiaries' past doctor visits and current prescriptions, and responses to general health requests.

Through X-road, the EHIF can also access parts of the Electronic Health Records data from health providers. It has also introduced a fully automated e-channel for the submission of providers' claims, enabling data exchange for multiple digital services through X-Road.

Source: WHO (2023).

Given the sensitivity of health data, exchanges between IS must be balanced against risks such as security breaches,

privacy violations and data misuse. This requires strong safeguards, including data-sharing agreements, data protection measures, clear legal mandates, purpose limitations, access controls and accountability mechanisms. Evidence from the Philippines also highlights the importance of dedicated governance and data management personnel, advanced analytics and cybersecurity capabilities, as well as sustained investment in data infrastructure (Grunfeld and Ruggia-Frick 2022; Birdsall 2025a).

Disease surveillance and climate-informed early warning systems

Interoperability with the health sector can improve the detection of public health trends, as well as preparedness for future health care needs and expenditures (National Research Council 2010; OECD 2016).

Investigating disease patterns and risk factors among population groups includes tracking infection rates and existing cases to guide prevention policies and the allocation of resources, which is usually achieved through epidemiological data. Such data is typically collected by health authorities through (electronic) health records and registries, ad hoc health surveys or population and census surveys. These sources make it hard to collect information and ensure a certain timespan between the information creation and processing.

The importance of bridging data gaps for disease surveillance has been highlighted on several occasions (Heeyoung et al. 2016; Li et al. 2020). Given the potentially significant volume of medical data that can be collected by health insurance schemes, mainly through claims received, countries have started implementing disease surveillance and early-warning mechanisms that integrate public health insurance IS. This allows for potential monitoring, analysis and forecasting of disease outbreaks to prevent their spread in a timely manner.

Taiwan is a pioneer when it comes to disease surveillance based on health insurance claims. The Center for Disease Control uses daily aggregates of outpatient, inpatient and emergency visits collected by the National Health Insurance institution to monitor Influenza-Like-Illnesses, enterovirus, diarrhoea and other conditions (Jian et al. 2017; Centers for Disease Control 2012).

In the context of pandemic prevention, preparedness and response, interoperability and the exchange of information between public health insurance IS and

HMIS/surveillance and early warning systems is of particular significance. Coordinated data exchange between social protection and health systems should be part of broader efforts to strengthen coordination between the two sectors (USP2030 2023).

In the context of the climate crisis and its adverse impacts on health outcomes and income security, interoperability has a particular role to play in ensuring that social protection systems contribute to adaptation efforts (Moreira da Silva and Williams 2020). Interoperable IS strengthen resilience by supporting risk assessment, reduction and preparedness through early warning and contingency planning, the rapid extension of cash and health benefits during recovery, and the quantification of post-disaster needs for financial protection (World Bank 2012; Moreira da Silva and Williams 2020).

The potential of interoperability is continuously developing, making it increasingly relevant to addressing health and climate challenges. Yet it should be maximised while guaranteeing equity, privacy and solidarity, through the right enabling factors.

Pre-requisites and enabling conditions for interoperability

Several policy dimensions are foundational to building robust interoperable IS, including legal frameworks, governance structures and technical standards.

Legal frameworks for data sharing

Building legal frameworks that enable interoperability, including seamless data exchange, while preserving data protection and security, is paramount. Interoperability involving a public health insurance scheme can potentially involve the management of personal data, meaning that privacy is of the utmost importance. Laws and regulations for public health insurance design must be guided by international social security standards (ILO 2020). In addition, legal frameworks for interoperability should include aspects that cover data collection and processing, as well as regulations related to data protection, transparency and intellectual property.

In Europe, countries are adopting diverse laws that govern different aspects of interoperability:

- In the Netherlands, a new framework law (*Wegiz*) was passed in 2021 to address health data

interoperability, obliging all providers to share medical-related information digitally (OECD 2022).

- In Estonia, where the national ID card is used for multiple purposes, including for national health insurance, the issuance and use of physical ID cards are governed by a set of laws, including the Identity Documents Act (2000). However, this framework does not fully address key aspects of digital identity use. In particular, access to and management of databases linked to the digital ID, such as electronic health records accessed by the ENHIF, remain subject to national e-health regulations (The Center for Internet and Society 2020).

Interoperability calls for legal frameworks capable of addressing the governance of complex, multi-entry database e-systems. In addition, laws and regulations should be overseen by units responsible for enforcing such frameworks and building coordination structures to enable interoperability (Grunfeld and Ruggia-Frick 2022).

Governance structure and institutional coordination

Establishing leadership and clarifying institutional responsibilities for data interoperability is paramount. In Germany, since 2005, the Coordination Centre for Interoperability in Healthcare (*gematik*) has supported the development, implementation, identification requirements and prioritization of binding technical specifications related to electronic patient records of social health insurance beneficiaries (*gematik* 2023; Jürgens et al. 2024). *gematik* also convenes the Interop Council, technical experts and stakeholder representatives from across the health system and the health insurance fund, who participate in defining standards and governance practices (Ziebolz 2022).

Based on a sound governance structure, institutional coordination among agencies and Ministries is required for integration or interoperability to materialize. Institutional coordination is particularly essential to establishing solutions that rely on interoperability for the identification of beneficiaries. This is the case regardless of the model chosen for the identification process – this can either be performed jointly, by another agency or by

the public health insurance scheme itself (Learning Collaborative on Population Targeting 2022).

The role of the social partners in the governance of public health insurance institutions, particularly when it comes to the continuous development of interoperable IS, should not be overlooked. Ultimately, transparent and accountable governance, supported by meaningful social dialogue, helps to build beneficiaries' trust and confidence in interoperable IS, thereby strengthening their effectiveness, legitimacy and long-term sustainability.

Technical standards: process, standardized data schemas and Application Programming Interfaces (APIs)

Achieving interoperability depends on the adoption of technical standards that support data harmonization and aligned connection points, including the three following components (Birdsall 2025b):

- **Process:** workflows must be in place to practically enable interoperability. Processes are defined by what data needs to be exchanged at various points along the public health insurance delivery chain, and why. As a pre-requisite to interoperability, a detailed mapping of business processes should be carried out at the level of the NHI, to identify any inefficiencies or bottlenecks.
- **Data standards** form the foundation of interoperability. By ensuring the use of a common “language” (or semantics) – such as standardized data structures and definitions – they promote workflow efficiency and minimize errors. Examples of shared identifiers and common classifications include ICD, procedure³ and drug codes, occupational and income categories and agreed data dictionaries.
- **APIs** complement standards by enabling practical system-to-system interactions; they establish connections between different applications or software components and enable real-time, automated data sharing.

There are numerous examples of such tools. AB-PMJAY (*Ayushman Bharat - Pradhan Mantri Jan Arogya Yojana*), India's non-contributory health insurance scheme for the poor, uses the National Health Claims Exchange (NHCX), developed under the Ayushman Bharat Digital Mission (Sharma et al. 2023). NHCX is a standardized communication protocol, designed to facilitate the

³ ICD relates to International Statistical Classification of Diseases and Related Health Problems.

seamless exchange of health claim information between insurers, Third Party Administrators (TPAs), providers (presently hospitals), and beneficiaries. Beyond data accuracy and trustworthiness, NHCX enables standardized and faster health insurance claims processing. It also ensures greater transparency for the public agency overseeing state-level delegation of front office functions to TPAs (Perappadan 2024).

The development of such tools should be informed by a holistic understanding of the broader system. In the Netherlands, for example, a national secure exchange point, *Landelijk Schakel Punt* (LSP), funded by health insurers, allows provider systems to share records. LSP is a centralized tool. It is complemented by a data exchange initiative, *MedMij*, which supports data exchanges between providers and patients, by using APIs. More work is needed to coordinate and harmonize the two systems in order to avoid duplications (OECD 2022).

Similarly, in Oman, the Financial Services Authority (FSA) has set up *Dhamani*, a national health insurance platform for private insurance institutions, health insurance claims administrators and health care providers. The platform enables the seamless, real-time exchange of patients' medical data and health insurance claims (Middle East Insurance Review 2025).

Sustainability and cost

Data sharing agreements are a foundational component of interoperability, with long-term institutional implications, while software platforms, system versions and underlying technologies are subject to continuous evolution and periodic obsolescence. Interoperability infrastructure requires continuous maintenance: interfaces must be updated, interoperability standards evolve,⁴ and partner information systems will inevitably undergo replacement or modernization. Consequently, interoperability should be understood not as a one-time technical integration, but as an enduring institutional relationship that entails ongoing governance, maintenance and financial investment (Haque et al. 2023). This further underscores the importance of developing permanent institutional capabilities rather than short term, project-specific technical solutions. It also highlights the need for long-term costing of interoperability at the onset of planning, including the financial implications of

maintenance and modernization needs (Dixon et al. 2010; OECD 2026).

Implemented together, the pre-requisites and enabling factors described above can contribute to building solid foundations for the establishment of interoperable IS – underpinned by a legal basis that protects people's rights and privacy, clear governance structures and shared responsibilities, and efficiency-maximizing technical standards. In addition, interoperable IS can only achieve the objectives of efficiency, universality and equity if they are accompanied by properly designed policies and operational processes.

Conclusion: key takeaways

Interoperable IS are essential to reaching USP and UHC by 2030. They support poverty reduction and health improvements, thereby contributing to building resilience and reducing health inequities. From this perspective, interoperability should be understood as a rights-enabling instrument.

Interoperable IS are tools that rely on overall good governance and collaboration between institutions, and they are developed incrementally, particularly in low-capacity contexts. The establishment of strong coordination structures and processes is a pre-condition for developing and sustaining interoperability. This initial step is typically followed by periodic batch exchange under a data-sharing agreement, before moving towards APIs, whereby the use case demands real-time exchange.

Importantly, a rights-based interoperability framework requires clear safeguards for data exchange, including an explicit legal basis for every data flow. It also requires strict purpose limitation to prevent health insurance data from being repurposed for policing, immigration enforcement or commercial use. Data minimization is also of importance, through the exchange of eligibility indicators rather than underlying personal files. Furthermore, proportionality between the data linked and the administrative function pursued is needed, along with security measures commensurate with the sensitivity of combined health and financial information. Finally, interoperability strategies must recognise the inherent asymmetry of crossmatching: while linked administrative databases are generally effective at identifying inclusion errors, they are less capable of detecting people who are

⁴ For example, the transition from ICD-10 to ICD-11 and successive versions of FHIR.

entirely absent from official records. Unless complemented by proactive, multi-channel, in-person outreach, interoperability risks prioritizing fraud control over the extension of social protection coverage.

Interoperable IS offer the information required to draw a comprehensive picture of individuals' situation and needs, by exchanging socio-economic and health data. Therefore they can directly contribute to addressing social determinants of health and health equity.

Ultimately, the level of intersectoral coordination between social protection and health will determine the effectiveness and inclusivity of IS. More needs to be done to ensure that best practices, including on facilitating coordination between sectors and policies, are shared among countries worldwide.

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