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Part 1: Implementing innovative care models in European countries: what are the implications for health and care workforce planning and training?

ABSTRACT

Europe's health and care systems are facing growing pressure from population ageing, rising multimorbidity and chronic disease, increasing workforce shortages and constrained public budgets. Maintaining equitable access to high-quality care requires a transformation in how services are organized and delivered. Health systems must move towards more integrated, preventive, digitally enabled and community-based models of care that better respond to complex and long-term health needs. Achieving this transformation depends on a health and care workforce (HCWF) with the right capacity, skills and flexibility, supported by effective workforce planning and forecasting.

Forecasting and planning are essential tools for aligning workforce capacity with future population health needs and evolving models of care. They allow policymakers to anticipate future service demand, identify workforce implications of new care models and ensure that education, training and governance structures adapt in time. Innovative care models – such as person-centred integrated care, population health management, hospital-at-home and transitional care – rely on multidisciplinary teams, stronger primary and community care and new competencies, including digital literacy, data use, teamwork, care coordination and leadership. Planning systems must therefore move beyond profession-specific approaches and support more flexible skill-mix and team-based workforce configurations.

Traditional workforce planning approaches based largely on headcounts and historical trends are no longer sufficient. Effective planning must integrate demographic, epidemiological and service utilization data alongside information on working time, productivity, skill mix and changing scopes of practice. Combining supply-, demand- and needs-based forecasting approaches, supported by routine scenario analysis, helps countries explore alternative futures, anticipate capacity and skill requirements and design more robust recruitment, retention and training strategies.

Reliable forecasting also depends on timely, comprehensive and interoperable data systems. Although many European countries have strengthened workforce data over the past decade, important gaps remain, particularly regarding full-time equivalents, workforce mobility and data on nursing and allied health professions. Integrating quantitative indicators with structured qualitative insights—such as those captured through the HEROES Advanced Minimum Data Set (AMDS)—can help planners better understand workforce behaviour, labour market dynamics and changes in care organization. Interoperable health professional registers with a clear legal basis are a cornerstone of workforce intelligence, enabling more accurate monitoring of workforce supply, distribution and activity patterns.

For forecasting and planning to influence policy and system transformation, they must be embedded within strong governance structures. Institutionalizing workforce planning through clear legal mandates, sustained funding and dedicated institutions ensures that forecasting becomes a routine and continuous component of health system governance rather than an ad hoc technical exercise. Countries can adopt different institutional models depending on their governance structures, but effective arrangements typically involve designated organizations responsible for data collection, forecasting and planning, supported by skilled analysts, robust data infrastructure and strong stakeholder engagement.

Ultimately, effective HCWF forecasting and planning require a whole-system approach that links data, governance, education and service delivery. Institutionalized, data-driven and multiprofessional planning systems can help countries anticipate workforce needs, support the transition to innovative care models and ensure that Europe's health and care workforce remains resilient, sustainable and capable of delivering coordinated, people-centred care in the future.

STATEMENT OF ORIGINALITY

This deliverable contains original unpublished work except where clearly indicated otherwise. Acknowledgement of previously published material and of the work of others has been made through appropriate citation, quotation or both.

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Authors

Ronald Batenburg, Nivel, Utrecht, Netherlands/Radboud University, Nijmegen, Netherlands

Mieke Rijken, Nivel, Utrecht, Netherlands/University of Eastern Finland, Kuopio, Finland

Peter Groenewegen, Nivel, Utrecht, Netherlands

Editors

Matthias Wismar, European Observatory on Health Systems and Policies

Gemma A. Williams, European Observatory on Health Systems and Policies

Michelle Falkenbach, European Observatory on Health Systems and Policies

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Abbreviations

AI	artificial intelligence
CDM	chronic disease management
CGA	Comprehensive Geriatric Assessment
COPD	chronic obstructive pulmonary disease
COVID-19	coronavirus disease
DeSiDE	Dental Skillmix Decision Environment
DMP	disease management programme
ECP	elderly care physician
EPTA	European Parliamentary Technology Assessment
EU	European Union
FTE	full-time equivalent
GFI	Groningen Frailty Index
GP	general practitioner
HCWF	health care workforce
HEROES	HEalth woRkfOrce to meet health challEngeS (EU Joint Action)
LHC	Leading Healthcare
NCD	noncommunicable disease
OECD	Organisation for Economic Cooperation and Development
PCP	primary care practitioner
SHA	Strategic Health Authority
WHO	World Health Organization

Key messages

Using planning and forecasting to respond to future health care workforce (HCWF) needs is central to a health system's ability to meet the challenges of population ageing and workforce shortages. This is one of a set of three policy briefs that reflect the evidence collected under the auspices of the HEROES project. These briefs cover:

- how forecasting and planning can support innovative care models;
- data and tools for forecasting and planning; and
- making forecasting and planning sustainable through institutionalization.

- **Europe's health systems need to implement innovative care models if they are to meet future needs.** The pressures of population ageing, chronic conditions and multimorbidity overlap with financial pressures and a shrinking HCWF, making it imperative that countries develop new ways of meeting needs in different settings, including primary care and community settings.

- **Transforming the HCWF will be essential** if health systems are to reduce the demand for health and personal care (including through prevention) and improve the efficiency of care delivery (through integration, digitalization and other innovative models of care).

- **Health workforce forecasting and planning are crucial for addressing new roles, developing new professions, developing other competencies and capturing the training implications** that will allow policy-makers to prepare for innovative care models and for the interprofessional education and training and joint-learning needed to support their implementation.

- **HCWF forecasting and planning can help develop appropriate strategies,** including by:
  - exploring different scenarios for future demand, factoring in population needs;
  - modelling the implications of new care-delivery models, such as population health management, person-centred integrated care or hospital-at-home services;
  - helping to anticipate the types of workforce, capacities and skills required; and
  - highlighting the need for better practice, fairer valuation and clearer career pathways in undervalued areas such as primary care and social care.
- **The evidence generated by forecasting and planning will be key in enabling governments, education and training bodies to promote relevant skills**:

- in primary care and transitional care;
- by using digital and e-health technologies that will support a shift to remote and self-care;
- by using team, communication and cross-professional skills to enable properly integrated care; and
- by working with patients, their families and communities to foster self-management, a person-centred focus and the engagement (and support) of informal carers.

- **HCWF planning models will need to evolve to guide future decisions** and the design and implementation of new models of care.
  - Current approaches must be made conceptually stronger and consistently data driven.
  - The emphasis needs to shift from traditional single-profession planning to new ways of working; new roles, skill mixes and collaborations; and integration and coordination across disciplines and professions.
  - Improvements in HCWF planning models could also usefully tackle the:
    - combination of specific, generic (transversal) and leadership competencies;
    - balance between cost-effectiveness, scope of practice and skill development;
    - feasibility and sustainability of different staff and skill mixes;
    - whole-system needs of clinical practice, population health and social care.
- **Governance is crucial and policy-makers need to ensure forecasting and planning are central to HCWF policies** and play a key role in strategy, policy design and implementation, steering the transition towards care models that achieve more tailored, coordinated, efficient and equitable care.

Executive summary

Europe's health and care systems are under intensifying strain due to population ageing, rising multimorbidity and growing chronic disease burdens that are coinciding with widening workforce shortages and tightening budgets.

Many countries are already having trouble in maintaining equitable access to quality care, particularly in primary care and community settings. To sustain universal, person-centred health systems, countries must redesign how care is organized and delivered. This means developing and implementing innovative care models that strengthen prevention, integration and digitalization, while reconfiguring the health care workforce (HCWF) to deliver them.

Forecasting and planning are central to this transformation. They allow policy-makers to anticipate future service needs, identify workforce implications and ensure that education, training and governance adapt in time.

Health and care delivery must shift towards integrated, proactive and community-oriented approaches that better meet the needs of people with chronic and complex conditions.
Innovative care models targeting various populations, for example, population health management, person-centred integrated care, transitional care, hospital-at-home and case management models, share common goals: improving outcomes and the efficiency and coordination of care, while supporting people to live independently for longer.

These models depend on flexible, multidisciplinary teams working across boundaries of profession, sector and organization. They highlight the need for strong primary care, collaboration between health and social services, and digital tools that support continuity and self-management.

Delivering innovative care requires transforming the HCWF, not simply expanding it. The challenge is to ensure that the workforce has the right skills, competencies and flexibility to work in new configurations of care. Across all models, three classes of competencies stand out:

- specific competencies, such as data analytics, digital literacy and integrative care planning;
- generic (transversal) competencies, including teamwork, coordination and patient communication; and
- leadership competencies, to drive cross-professional collaboration and manage organizational change.

Nurses, general practitioners and community-based professionals are central to these models. Their roles are expanding, often beyond traditional boundaries, requiring new capabilities in prevention, care coordination and shared decision-making.

Workforce forecasting and planning are essential for guiding this transformation. They enable decision-makers to:

- explore future demand scenarios, taking account of population ageing, disease patterns and service redesign;
- model workforce implications of new care models (such as hospital-at-home services or person-centred integrated care);
- anticipate capacity and skill needs for emerging roles and technologies; and

- align education and training pipelines to meet future demand.

Beyond technical modelling, planning exercises can also highlight policy priorities, for example, fairer valuation and clearer career pathways in primary care, nursing, social care and community services, which are often undervalued despite being central to system resilience.

Current HCWF planning approaches remain largely profession-specific, focusing on recruitment and retention within traditional roles. However, as new models of care rely on interprofessional collaboration and skill-mix innovation, planning systems must evolve.

Innovating HCWF planning is a whole-system endeavour that links data, governance, education and service delivery.

Evidence from across Europe shows that aligning the strategic vision, interprofessional learning and data-driven planning enables systems to anticipate change. To future-proof Europe's health and care systems, planning models must:

- be multiprofessional and dynamic;
- integrate education, regulation and financing reforms; and
- place primary care and teamwork at the centre of transformation.

Ultimately, forecasting and planning are not technical exercises but strategic tools for resilience, equity and innovation. Embedding them into policy will ensure that Europe's HCWF remains fit for the future and thus capable of delivering coordinated, efficient and people-centred care for all.

1. Intro: why this brief and why now?

The health and care needs of European populations are changing as a result of ageing. Population ageing impacts the demand for chronic (curative) care and long-term care, as single chronic conditions and multimorbidity are common among older citizens. As many older citizens live independently in the community, primary care and community services are seeing many more people with complex care needs now than in previous decades and the growth in demand for care will outpace the growth of the health care workforce (HCWF). In addition, migration patterns impact both the demand and supply of care in European countries by contributing to greater demographic diversity, changing epidemiological profiles and varying cultural needs, and by changing the availability and quality of the HCWF in different countries. These trends challenge the financial sustainability of European health and care systems and threaten equitable access to quality care.

To sustain universal and person-centred care, countries across Europe are rethinking how services are organized and delivered. Innovative care models – such as integrated, digital or community-based models – are emerging as responses to demographic, epidemiological and workforce pressures. These models offer opportunities to enhance efficiency, improve care quality and reduce the burden on overstretched health and care workers. Yet, implementing these new models also requires substantial changes in how countries plan, train and support their HCWF.

This policy brief examines how innovative care models affect the organization, composition and competencies of the HCWF (boxes 1 and 2). It asks:

What innovative care models are being developed and implemented in European countries to provide quality care to growing populations with an increased complexity of care needs, and what are the implications of these developments for countries' HCWF planning and training?

Box 1. Methods in brief

Evidence for this policy brief is drawn from previous and ongoing research on integrated care conducted by the authors, including deliverables from European Union (co-)funded actions. Seven innovative care models implemented across European countries were selected based on this body of work. The analysis builds on key peer-reviewed and grey literature identified through reference and citation tracking, with priority given to scoping and systematic reviews where available, as well as publications from international organizations. A narrative synthesis was undertaken to examine implications for the health and care workforce. Additional country-specific sources were provided by national informants participating in the Joint Action HEROES. No structured systematic literature search was conducted.

Box 2. Definitions of HCWF terms

In this policy brief, we use World Health Organization (WHO) terminology to refer to the HCWF, which encompasses all persons primarily engaged in actions with the primary intent of enhancing health (health workers) and all persons who provide direct personal care services in a client's home, in health care organizations and in residential settings (care workers) (WHO, 2023). WHO definitions and other terminology in this brief align closely with the International Standard Classification of Occupations (ISCO-08), which is a system for classifying health workers into five broad groups: health professionals (including doctors, nurses, dentists, pharmacists, paramedics and allied health professionals, among others), health associate professionals, personal care workers in health services, health management and support personnel, and other health service providers not elsewhere classified (ILO, 2025).

The policy brief has been developed under the Joint Action HEROES (HEalth woRkfOrce to meet health challEngeS), which supports European countries to build a resilient, future-ready HCWF through collaborative learning and applied evidence (Box 3).

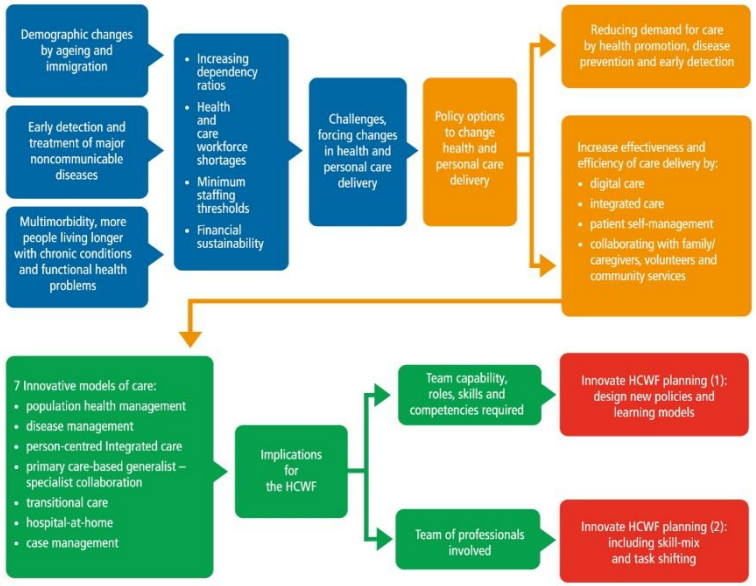
Box 3. Joint Action HEROES

The Joint Action HEROES started on 1st February 2023 and will end on 31st July2026. This project is financed under the EU4Health Programme and 19 countries are actively participating to effectively learn from each other and identify good practices on HCWF planning and forecasting. The three main objectives of the project are to: 1) to improve databases used in HWF planning; 2) to develop effective tools and methods to carry out HWF planning; 3) to define the best skill-mix needed by professionals to carry out HWF planning.[1]

[1] Further information can be found at: The project – HEROES, https://healthworkforce.eu/the-project/.

Fig. 1 shows the general framework of the policy brief, which first outlines why health and personal care delivery needs to change, and identifies the demographic, epidemiological and workforce challenges driving reform (blue boxes). Strategies for reshaping care delivery are then discussed, highlighting the key directions for system innovation: reducing the demand for health and personal care (e.g. through prevention) and improving the efficiency of care delivery (e.g. through integration or digitalization of services) (orange boxes). The next section explores the implications of new care models for the HCWF, detailing the required roles, skills and competencies (green boxes). This is followed by an examination of what needs to be done to achieve these changes, focusing on how countries can innovate workforce planning through new learning models, interprofessional collaboration and skill-mix approaches (red boxes). The brief concludes with the main insights and actions for policy-makers seeking to future-proof their HCWF.

Fig. 1 General framework



HCWF: health and care workforce.

2. Why health and personal care delivery needs to change

Health and care systems in European countries are under pressure because of the accelerating growth of the demand for health and personal care, alongside substantial challenges to attracting and retaining enough health and care workers who are sufficiently qualified to meet the demand. Although population growth is relatively small in Europe (Eurostat, 2025a), the changing composition of European populations due to ageing and migration highly impacts the demand for health care (Lancet Healthy Longevity, 2021).

In addition to demographic changes, the progress that has been made in the early detection and treatment of major noncommunicable diseases (NCDs), such as cancers and cardiovascular diseases, has increased the demand for (complex) medical treatment as well as the demand for long-term health and personal care because more people are living longer with chronic conditions and functional health problems. The high prevalence of multimorbidity due to ageing, and the higher incidence and survival rates of chronic conditions, also increase the complexity of (older) people's care needs (Colombo, García-Goñi & Schwierz, 2016). As many very old people live in their own homes for as long as possible, primary and other ambulatory care professionals, including community nursing and home care professionals, see many more patients with complex care needs (Turner & Cuttler, 2011).

The rapidly increasing demand for (complex) care goes along with an increasing dependency ratio due to population ageing. For example, the old-age dependency ratio, defined as the number of older people at an age when they are generally economically inactive (i.e. aged 65 years and over) compared to the number of people of working age (i.e. 15–64 years old), increased in the EU from 25.9% in 2001 (Eurostat, 2021) to 33.9% in 2024 (Eurostat, 2025b). The latter ratio means that there are about three persons of working age for every person aged 65 years and over in the EU. Future projections estimate a further increase of this EU old-age dependency ratio to 60% by 2100 (Eurostat, 2025b). These developments have very serious implications for countries' financial sustainability as well as for their workforce and productivity. Specifically, for the HCWF in the EU, shortages have already been reported in the number of doctors (shortages reported by 20 countries in 2022/2023) and nurses (shortages reported by 15 countries in 2022/2023) (OECD & European Commission, 2024). Moreover, it has been estimated (based on minimum staffing thresholds for universal health coverage) that EU countries together had a total shortage of about 1.2 million doctors, nurses and midwives in 2022 (OECD & European Commission, 2024). Many EU countries experience a growing shortage of general practitioners (GPs), particularly in rural and remote areas, contributing to medical deserts. Although the overall density of doctors has increased in all EU Member States over the past two decades, the share of GPs has come down in most countries. The ageing of primary care doctors further exacerbates the shortages, in particular in rural areas. These shortages are due to population ageing, but factors specific to the health and care labour market also play a role, such as a declining interest in health careers among young people (OECD & European Commission, 2024).

Together these trends, impacting both the demand and supply of health and personal care, are challenging the resilience of European countries' health systems. Without reform, many countries will struggle to maintain quality, accessibility and equity of care. Policy-

makers therefore face the urgent need to redesign the organization of care delivery and the structure of the HCWF to ensure sustainable, person-centred health systems capable of meeting future needs.

3. How health and personal care delivery can be changed

Transforming health and personal care delivery requires strategies that both reduce the pressure on health systems and improve the efficiency and quality of care. To be sustainable, these strategies must strengthen prevention, enable earlier interventions and make better use of existing workforce capacities through collaboration, digitalization and innovation. The overarching aim is to deliver better care to more people with the same, or fewer, resources, without compromising quality, accessibility or equity.

3.1 Reducing the demand for care through prevention and healthy ageing

One of the most effective ways to alleviate pressure on health systems is to reduce the demand for health and personal care by preventing disease and delaying functional decline. Strategies to promote health and prevent illness should target both the general population and specific high-risk groups, supporting people to live healthier, more active lives.

Healthy ageing, defined as maintaining and improving older adults' functional abilities and well-being, plays a particularly important role (Rudnicka et al., 2020). Traditionally, health promotion and disease prevention have been considered to be the responsibility of public health authorities. However, a more integrated approach is needed, in line with the Health in All Policies framework, which encourages all sectors to consider the health implications of their decisions to improve population health and equity (WHO, 2014).

This shift requires that health care professionals take on a more proactive role in prevention; for instance, by identifying high-risk individuals for tailored interventions, by programmatic and opportunistic screening, by patient education and counselling, and by structurally collaborating with public health, community and social care workers. The European Commission's long-term HCWF forecast highlights that if the burden of certain diseases continues to decline as they have in the past, this could offset much of the demand created by population ageing, thereby ultimately reducing the need for doctors and nurses while improving the well-being of Europe's population (European Commission, 2024).

3.2 Increasing efficiency through new ways of delivering care

Alongside prevention, improving efficiency in care delivery is essential. Efficiency gains can be achieved by delivering the same amount of health and personal care with a lower number of health and care professionals, or by delivering more care with the existing workforce. Strategies for achieving this goal include digital transformation, integrated care, patient self-management of chronic conditions and collaboration with informal caregivers and volunteers. Each of these strategies supports both quality and sustainability when implemented in alignment with local needs and system contexts.

- **Digital care** encompasses a wide range of technologies to support the care-delivery process and the tasks of health and care workers, as well as the tasks of patients and their family/caregivers in the prevention and management of (chronic) diseases, the maintenance and improvement of functioning, independent living and well-being. Many different e-Health technologies exist that enable the delivery of remote care, including telehealth (e.g. self-monitoring of blood glucose values), telemedicine (e.g. video consultations), m-Health (e.g. personalized health check-ups, automatic medication dispensers), telecare (e.g. using environmental sensors in older adults' houses to detect falls). In addition to e-Health, many other technologies exist that can help (older) adults with function impairments to remain active and live independently, such as active and assistive living and robotic technology (European Parliamentary Technology Assessment (EPTA) Network, 2019). e-Health technologies, such as self-monitoring devices and apps, may also reduce the demand for care. Artificial Intelligence (AI) may further widen the options for digital (care) support. For example, AI-enabled decision support may save time for health care professionals to identify and synthesize relevant information from patients' electronic health records and clinical guidelines, which may be particularly helpful in acute care situations or when patients have complex health needs (e.g. multimorbidity).
- **Integrated care** aims to overcome care fragmentation by linking and coordinating services across sectors and levels of care (Nolte & Pitchforth, 2014). According to the Rainbow Model of Integrated Care (Valentijn et al., 2015), integration can take place at all levels of health and care systems:
    - the micro-level, where health and care workers provide care to individual patients or clients (care coordination and clinical integration);
    - the meso-level, where care professionals develop and implement multidisciplinary guidelines (professional integration) and care organizations merge services or collaborate based on a formal agreement in an integrated care pathway for a defined patient population (organizational integration);
    - the macro-level, where segregated health and care systems merge their governance, quality regulation and financing to become an integrated health and care system (system integration).

It should be understood that delivering integrated care by health and care workers at the micro-level usually requires organizational adaptations at the meso-level (e.g. multidisciplinary team training and consultations, integrated clinical information systems), which may need adaptations at the macro-level (e.g. professional training, financing of integrated care, quality assessment and data sharing legislation). The Rainbow Model therefore distinguishes two additional dimensions: functional integration (e.g. shared information and management systems) and normative integration (e.g. shared vision and values) (Valentijn et al., 2015). Effective integrated care often requires new professional roles, shared information systems and changes in training and financing mechanisms. Evidence from the

Health System Performance Expert Group (European Commission, 2017) highlights that redesigning professional roles and creating new positions are key to achieving continuity of care and successful integration (Groenewegen et al., 2026).

- **Patient self-management** is another critical element of chronic care innovation. The Chronic Care Model (Wagner, 1998; Wagner et al., 2001) and its successors, identify self-management support as central to improving outcomes and reducing unnecessary service use. Patient self-management of chronic conditions involves adopting and maintaining healthy behaviours, self-monitoring of chronic condition(s) and self-care (e.g. taking medication), communicating with care professionals, and coping with the physical and emotional challenges of living with chronic illness (van Houtum et al., 2015). European self-management programmes, often adapted from the Chronic Disease Self-Management Program developed by Lorig et al. (2001; 1999), range from group courses to digital interventions. These programmes could be in-person, online group-based courses or online courses for individuals. Although peers can play an important role in these interventions, professionals remain essential in motivating and educating patients and ensuring continuity of support through care coordination and multidisciplinary teamwork.
- **Collaborating with family/caregivers, volunteers and community services** complements formal health care provision and reduces pressure on professionals. Informal caregivers provide about 80% of all long-term care in Europe (Rodrigues & Hoffmann, 2010), with 10–25% of the population engaged in some form of unpaid care (Zigante, 2018). Although professional care cannot and should not be replaced by informal care, partnerships between health professionals and families enhance well-being, promote self-management and prevent unnecessary institutionalization. Supporting caregivers, through training, respite services and coordination, is therefore a vital part of system sustainability.

3.3 Combining strategies to create innovative care models

None of the strategies discussed in the previous sections are sufficient on their own. Their effectiveness depends on how they are combined and adapted to different health system contexts. In practice, many European countries are implementing innovative care models that integrate elements of prevention, digitalization, coordination and community engagement. These models are increasingly centred in primary care, which provides first contact, continuity, comprehensiveness and coordination (Jimenez et al., 2021). These innovative models vary widely – from population-based approaches to home-based hospital care – but they share a common goal: improving outcomes and sustainability while redefining the roles, skills and collaborations required from the HCWF (section 4).

4. Innovative care models

Across Europe, innovative care models are being designed and implemented to address the growing complexity of health and care needs while improving quality, efficiency and sustainability of care delivery. These models combine elements of prevention, integration, digitalization and collaboration with informal carers, and are often based in primary care, because of their alignment with the four core functions that primary care fulfils: first contact, comprehensiveness, coordination and continuity (Jimenez et al., 2021). These core functions of primary care have been

associated with better outcomes in all five domains of the Quintuple Aim for health care improvement (Nundy, Cooper & Mate, 2022): (1) better patient experiences; (2) better health outcomes; (3) lower costs; (4) more job satisfaction for care professionals; and (5) more equity (Baicker & Chandra, 2004; Lewin et al., 2008; Starfield, Shi & Macinko, 2005; Stobbe, Groenewegen & Schäfer, 2021), thereby shifting care from being reactive to proactive, from being fragmented to coordinated and from being located in hospitals to being located in community settings.

In this section we describe seven innovative care models (Table 1) that have been or are being implemented in European countries or regions at a wider or smaller scale. Each model combines elements of prevention, digitalization and integration but applies these elements in different organizational contexts. Although the models vary in scope and structure, most are built around primary care, which is the point closest to people's everyday lives and which is best positioned to ensure continuity and coordination.

Table 1. Overview of selected care models

Care model	Main target population	Main sector of care delivery
Population health management	Entire population in a defined region, regardless of age and health condition	Community care and public health
Disease management	Patients with selected noncommunicable/chronic diseases	Primary and hospital care
Person-centred integrated care	(Older) patients with complex care needs	Primary and community care
Primary care-based generalist–specialist collaboration	(Older) patients with complex care needs who may benefit from medical specialist expertise (consultation model) and patients who would otherwise be followed up in specialist outpatient clinics (substitution model)	Primary, hospital and long-term care
Transitional care	Hospitalized patients who have been discharged	Hospital and primary care
Hospital-at-home	Patients who need (acute) hospital care, but whose condition is stable enough to provide care at home	Primary, home and hospital care
Case management	Patients with complex care needs who need care from multiple health (primary, secondary) and social services	Hospital, primary and social care

4.1 Population health management

Population health management is a "people-centred, data-driven and proactive approach to managing and improving the health and well-being of a defined population" (WHO Regional Office for Europe, 2023). It uses integrated data to identify high-risk groups, target preventive interventions and manage chronic conditions more effectively. Population health management enables providers to anticipate needs, allocate resources and act proactively rather than reactively (WHO Regional Office for Europe, 2023).

Population health management requires physicians, nurses, allied health professionals and social workers in a defined geographical area or health care region to collaborate closely together, and to also collaborate with public health and community health workers and

educators. Depending on the breadth of the population health management model, professionals working in other sectors (e.g. urban planners, transportation workers) may also be involved, in particular when the model builds on Health in All Policies (Frogner, Patterson & Skillman, 2023). Box 4 provides an example of a population health management model that has been implemented in certain regions in Germany.

Box 4. Optimedis integrated care model (Germany)

In Germany, the traditional health system has been characterized by institutional fragmentation, with public health services strictly segregated from health care, and, within health care, primary and secondary outpatient care organized and financed largely independently of hospital inpatient care. This strict division provided very few incentives for prevention, quality improvement, efficiency and outcome-oriented care. To overcome these issues, policies were implemented (e.g. the Statutory Health Insurance Modernization Act, 2004–2008) to promote integrated care, which resulted in integrated care pathways for specific conditions (e.g. hip/knee surgery), and a few population-based integrated care systems covering all sectors and indications of care for a given population, an example of which is the Integrierte Versorgung Gesundes Kinzigtal (Hilbrandt et al., 2010). Gesundes Kinzigtal has been scaled up to become the Optimedis integrated care model, which is currently operating in the states of Baden-Württemberg and Hesse (OECD, 2023a). The Optimedis model aims to achieve all Quintuple Aim objectives (improved patient experiences, improved health outcomes, reduced per capita costs, improved work/life balance for health care professionals and equity) by promoting access to prevention and evidence-based interventions and coordinating care across all sectors (OECD, 2023a).

The model consists of building an integrated network of health care providers at all levels of the health system in a region that, together, are accountable for the health and health care of the region's population. People of all ages living in the region can voluntarily participate in the model (regardless of their condition), which offers them a wide range of preventive interventions (e.g. exercise facilities) and disease management interventions, including health coaching and service navigation support. An important element that contributes to the economic sustainability of the model are the shared savings: through health promotion, disease prevention and supporting people to self-manage health conditions, substantial health gains are expected, which, together with an increased efficiency through coordinated care delivery, are expected to result in substantial savings. These savings are shared between the integrated network and sickness funds (Hilbrandt et al., 2010; OECD, 2023a)

4.2 Disease management

Disease management programmes (DMPs) structure care for people living with chronic conditions such as diabetes, chronic obstructive pulmonary disease (COPD), cardiovascular diseases and depression. They standardize treatment pathways, strengthen coordination and enhance patient self-management. Although not a new care model, the first DMPs had already been introduced in some European countries at the beginning of the 21st century, disease management remains very relevant as a systemic approach to managing major NCDs.

Disease management is defined as "an individual, proactive, multi-component, patient-centred approach to health care delivery that involves all members of a defined population with a specific disease or risk factors. Care is focused on and integrated across the entire spectrum of the disease and its complications, the prevention of comorbid conditions, and relevant aspects of the delivery system" (Norris et al., 2003).

DMPs combine clinical guidelines with prevention, early detection and self-management, supported by continuous data collection and analysis. Digital tools and information systems play a key role in programme monitoring and feedback (Box 5). Most DMPs are based in primary care, though some are hospital-led (e.g. Germany's breast cancer DMP (Rupprecht, 2005)).

Multidisciplinary teamwork is central to disease management. GPs or family physicians and nurses are almost always involved, supported by physiotherapists, dietitians and, depending on the disease, specialists in secondary or mental health care (Rijken & Bennema, 2011).

Box 5. Information technology-supported chronic disease management (Ireland)

Structured chronic disease management (CDM) in general practice has received a high priority in Ireland's health policy, which led the Health Service Executive to establish a CDM programme for general practice in 2020, under the National Framework for the Integrated Prevention and Management of Chronic Disease (2020–2025). This national CDM programme targets patients with diabetes type 2, asthma, COPD and cardiovascular diseases (including heart failure, coronary artery disease, stroke and atrial fibrillation) (Tandan et al., 2022). The main elements of the programme are opportunistic case-finding, structured CDM treatment and annual reviews (eHealth Ireland, 2025).

Information technology support plays a significant role in care delivery and data processing for analysis at the national level and the payment of reimbursements. Initially the GP practice management systems were enhanced with a CDM module to capture patient review data and send them (via Healthlink) to the CDM Clinical Data Repository, which analyses the data for programme monitoring and service planning, and to the Primary Care Reimbursement Service for payment. In recent years, additional programmes (for opportunistic case-finding and prevention) and new functionalities and enhancements have been integrated to expand the prevention programme to new patient target populations and streamline the entire CDM programme (eHealth Ireland, 2025).

The CDM programme has currently been adopted by over 95% of all GPs, providing structured care to 80% of eligible patients across Ireland. Practice nurses play a key role in programme delivery, besides GPs. Based on a survey among a sample of general practices from a network of practices associated with University College Dublin Academic General Practice, it was found that GPs and nurses were almost always involved in the delivery of the CDM programme. Nearly 80% of practices had two or more GPs and 66% had two or more nurses involved in the CDM programme. Nevertheless, between 27–30% of practices reported that they had inadequate numbers of staff to implement the CDM programme, and CDM-related training was reported as inadequate in 42% of practices (35% had inadequate training related to COPD and asthma, 31% to ischaemic heart disease and 28% to diabetes). Smaller practices, non-training practices and those in rural areas were less likely to be adequately staffed with GPs or practice nurses. Among the barriers mentioned to implementing the CDM programme were recruitment (73%), salary costs (72%) for practice nurses and inadequate premises (69%) (Tandan et al., 2022).

4.3 Person-centred integrated care

The disease management model (section 4.2) has been criticized for its predominantly single-disease focus and the strictly protocolized integrated care pathways, which are ill-suited to the needs of people with multimorbidity. In response, person-centred integrated care models have emerged to organize care around the comprehensive needs, values and preferences of individuals rather than the requirements of a single

condition. Person-centred integrated care is characterized by a person-centred focus, care integration and a proactive approach to identify persons with complex care needs who may benefit from person-centred integrated care (Mas et al., 2021; Raaijmakers et al., 2023).

Unlike disease management, person-centred integrated care is individualized rather than protocol-driven and begins from patient-defined goals. Also known as person-centred, integrated proactive care (Berntsen et al., 2019), person-centred integrated care is most often rooted in primary care, where comprehensiveness, continuity and proximity make it possible to reach older adults and those with multiple chronic conditions.

A scoping review by Michielsen and colleagues (2023) of 21 studies from the USA (9 studies), the Netherlands[2] (5 studies), Australia (2 studies) and five other countries (1 study), identified a wide range of health and care professionals involved in person-centred integrated care: GPs, nurses, nurse practitioners, primary care internal medicine residents, physiotherapists, behavioural health consultants, pharmacists, occupational therapists, social workers and speech therapists. It should be noted that in 11 studies the care professionals involved were not specified.

Patients with complex care needs are often identified through screening tools and software that search the electronic health records of listed patients (Box 6) for risk factors or indicators of frailty. Primary care teams, typically a GP and a nurse, then conduct a comprehensive needs assessment covering the physical, psychological and social dimensions, as well as patients' life goals, values, priorities and preferences. The result is shared, a person-centred care plan is developed collaboratively with the patient and, where relevant, with family and caregivers. Multidisciplinary teams subsequently deliver care in close partnership with the patient, adjusting plans as the needs evolve.

Although person-centred integrated care is not yet fully implemented across Europe, several studies in the Netherlands have explored cost-effective strategies for scaling it up without further increasing the workload of the health and care workers involved (Bogerd et al., 2024; Heins et al., 2020; Rijken et al., 2020; Rijken & van der Heide, 2019; Smeets et al., 2020a; 2020b) (Box 6). Findings suggest that general practices must prioritize those patients with the highest needs and develop targeted approaches for frail older people or those at a high risk of developing frailty.

Box 6. U-CARE, proactive integrated primary care for older people (the Netherlands)

Providing optimal care for the increasing number of older people with complex care needs is a major challenge in primary care. The traditional reactive approach in primary care results in unnecessary loss of daily functioning, suboptimal quality of life and high health care expenditure. To overcome this, a proactive personalized primary care strategy for frail older people was developed in Utrecht, the Netherlands. The strategy consists of a screening intervention (U-PRIM), followed by a personalized nurse-led care intervention (U-CARE). U-PRIM is a software application that identifies potentially frail older patients using available routine care data (International Classification of Primary Care (ICPC) codes of symptoms and diseases, Anatomical Therapeutic

[2] Note that Netherlands (Kingdom of the) comprises six overseas countries and territories and the European mainland area. As data for this Report refer only to the European territory, the Report refers to it as the Netherlands throughout.

Chemical (Classification System) (ATC)-codes of prescribed medication and contact information) registered in the electronic medical records of general practice patients. Every 3 months, an Utrecht Patient-Risk Identification Model (U-PRIM) report is generated and reported to the practice. Based on this report, GPs are able to invite patients to the U-CARE programme, which is delivered by trained practice nurses. The programme starts with a self-assessment using the Groningen Frailty Index (GFI) and the Intermed Self-Assessment scale to assess bio-psychosocial care needs, which is then followed by a Comprehensive Geriatric Assessment (CGA) conducted by the nurse if potential frailty is indicated according to the GFI. Based on the outcome of the CGA and the individual needs of the patients, nurses provide evidence-based tailored care, care coordination and multiple follow-up home visits.
The programme was evaluated in the Utrecht PROactive Frailty Intervention Trial (U-PROFIT), which demonstrated that screening (U-PRIM) or screening plus nurse-led care (U-PRIM followed by U-CARE) both resulted in less decline in daily functioning after 12 months compared to usual care (Bleijenberg et al., 2016). The probability of cost-effectiveness at the €20 000 per quality-adjusted life year threshold was 87% for screening plus GP care versus usual care, and 91% for screening plus nurse-led care compared to usual care (Bleijenberg et al., 2017). Practice nurses and GPs reported that it was difficult to deliver the programme due to a lack of time and financial compensation, but most indicated that the programme had added value for the coordination of care and allowed them to provide structured care. The programme has been scaled up in the region of Utrecht, for which it received an implementation grant from the Netherlands Organisation for Health Research and Development. Further development and upscaling, including expansion to other regions, are currently taking place.[3]

4.4 Primary care-based generalist–specialist collaboration

Two main types of collaboration models can be distinguished according to their purpose and patient population: consultation models and substitution models. Consultation models strengthen the quality of care for (older) people with complex needs within primary care, whereas substitution models are mainly implemented to shift expensive outpatient specialist care to primary care to reduce costs and unnecessary referrals. In practice, both models overlap, as their goal is to ensure that patients receive high-quality, continuous care at the most appropriate level.

4.4.1 Consultation model

A consultation model is defined as "an intervention in which medical specialists from outpatient hospital care perform joint consultations with GPs in a primary care setting to discuss medical cases and to agree on an approach of case management" (van Hoof et al., 2019). These models target community-dwelling patients with complex chronic conditions, multimorbidity, frailty or mental health problems who risk hospitalization. Although ad-hoc specialist consultations have long existed, many countries have now established formalized collaborations that integrate

[3] More information is available here (in Dutch): *Ouderenzorgproject Midden Utrecht (OM U 3.0)* [Elderly care project Midden Utrecht (OM U 3.0)], https://juliuscentrum.umcutrecht.nl/nl/om-u-3-0; *Samen werken aan betere zorg en ondersteuning in uw wijk* [Working together to better care and support in your neighbourhood], https://www.omuutrecht.nl.

specialist expertise directly into primary care teams. Experience from Denmark's Clinic for Multimorbidity illustrates both the potential and challenges of this approach (Box 7).

Box 7. Clinic for Multimorbidity (Denmark)

The Clinic for Multimorbidity was developed in 2012 by clinicians, management and facilitating officers from Silkeborg Regional Hospital, together with local GPs. GPs can refer patients who have at least two chronic conditions (including mental health conditions) and complex care needs. The purpose of the referral is to obtain a comprehensive assessment of the patient's care needs and a treatment plan, which can then be followed up and monitored by the GP. After acceptance of the referral, a physician from the clinic, assigned as a personal consultant, collects all relevant patient information and acts as a generalist across all care professionals involved from the clinic. Patients visit the clinic for one day, during which they have diagnostic tests, a medication review by a pharmacist, assessments by a physiotherapist and an occupational therapist and a consultation with their personal consultant that focuses on their needs and concerns. After this, and on the same day, patients are discussed in a multidisciplinary conference with the participation of the personal consultant, other relevant medical specialists from the diagnostic centre, the pharmacist, therapists and the pathway coordinator, at which point a treatment plan is proposed. GPs can participate by videoconference, if they wish. After this conference, the treatment plan is proposed to the patient, which, when agreed upon, will be sent to the GP. The GP will subsequently follow-up according to the treatment plan, including specialist suggestions for treatment and monitoring (Bell et al., 2023).

The Clinic for Multimorbidity has struggled with only receiving a few referrals of patients from GPs. This may be explained by GPs experiencing difficulties in determining suitable times for referral and, consequently, referring few patients. Furthermore, GPs felt it difficult to provide the follow-up care according to the treatment plan, and felt the division of roles and responsibilities was unclear (Nissen, Aarhus & Ørtenblad, 2022). These aspects need to be carefully addressed in generalist–specialist collaboration models.

In the Netherlands, specialist expertise is being implemented in primary care through collaborations with elderly care specialists. Elderly care specialists are physicians who follow a 3-year specialist training programme to care for frail older people. This is a profession that was originally based in nursing homes but now supports frail older people in community settings (Koopmans, Pellegrom & van der Geer, 2017). A study by Vrijmoeth and colleagues (2022) identified several collaboration models (Box 8) that vary in intensity and organizational form, from co-located teams to remote consultations.

Box 8. Characteristics of collaborations of elderly care specialists in primary care (the Netherlands)

Collaboration practice	
1	Self-employed treatment centre for elderly care at the same location as the PCP; ECPs mainly deployed as co-practitioners
2	Long-term care organization with expertise centre and team in primary care that closely collaborates with a regional hospital and the local GP association
3	Long-term care organization participating in a strong regional collaborative care network, including the regional hospital; ECP deployed solo (with some task delegation to a practice nurse with expertise in older adult care who works in close collaboration with the GPs)

4	Independent care institution that delivers ECPs to long-term care organizations to structurally collaborate with a primary care practice in the primary care setting; ECP deployed solo (with some task delegation to a practice nurse with expertise in older adult care who works in close collaboration with the PCP)
5	ECP as freelancer (member of a cooperation of freelancers) with structural and close collaboration with a number of general practices; ECP deployed solo (with some task delegation to a practice nurse with expertise in older adult care who works in close collaboration with the PCP)
6	Long-term care organization as a network partner of a PCP association that strongly promotes collaboration between PCPs and ECPs; ECP deployed solo (with some task delegation to a practice nurse with expertise in older adult care who works in close collaboration with the PCP)
7	Academic long-term care organization with an existing academic partnership with PCPs as a foundation for collaboration in primary care, with the possibility for short (diagnostic) admission

ECP: elderly care physician; GP: general practitioner; PCP: primary care practitioner.

Source: Vrijmoeth et al. (2022).

4.4.2 Substitution model

Substitution models relocate elements of specialist care to general practice without physically transferring hospital infrastructure. They aim to provide appropriate specialist input closer to patients' homes, reduce waiting times and achieve cost efficiency. According to Van Hoof and colleagues (2019), these models have been most extensively studied in the United Kingdom, where multidisciplinary GP practices host outpatient consultations by specialists (e.g. dermatologists, cardiologists, ophthalmologists). The Netherlands' Primary Care Plus model represents a similar approach, enabling GPs to manage patients who would otherwise be referred to hospitals.

Overall, generalist–specialist collaboration models demonstrate how integrated, cross-setting care can enhance quality, continuity and efficiency. Their success depends on clear role definitions, shared protocols and sustained collaboration between primary care and specialist teams – supported by organizational frameworks that facilitate communication, feedback and mutual learning.

4.5 Transitional care

Many hospitalized patients, in particular those with complex care needs, experience fragmented care after discharge from hospital, which may lead to safety issues and adverse outcomes, including unplanned hospital re-admissions, emergency department visits and mortality (Joo, 2023). To improve the quality of care after discharge and prevent adverse outcomes, transitional care models have been developed to ensure, coordination, continuity and quality of care across settings (Le Berre et al., 2017).

Transitional care is defined as "a set of actions designed to ensure the coordination and continuity of health care as patients transfer between different locations or different levels of care within the same location" (Coleman & Boult, 2003). Transitional care interventions typically occur across three phases (Collet et al., 2025):

1. pre-discharge – comprehensive needs assessment, multidisciplinary treatment planning, caregiver engagement, patient education and medication review;
2. bridging – coordination between hospital and primary care providers, usually led by a case manager to ensure timely information transfer and referral;
3. post-discharge – follow-up care via phone calls or home visits, rehabilitation and use of digital tools for symptom monitoring and patient–professional communication.

A systematic review of 49 cluster-randomized control trials by Collet and colleagues (2025) identified three main transitional care models:

1. hospital-led referral models – in-hospital care plans followed by referrals to community services;
2. case manager-led models – coordination across hospital, patient/family, and community settings; and
3. comprehensive multidisciplinary models – hospital-based teams managing the full rehabilitation process through outpatient or home-based care.

In 60% of case manager-led models, coordination was provided by hospital nurse practitioners, while others involved physicians, primary care nurses, physiotherapists, occupational and respiratory therapists or social workers. Some studies also reported patient navigators, discharge coordinators or multidisciplinary teams in this role. In the more complex, comprehensive models, case management was most often provided by hospital teams (57%) or nurse practitioners (29%), with a few examples involving primary care coordinators (Collet et al., 2025).

Effective transitional care depends on multidisciplinary collaboration, continuity of information and role clarity across hospitals, primary care and community services – supported by digital tools and case management capacity to ensure safe, patient-centred transitions.

4.6 Hospital-at-home

Hospital-at-home is a "service that provides home-based nursing and rehabilitation services whose aim is to prevent admission or to facilitate early discharge from care in an acute hospital" (Chun Ying, Pryor & Parker, 2017). Two main models are recognized (Leong, Lim & Lai, 2021):

- admission avoidance – initiated by a GP or family physician without hospital contact;
- early supported discharge – designed to shorten hospital stays.

Originating in France, hospital-at-home was developed to reduce unnecessary hospitalizations and costs, while offering patients the option of receiving treatment in their homes. It is associated with fewer hospital-acquired complications, improved patient safety and satisfaction and reduced bed pressure in hospitals (Chun Ying, Pryor & Parker, 2017; Leong, Lim & Lai, 2021).

Hospital-at-home programmes are now tested or already more widely implemented in many European countries (e.g. Denmark, Germany, Ireland, Spain, Sweden, United Kingdom). In France, the *Hospitalisation à domicile* service operates nationwide (Box 9). In the USA, the Johns Hopkins Model demonstrates how hospitals and managed care providers deliver acute care at home through remote monitoring, home visits, and coordinated handovers to primary care once patients stabilize (Klein, 2025).

Despite its benefits, hospital-at-home faces challenges, particularly in medication management and team coordination. Issues include prescription changes, drug interactions and communication gaps between hospital and home teams (Nikmanesh, Arabloo & Gorji, 2024). Furthermore, access to hospital-at-home services may depend on geographical location, digital literacy of patients and the availability of family members who could take more responsibility to care for the patient at home (Bengtsson et al., 2025). Effective hospital-at-home delivery depends on strong multidisciplinary collaboration, clear role distribution and active communication among health care professionals, patients and family caregivers. Continuous education and coordination mechanisms are essential for maintaining safety and continuity of care (Nikmanesh, Arabloo & Gorji, 2024).

Box 9. Hospitalisation à domicile (France)

In France, *Hospitalisation à domicile* has been implemented nationwide as a service that provides care at a patient's home for a limited period, with the aim of avoiding or shortening hospitalization. The use of *Hospitalisation à domicile* services increased from 117 000 patients in 2017 to 168 000 in 2023, with a significant increase in 2020 due to the COVID-19 pandemic. GPs can refer patients to a *Hospitalisation à domicile* service, which is reimbursed by health insurance under the same conditions as conventional hospital care.

Hospitalisation à domicile may include health and personal care, and is delivered by a team of health care professionals who closely collaborate with social services, GPs and hospital facilities. Care that can be provided by the service includes complex dressings, certain chemotherapies, intravenous or intensive nursing treatments, blood transfusions, respiratory assistance, rehabilitation care, paediatric care, antenatal or postpartum care, and palliative care.

The referral to *Hospitalisation à domicile* is reviewed by a *Hospitalisation à domicile* physician who organizes and coordinates the multidisciplinary care, maintains contact with other (hospital and private) physicians involved in the patient's care, and is the first point of contact for the patient and family/caregivers. The *Hospitalisation à domicile* service provides the patient and family/caregivers with an alert protocol for emergency situations, which consists of, at a minimum, a nurse hotline available 24/7. All *Hospitalisation à domicile* services offer the option of a nurse visiting the patient's home at night. When this is not possible, the nurse can be reached by phone, who will then arrange emergency assistance if necessary. The joint intervention of a *Hospitalisation à domicile* facility and a home nursing service or a multipurpose home care and assistance service is possible and will be coordinated by the *Hospitalisation à domicile* (Ministère de la Santé, 2025).

4.7 Case management

Case management is a collaborative approach to ensure, coordinate and integrate care and services for patients with complex needs. It involves assessing, planning, implementing, coordinating and evaluating care to meet individual health and social needs efficiently and effectively (NCMN, 2009; ASCM, 2024).

Case management targets patients who require services from multiple sectors, typically older adults with multimorbidity or functional limitations, but also younger individuals facing mental health, social or economic vulnerability. When family or caregivers are not able to coordinate care, professional case managers step in. They may operate from primary care, hospitals or social care organizations, developing individual care plans and leading multidisciplinary teams responsible for delivery (Hudon et al., 2019).

Models of case management vary in intensity. Hudon and colleagues (2019) characterized high-intensity case management in primary care as having small caseloads (fewer than 60 patients), extensive face-to-face contact and frequent multidisciplinary coordination.

Case managers are often nurses (practice, community, district or hospital-based) though they can also be social workers or other care professionals. Their responsibilities typically include case-finding, comprehensive needs assessment, care delivery, care coordination and outcome evaluation (Bertuol et al., 2020; Villarreal-Granda et al., 2024). The scope of practice can span across primary, specialized and home care.

Approaches differ by country: in Norway, nurse case managers in community settings work exclusively as case managers; in England, nurse case managers combine their role as case manager with practice or district nurse roles (Putra & Sandhi, 2021). In Spain, regional variation is substantial, with most established models in Andalucía, the Basque country, Catalonia and Valencia. In Valencia, a two-nurse system bridges hospital and community care (Box 10).

Box 10. Nurse case management for patients with complex care needs (Spain)

Case management is a key element in the integrated care model for patients with complex care needs, which was initiated as part of the Strategy for Chronic Care in the Valencia region, Spain. A complex case is defined as a patient requiring an intensive level of attention for chronic or palliative care, i.e. those who fall into the apex of the Kaiser Permanente Pyramid (Barceló et al., 2012) (around 3% of the overall population in the Valencia region). These patients are usually characterized by being aged 75 years and over, having multimorbidity and polypharmacy, experiencing frequent emergency department visits and frequent hospitalization for acute episodes, having functional dependency, fragile family support, social and economic needs and changes in health status, the circumstances of carers or living situation. They may need vital technologies (e.g. oxygen therapy) or assisted technology (e.g. anti-decubitus mattresses) and treatments that need to be carried out by care professionals (e.g. placement and use of a catheter). The main purpose of the integrated care model is to improve the quality of care for these patients, enable them to stay in their own homes and maintain the best possible quality of life by preventing or delaying clinical, functional and social deterioration and, when appropriate, guaranteeing dying with dignity.

As these patients need both primary/community care services, as well as hospital specialist services, they are enrolled into case management delivered by two nurse case managers, a community nurse case manager and a hospital nurse case manager (also referred to as hospital liaison nurse). There are various hospital services in Spain and, depending on the nature and complexity of the patient's health condition, patients could be managed in a hospital for acute care and short-term treatments, a hospital-at-home service, a chronic care hospital for post-acute, rehabilitation and mental health services, or in a palliative care service. When they are stable, patients with complex care needs can be managed by home and community care services, with health centres acting as hubs of both primary and, to a certain extent, specialized care. Given the multiple care providers, and the many transitions a patient may experience, the community nurse case manager and the hospital nurse case manager are jointly responsible

for monitoring the patient and interacting with all care providers. They communicate on a continuous basis to ensure high-quality care and continuity and coordination in case of transitions from hospital services to home, and vice versa (Barbabella et al., 2016; Gallud, Soler & Cuevas, 2012).

Across Europe, innovative care models are reshaping the organization and delivery of health and personal care to address rising complexity, workforce shortages and growing demand. Though each of the seven models (population health management, disease management, person-centred integrated care, generalist–specialist collaboration, transitional care, hospital-at-home and case management) differ in scope and implementation, they share common objectives: improving coordination, continuity and person-centredness of care while enhancing efficiency and sustainability.

These models demonstrate a decisive shift from fragmented, disease-specific care towards integrated, proactive and community-based systems that better support patients with chronic or complex needs. They rely on multidisciplinary teamwork, strong data and digital infrastructure, and close alignment between health, social and community services. Importantly, they depend on a skilled and adaptable HCWF capable of assuming new roles, collaborating across sectors and operating in settings that extend beyond traditional hospital care. Section 5 explores these workforce implications in greater depth by highlighting the key professions, skills, and competencies required to make these innovative care models work, and identifying how health workforce planning and training must evolve to sustain them.

5. Implications for the health and care workforce

The implementation of innovative care models has significant implications for the HCWF and the planning of human resources. The seven models mentioned in section 4 demand that the HCWF have new skills, greater flexibility and closer collaboration across traditional professional and organizational boundaries. The central challenge for European countries is to ensure that workforce planning, education and training evolve in step with the changing models of care.

In this section, we specifically address the question of what these models mean for the HCWF and the planning of human resources. What are the skills, competencies and roles of health and care professions that are critical in these models? And what are the key professions that are involved, and need to collaborate, in the innovative care models?

5.1 Evolving roles and new competency needs

All seven models (population health management, disease management, person-centred integrated care, generalist–specialist collaboration, transitional care, hospital-at-home and case management) emphasize a set of core competencies that go beyond profession-specific expertise. These include communication, teamwork, care coordination, data literacy and leadership. Below we discuss how the seven models address the required roles and competencies of the HCWF.

1. **Population health management** demands professionals who can bridge public health and clinical practice. According to Frogner, Patterson and Skillman (2023), this includes the ability to analyse and act upon the social and structural determinants of health, collaborate across sectors and operationalize Health in All Policies. Essential competencies include data analytics, prevention and inter-organizational

coordination – skills particularly relevant for public health workers, nurses and physicians involved in prevention and health promotion (WHO Regional Office for Europe, 2015).

2. **Disease management** relies on multidisciplinary teams that bring together GPs, medical specialists, nurses and allied health professionals. A European survey found GPs or family physicians were involved in all identified DMPs, while specialists' participation depended on disease type (e.g. cardiologists for cardiovascular diseases, pulmonologists for COPD). Nurses, especially specialized or practice nurses, were universally central to programme delivery. Dietitians, physiotherapists and, increasingly, community pharmacists also play key roles (Jokanovic et al., 2017; Rijken & Bennema, 2011). Required competencies include coordination, patient engagement and motivational communication, reflecting the person-centred and preventive nature of chronic disease care.

3. **Person-centred integrated care** involves a wide range of professionals – GPs, nurses, nurse practitioners, physiotherapists, occupational and speech therapists, pharmacists, behavioural health consultants and social workers – working collaboratively around patients' goals (Michielsen et al., 2023). The model depends on four key competencies:

   person-centred communication, including empathy, listening and motivational interviewing;
   collaborative teamwork, jointly managing cases and sharing accountability;
   interprofessional communication, ensuring clarity across disciplines; and
   leadership, to coordinate care and guide team-based processes.

   These skills enable teams to deliver holistic, responsive care that prioritizes patient preferences and life context.

4. **Primary care-based generalist–specialist collaboration** requires coordination between GPs and specialists, ensuring patients receive care at the appropriate level. Key competencies include shared decision-making, role clarity and interprofessional communication (van Hoof et al., 2019). In models involving elderly care physicians**,** such as in the Netherlands, additional competencies include managing frailty and working in broader multidisciplinary teams (Vrijmoeth et al., 2022);

5. **Transitional care** models highlight the importance of coordination and continuity across care settings. Workforce requirements vary depending on local systems, but typically involve nurses, GPs, pharmacists and allied health professionals such as physiotherapists, occupational therapists and speech therapists (Leithaus et al., 2022). The central coordinating role is often played by a case manager (frequently a nurse practitioner) who ensures communication between hospitals, primary care and community services.

6. **Hospital-at-home** models require professionals to deliver acute care safely in patients' homes. According to Wallis et al. (2024), both hospital and primary care specialists are involved, supported by nurses who operate beyond their traditional scope of practice. Core competencies include clinical autonomy, decision-making, safety management and team collaboration, as well as proficiency in person-centred and shared decision-making.

7. **Case management** is inherently multidisciplinary, involving nurses, social workers and other care professionals who jointly develop and monitor individual care plans (Hudon et al., 2019). Case managers need strong skills in assessment, care coordination and communication, along with an understanding of social care linkages and community resources (Bertuol et al., 2020; Villarreal-Granda et al., 2024). Collaboration across health and social care sectors, often led by nurse case managers, is vital for supporting vulnerable populations.

These evolving roles and competencies mark a shift from professional silos to integrated, team-based care, where flexibility, trust and collective accountability are central to effective service delivery. Table 2 lists each care model by its key professions, their roles, skills and competencies.

Table 2. Generic and new roles, required skills and competencies and key professionals involved in care delivery

Care model	Key roles, skill and competencies required	Key professionals involved
Population health management	• Collaboration over different sectors • Coordination of different organizations and professionals • Focus on prevention and skills in data analytics • Collaboration between public health and health care	• Public health workers • Nurses • Physicians
Disease management	• Coordination of different organizations and professionals • Motivational competencies	• GPs[4] • Medical specialists, dependant on the chronic condition(s) • Nurse practitioners, specialized nurses or practice nurses • Allied health care workers depending on the chronic condition (physiotherapists, dietitians) • Psychosocial workers in the case of depression or mental illness
Person-centred integrated care	• Person-centred communication • Collaborative teamwork • Interprofessional communication • Leadership	• GPs • Nurses, nurse practitioners • Physiotherapists, occupational therapists, speech therapists • Behavioural health consultants • Pharmacists • Social workers
Primary care-based generalist–specialist collaboration	• Provide care at the right time and place • Collaboration and communication between GPs and the medical specialists • Collaborate in broader multidisciplinary teams • Clarity about roles and responsibilities	• Type of professionals involved depends on the specific care needs of the patients • GPs • Medical specialists • Elderly care medicine specialists
Transitional care	• Coordination • Multidisciplinary cooperation	• Case manager • Type of professionals involved depends on the specific care needs of the patients

[4] The abbreviation GPs refers to general practitioners.

		• Nurses in various specialties and roles • GPs • Pharmacists, allied health professionals • Geriatricians
Hospital-at-Home	• Collaboration between primary care and hospital teams • Skills to deliver safe and effective patient care at home • Providing care outside their normal place and scope of practice • Person-centred care • Shared decision-making • Multidisciplinary	• The type of professionals involved depends on the specific care needs of the patients • Hospital and primary care specialists • Nurses
Case management	• Develop individual care plans together with patients and their informal carers • Skills with regard to collaboration (including the links to social care) and coordination • Skills in multidisciplinary teamwork and collaboration • Patient-centred communication • Shared decision-making • Interprofessional collaboration • Sensitivity to sociocultural differences • Multidisciplinary work and working in teams • Nurse-led care	• Social workers • Case managers • Nurses, nurses in chronic care

5.2 Core classes of competencies

Across these innovative care models, three broad classes of competencies can be distinguished (Kuhlmann et al., 2025):

- specific competencies and skills required by some of the models, such as data analytics for population health management or integrative care planning for hospital-at-home;
- generic (or transversal) competencies, relating to communication, coordination, collaboration, organization and management of services, and teamwork, which are the most important competencies needed for professionals across all multidisciplinary, patient-centred models; and
- leadership competencies, needed to implement and sustain innovative care models, and ensure coordination of care between professions, health care organizations and informal carers.

Our overview shows that person-centred communication, shared decision-making, and sensitivity to sociocultural differences are central to all models (Maeda & Socha-Dietrich, 2021). Multidisciplinary work and team-based collaboration are essential to implementing integrated care (Busetto et al., 2017).

5.3. Key professions and workforce trends

Across all the models, nurses and primary care professionals are consistently identified as central actors. Nurses increasingly assume autonomous and coordinating roles whereby they are managing chronic conditions, leading case management and providing hospital care at home (De Wit et al., 2024). This shift reflects a broader transition from supporting doctors to supporting patients (WHO Regional Office for Europe, 2022).

Missing from the literature on innovative care models and their implementation is the importance of supportive personnel. Primary care professionals, including GPs, pharmacists and allied health staff, form the hub of integrated service delivery. Ensuring they have the resources, data and administrative support to manage growing complexity is essential. As many countries still rely on single-handed GP practices, strengthening team-based and administrative capacity is a critical enabler of innovation.6. Implementation considerations: from innovative care delivery to refined models for HCWF planning, forecasting and training

Implementing the innovative care models described in section 3 has major implications for HCWF planning, forecasting and training. The current, profession-based approaches that are designed to address shortages and maldistribution must evolve to reflect new ways of working, interprofessional collaboration and flexible role boundaries.

Although HCWF planning has advanced across Europe and globally, it remains largely dependent and embedded in systems marked by workforce shortages, regional disparities and professional silos. Most HCWF planning and forecasting models are profession-oriented,

focusing on recruitment, retention and well-being within specific occupations. Although this remains crucial, innovative care models require planning that integrates collaboration, coordination and shared accountability between professions and sectors. This argument echoes findings from a series of comparative studies.

- In their OECD Working Paper, Ono, Lafortune and Schoenstein (2013) reviewed 26 projection models across 18 countries and identified a gap in high-level, integrated multiprofessional planning. No model achieved full integration, i.e. capturing demand and supply across all professions and scenarios. The authors advocated for multiprofessional models that consider task-sharing and substitution, and for countries to learn from peers with similar systems and labour markets.
- Batenburg (2015) found wide variation in European planning systems, with frontrunners (e.g. Sweden, Norway) benefiting from strong primary care and robust data infrastructure. Most models were demand- or supply-driven and profession-specific, but opportunities for mutual learning and country clustering, as implemented in the Joint Action HEROES project, for example, were significant.
- Lee et al. (2024), reviewing 40 modelling studies, found that although recent approaches embrace complex systems thinking – combining demand, supply and gap analysis – most remain needs-based or based on stock-flow calculations and neglect skill mix or social care roles. The differentiated medical workforce dominates; nurses and midwives are treated as "undifferentiated labour" despite their growing importance.

In particular, we quote Lee et al. (2024) arguing that:

- effective strategic workforce planning for integrated and coordinated health and social care is essential if future services are to be resourced such that skill mix, clinical practice and productivity meet population health and social care needs in timely, safe and accessible ways globally; and
- whole-system, needs-based approaches must consider the ecology of a co-produced health and social care workforce.

In line with our previous analysis, Lee et al. (2024) also concludes that in most HCWF models nursing and midwifery are characterized as "undifferentiated labour", requiring urgent growth to meet demand. The implication is that HCWF innovation must extend beyond professions thereby addressing imbalances between generalist and specialist physicians, between physicians and nurses (Kyriopoulos et al., 2025) and in the roles of allied health professionals and care assistants.

6.1 Two strategic directions for innovation

Building on the skills, roles and competencies highlighted in section 4, two complementary directions have emerged for innovating HCWF planning on the path to realizing innovative models of care:

1. **designing policies and learning systems** that support collaboration, coordination and cross-sectoral integration (the *qualitative* dimension of HCWF reform); and

2. **embedding skill-mix and task-shifting dynamics** in planning models (the *quantitative* dimension of reform).

Direction 1: Designing new policies and learning models

Redistributing responsibilities within the workforce, such as through task shifting or redefining scopes of practice, is complex and difficult to implement. It impacts professional identity, income and jurisdiction. Success requires mutual trust, transparency and joint ownership across professions, supported by education systems and policy frameworks (Barbazza et al., 2015). Reallocating tasks and roles through HCWF planning is hard because shifting training budgets, changing privileges and labour market investments affects the professional status and income of HCWF professions. Still, the previous chapters showed that the system and organizational changes associated with innovative care models, explicitly *require* a new and clear (re-)distribution of responsibilities that cannot be achieved by top-down planning alone. Changes in the distribution of capacities and responsibilities are only possible when there is mutual trust among policy-makers, professionals and patients, and on a shared willingness to improve collective service delivery (Barbazza et al., 2015). Trust is dynamic and must be actively nurtured during change. Policy levers work best where education systems can move faster than occupational structures: education is more adaptable, whereas occupational hierarchies are comparatively inert (Groenewegen, Plochg & Batenburg, 2012). Box 11 illustrates this approach in Sweden, where a national learning system builds interprofessional trust and a systems-oriented method for HCWF planning.

Box 11. A national learning system to reduce fragmentation and better address the complexity of the health and medical care system (Sweden)

Background

In 2025 in Sweden, the National Board of Health and Welfare initiated a new needs-based policy programme that considered human resources in health and medical care from a national perspective. The programme is based on a national learning system aimed at reducing fragmentation and better addressing the complexity of the health and medical care system in Sweden. The learning system has been developed using an exploratory approach, incorporating interactions across organizational boundaries, and is based on continuous feedback and interaction. It involves cooperation between the National Board of Health and Welfare and other actors, such as regions and municipalities.

The innovation was driven by the need for a system-wide approach to planning human resources in health. Workforce planning used to be based on historical data rather than on locally anchored, forward-looking needs analyses. The need for care in Sweden is increasing, due to an ageing population and a rise in mental health conditions among children and young people. New medical and technological opportunities also create expectations and increased demands on the health care system. Against this background, there was a need for a more efficient use of resources to help ensure the provision of sufficient human resources, both in health and medical care and in other publicly funded services and services that contribute to the health of the population. This requires a shift in the centre of gravity:

- from control to learning;
- from siloed thinking to a systemic approach; and
- from standardization to responsiveness to the experiences and needs of citizens and patients.

The introduction of a national programme for learning systems and the development towards a more efficient and needs-based use of resources are based on a relational approach. This means that interaction between citizens, employees, patients and decision-makers at different levels is seen as a basic prerequisite for change. It is about interaction and trust between individuals as well as legal, economic and personal relationships along with investments in infrastructure and technology.

Pilots of the national learning system

One of the pilots within the programme is the Leading Healthcare (LHC) project, which aims to develop new methods and models for skills supply. The project's approach is to bring together several interest groups for joint discussions on issues that are often dealt with professionally, with the LHC as an arena that guarantees the system perspective. The project has been based on the think-tank as a method and facilitator of social development. In focus groups, participants worked on the theme of the future of skills supply together with representatives from the Swedish Association of Occupational Therapists, Midwives, Physiotherapists, Natural Scientists, Psychologists, Health Professionals, Pharmacists and Dentists. A prerequisite has been that the participants do not commit to agreeing with the other participants or formulating common conclusions, rather the purpose of the groups is to generate new insights and questions and to challenge different perspectives.

The focus group discussions of this project resulted in the following outcomes:

- A more efficient use of available resources should be the starting point for workforce planning. Although access to training places continues to be an important goal, the solutions proposed cannot be based on an assumption that the number of employees in the well-being services area will increase in relation to future needs.
- Workforce planning needs to include a development perspective that takes into account new opportunities for division of labour and developed working methods. Not least, the strategic transition to good and close care needs to be reflected in the dimensioning, allocation and coordination of resources.
- Skills supply needs to be seen in a longitudinal perspective over the entire process from education and clinical placements, onboarding at the workplace, working conditions and work environment that promotes a sustainable and long-term working life.
- Solutions to improve skills planning and supply should be developed with a system perspective in mind, i.e. that the questions need to be asked so that the answers do not automatically end up in positioning between the professional groups; for example, in terms of resource allocation or knowledge requirements. Rather, many of the proposals discussed in this group are based on improving the conditions for cooperation between different professional categories in order to jointly meet patient needs in a more effective way.
- Skills-supply issues can also include working proactively with the needs side of health care. It is inevitable that the need for care will increase in the future, but there are also ways to work towards a decrease; for example, through a health-promoting approach, preventive measures and/or redistribution of work efforts towards a higher degree of self-care.

Source: Socialstyrelsen (2025).

A case study from Norway illustrates how policies can contribute to educational systems, and the need to adapt to implement interprofessional training – one of the key skills emerging from the innovative models of care (Box 12). As with the example from Sweden, the approach is to set up governance structures to achieve collective goals that cannot be reached by individual education and training institutes.

Box 12. RETHOS: four ministries shaping a new governance system on the content of the education of both health care and social work students (Norway)

Background

In Norway, for many years, it was possible to increase the number of health care workers faster than the corresponding population growth, both in response to the very decentralized health care system, and as a way of delivering a higher standard of care. However, Norway, like most other European countries, is now facing growing pressure on its HCWF due to the combination of an ageing population and stagnation in the number of people of working age.

Interprofessional collaboration

Consequently, there is an impetus to organize work in new ways in the health care sector. One way forward is to foster more interprofessional collaboration. Such collaboration can enhance the quality of care, by ensuring that each profession brings its expertise to the table and allows for more flexibility in the way work is carried out by different groups. This flexibility is seen as crucial in a future where health care workers will have to adopt a broad set of skills to assess a varied patient population, especially in primary health care. Preparing the health care staff for new models of care should start when they are (first) being educated.

Collaboration between four ministries/new governance system

In 2017, in a groundbreaking project (called RETHOS[5]), four Norwegian ministries started collaborating on the content of the education being provided to both health care and social work students. The Ministry of Health and Care, the Ministry of Education and Research, the Ministry of Labour and Social Inclusion and the Ministry of Children and Families are all members of the Steering Committee of the new governance system.

The main aim of the collaboration is to ensure that the educational content is aligned with future developments, the needs of the health care and social services, and the needs of patients and users of the services. Both the services and the patients and users have increased influence on the content of the education through this new governance model. The new system was initially met with some resistance, especially as the health care and social service sectors had a more direct say in the content of the curricula. Getting the four ministries to collaborate has been a key success factor in setting up the new system. So far, 35 different courses, mostly at bachelor level but also some at master level, have been included in the new system.

Expected results

The expected result of this new governance system is to produce qualified candidates who share core knowledge and are familiar with the competencies of other professions, and who have trained together to some extent during their education, and, therefore, should be able to collaborate more easily and draw on each other's strengths in health care and social services.

[5] Useful links for more information on RETHOS is provided here (in Norwegian): *Om RETHOS* [About RETHOS], [https://hkdir.no/hoyere-utdanning-og-forskning/nasjonale-retningslinjer-for-helse-og-sosialfagutdanningene-rethos/om-rethos#Om%20styringssystemet, and information on the 35 courses currently included in the project is here (in Norwegian): *Programgrupper i RETHOS* [Programme groups in RETHOS] https://hkdir.no/hoyere-utdanning-og-forskning/nasjonale-retningslinjer-for-helse-og-sosialfagutdanningene-rethos/programgrupper-i-rethos.

Source: The content of this case description was gratefully provided by Christin Marsh Ormhaug, Department of Competence Development. Norwegian Directorate of Health.

Direction 2: Embedding skill mix and task shifting into HCWF planning and forecasting

Innovating HCWF planning and forecasting also means tackling structural hierarchies and rigid professional boundaries. Abbott (1988) described these as "systems of jurisdiction", where professions claim exclusive domains of expertise reinforced by education, regulation and institutional norms. Such hierarchies sustain division of labour and restrict adaptability. Yet innovative care models demand generalist competencies, shared learning and adaptive teamwork.

A similar tension can be seen in education, which mirrors professional silos. For innovative care models to succeed, education must shift towards interprofessional and competency-based learning. *The Lancet* committee, led by Julio Frenk, already voiced these required changes in the health educational and occupational structure (Frenk et al., 2010). In 2010 they concluded, based on a worldwide analysis of health education and occupational systems, that health labour markets are neither integrative nor proactive systems. They fail to solve the quantitative labour market mismatches, i.e.:

- shortages, waiting lists, stress and burnout;
- oversupply, supply-induced demand;
- recruitment and retention problems; and
- mismatch between student interests and required capacities and workers.

Neither do health labour markets solve the qualitative labour market mismatches, i.e.:

- lack of competencies to meet patient and population needs;
- poor integrative and patient-centred care organizations and limited teamwork; and
- no focus on skill-mix optimization (e.g. hospital/clinical orientation at the expense of public health and primary care).

These gaps remain. As shown in section 4, innovative care models require hierarchies to be reduced and roles to be redefined to enhance flexibility. Task shifting and substitution are therefore essential (Apuzzo et al., 2023; Maier et al., 2022). Yet most HCWF models remain single-occupation-based, overlooking interprofessional dynamics and thereby overestimating capacity needs (Birch et al., 2017).

Nonetheless, several countries have begun incorporating skill mix and task shifting into planning. The example from the Netherlands illustrates how reallocation between dental professions, i.e. dentists, hygienists and preventive assistants, was evaluated within a national HCWF model (Box 13). Although this case might not show the optimal alignment of integrative and skill-mix requirements of the new models of care, it does shows how the potential effects of task shifting, or substitution between the three main health professions in oral care (dentists, oral hygienists and prevention assistants) can be evaluated by HCWF planning.

Box 13. Evaluating the feasibility of reshaping the skill mix in dental health care using the national health workforce planning model (the Netherlands)

Background

In 2006, the Linschoten Committee on Innovation in Dental Healthcare in the Netherlands presented a number of (by then) groundbreaking recommendations on how to restructure task divisions in oral health. This can be considered an innovative model of care, suited to researching the feasibility of staff-mix scenarios in dental health care as proposed by the committee. The Dutch model for HCWF planning was applied in an ex-ante evaluation study to simulate the potential effects of structural task reallocation between the three dental health professions (dentists, oral hygienists and preventive assistants) and to explore the feasibility of future staff mixes in Dutch dental health care.

Methods

For the study, a specific task reallocation software tool was developed and connected to the existing Dutch model for HCWF planning. This planning model has been in place since 1999 (OECD, 2023b; van Greuningen, 2016) and was developed to inform decisions on the annual training inflow to the Dutch ministries of health and education, aiming to match the future supply and demand of medical professions. In 2010, when this study was carried out, the targeted annual intake for dentist training was 240, for oral hygienist training it was 300, and the intake for preventive assistant training was assumed to be optimal if 200 training places were filled. The committee's report recommended task reallocation from dentists to oral hygienists and preventive assistants: a shift of half of the current total dentist capacity measured in full-time equivalents (FTE) to oral hygienists and preventive assistants.

It was assumed that this shift could be achieved over a period of 20 years. The model estimated that dentist capacity would be reduced by 1.25% per year (assuming that both dental hygienists and oral preventive assistants each take over half of the shifted tasks).

Evaluation of several staff-mix scenarios

The model provided several staff-mix scenarios. First, it was estimated that the recommended oral health staff mix would be met in 20 years if student intakes remained constant, otherwise it would take more years to meet this target. This was done by comparing the available FTEs of dentists, oral hygienists and preventive assistants in 2010 with the targeted required FTEs in 2030. Second, the model used trial-and-error to explore the feasible amount of task reallocation in 2030, assuming that the annual student intake would remain constant over time. And, finally, the available dental staff mix in 2010 was compared with the targeted (or recommended) staff mix in 2030, given the current student intake and the feasible amount of task reallocation between dentists, oral hygienists and preventive assistants, as explored in the second step.

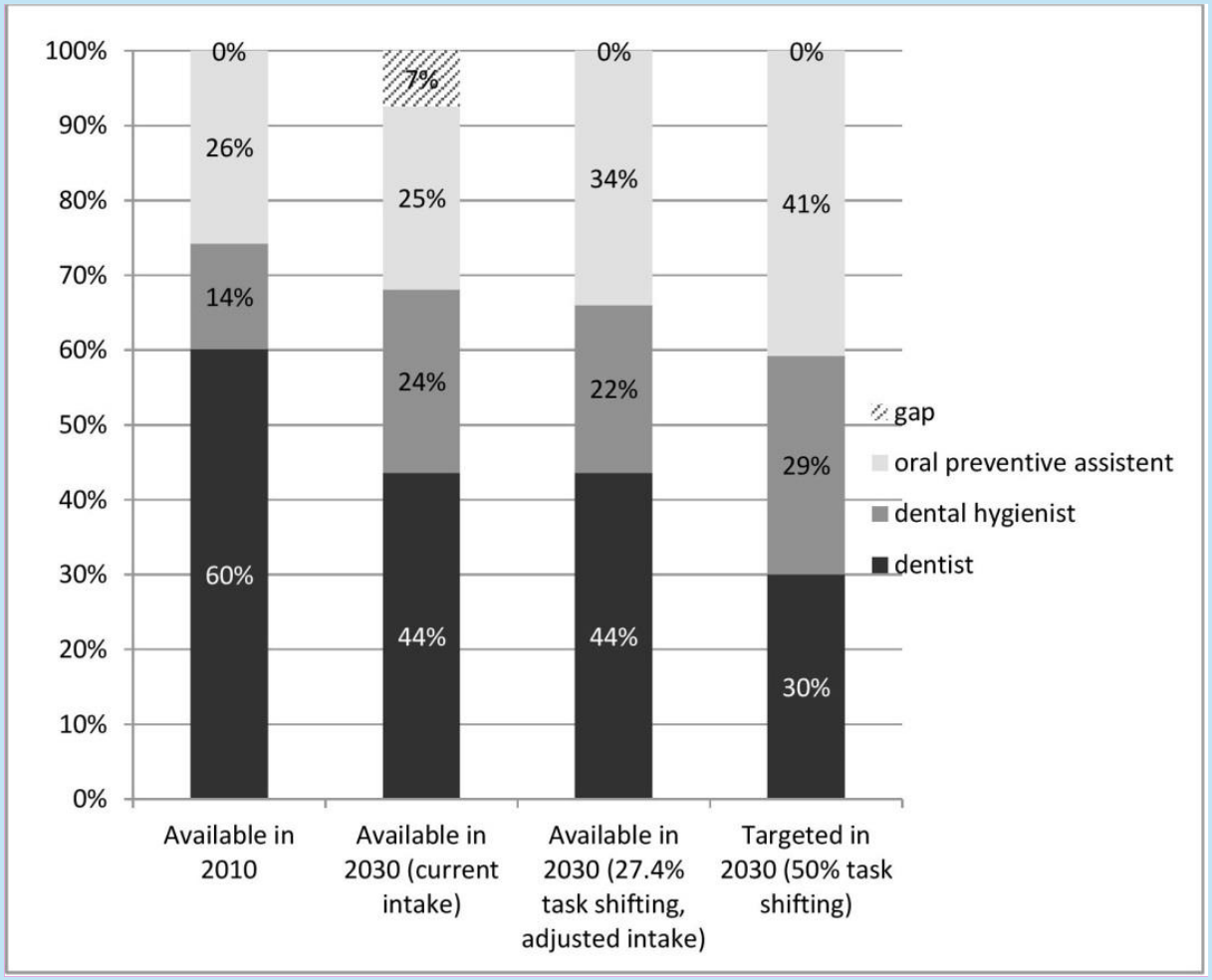
Results

The workforce projections from the study model showed that it is possible to halve the total FTE of dentists and to double the total FTE of oral hygienists, while maintaining the current annual student intake – as proposed by the recommendations of the committee. The analyses showed, however, that it will take more than 20 years to achieve this new skill mix. Otherwise, the total FTE of preventive assistants would not be achieved if their current student intake were not increased.

Fig. 2 depicts, from left to right, the staff-mix ratios of (1) the dental health workforce in 2010 as the base year; (2) the oral health workforce in 2030 without adjusting student intakes; (3) the staff mix after the most feasible level of 27.4% task reallocation has been achieved in 2030; and (4) the scenario in which the Committee's proposal

of 50% task reallocation had been implemented during 2010–2030. According to the aim of the simulations, the targeted *total* dental workforce in 2030 should be the same as in 2010. But from Fig. 2. it can be seen that the total available dental workforce in 2030 will actually be smaller, assuming that all student intakes remain constant. To meet the most feasible level of 27.4% task reallocation from dentists to dental hygienists and oral preventive assistants, and maintain the total dental workforce, the model estimated that annual student intakes for oral hygienist training and preventive assistant training would have to be adjusted (252 for dental hygienist training and 337 for oral preventive assistant training).

Fig. 2 Total available dental HCWF



Conclusion

The conclusion from this explorative simulation study was, first of all, that the recommendations of the Linschoten Committee on Innovation in Dental Healthcare would only be feasible if large adjustments were made in the annual training inflow of dentists, oral hygienists and oral preventive assistants. The required increase in oral

hygienist and preventive assistant training would require major investment, and the necessary *decrease* in the annual intake for dentist training would have substantial (adverse) consequences, such as the closure of academic dental schools. To restructure the total dental workforce and skill mix, supporting policies such as encouraging dentists to work part time or retire at an earlier age should be implemented. The simulations and workforce projections also show that the advisory committees' recommendations have significant consequences and require additional policies to oversee their long-term effects, specifically regarding the recommended task reallocation of 50% between dentists, oral hygienists and preventive assistants – which appears to be not feasible within 20 years based on the assumptions of the training inflows in the selected base year.

The analyses, therefore, address important questions about the feasibility of task reallocation, taking into account the characteristics of the dental health workforce and the inflow and outflow of dental professions. However, while the study was being conducted, several studies found that task reallocations in Dutch oral health care were not yet developing according to the expectations or targets, and predicted that task reallocation from dentists to oral hygienists is actually stagnating, with tasks mostly being shifted to preventive assistants, because their training and hiring costs are lower. Task reallocation in dental health care is therefore not merely a matter of changing skill mix or staff ratios as a redesign exercise carried out on paper.

Source: van Greuningen (2016).

A United Kingdom case study also illustrates how skill-mix innovation can be tested using workforce planning models. Unlike the Dutch example, which modelled task shifting from dentists to hygienists and preventive assistants (Box 13), the United Kingdom study by Gallagher et al. (2013) explored shifting tasks to dental therapists, simulating the optimal skill mix for dental teams. The study went further by modelling the cost-effectiveness and feasibility of the different configurations and by differentiating the types and levels of task shifting, including examination, diagnosis, prevention and routine and complex treatments (Box 14).

Box 14. Exploring the feasibility of an optimal make-up of dental teams by introducing the new role of dental therapists (United Kingdom)

Background

In their paper, Gallagher et al. (2013) explored or pre-evaluated a number of future scenarios on the optimal skill mix within dental teams for the South Central Strategic Health Authority (SHA) in the United Kingdom. The study was driven by the important changes in the need for oral health care, caused by improvements in the oral health of children and adults, together with demographic changes (i.e. older people living longer as well as retaining their natural teeth) and increasing patient expectations from a basic public health service.

Methods

The authors developed a demand/needs-informed and supply model for workforce planning, labelled Model DeSiDE (Dental Skillmix Decision Environment). The model included population demography, oral health needs and demands, the current dental workforce, activity and dental utilization as the main factors that fed into a linear programming module to obtain the optimal make-up of the dental team.

The demand side of the DeSiDE model was developed with key parameters assuming future changes in the demands, such as population, attendance, oral health trends and the proportion of treatments in three bands of care received by different age groups (0–19 years, 20–64 years, >65 years).

- Band 1: examination, diagnosis, preventive care.
- Band 2: examination, diagnosis, preventive care and routine treatment including fillings and extractions.
- Band 3: examination, diagnosis, preventive care and all treatment including complex work such as dentures, crowns and bridges.

The model projects the future dental demands in the three age and care band groups for the South Central SHA and its subregional communities (Primary Care Trust level).

The supply side of the DeSiDE model was subsequently developed to provide insights into the dental workforce needed for the projected dental demands. Assumptions were developed for several scenarios using linear programming and a method to adopt a dentist-to-therapist ratio that would optimize the dental workforce in the South Central SHA and its primary care trusts. A specific scenario was developed to estimate the potential of the dental therapist as a (relatively) new role or occupation adding to the dental workforce. In the United Kingdom, dental therapists provide clinical dentistry under the direction of a dentist and have an extended role similar to dental hygienists by carrying out direct restorations on permanent and primary teeth (including pulpotomies and extracting and placing preformed crowns on primary teeth). Dental therapists work in dental teams and are employed by independent general dental practitioners or dental services.

The key challenge of the DeSiDE model and its scenario for adding dental therapists to the dental workforce was to determine: (1) an accurate dental therapist staff level and (2) the optimal dentist-to-therapist ratio. Empirically, the ratio was 16.7 to 1 in the South Central SHA region, which was close to the ratio suggested by the General Dental Council for the national dental workforce (19 to 1).

In an initial exploratory scenario, the skill mix within the dental teams was varied by dental therapists (1) working part time or full time and (2) working within current guidelines (where dental therapists work under the direction of dentists) or working at the front end providing dental examinations. In all scenarios, dental therapists were assumed to be excluded from performing Band 3 treatments because of the complexity of this care and its treatments. In addition, it was assumed that dental therapists would only be able to handle 70% of the estimated maximum current proportion of care that they are able to provide. It was also assumed that complications in 20% of patients would be too complex for dental therapists to handle, and that 10% of the single-handed dental practices in the South Central SHA region cannot hire dental therapists.

Results

The simulation and linear programming results of the DeSiDE model showed that the largest number of dental therapists would be required to obtain the optimal workforce when dental therapists work only part time. In the optimal scenario, dental therapists work full time within the current system of delegated care. This optimal situation was indicated by the estimated cost-effectiveness of the scenario and its feasibility in terms of the number of dental therapists currently in training nationally and those working in the region.

Other future scenarios involved dental therapists undertaking their current scope of practice and working full time. The results suggested that the current staffing level of dental therapists provides between 10% and 20% of the current job competency level based on current levels of care. It was shown by the simulations that, upon increasing the level of job competency (i.e. taking over tasks within their scope of practice), there is potential for much greater development of skill mix with the use of dental therapists in primary dental care, including costs. Overall, it was observed that greater benefits can be achieved if a dental therapist is able to provide a full-time commitment to National Health Service services rather than work part time. The optimal exploratory scenario in terms of costs and volume of staff was based on dental therapists working full time and providing 70% of routine care (that is within their current job competency). This scenario required 483 dental therapists by 2013, a figure that appeared achievable.

The most promising result was that increasing the level of job competency provided by dental therapists revealed potentially greater benefits in terms of reduced costs and the need for fewer dentists. The findings by Gallagher et al. suggest that: (1) dental therapists can play a more significant role in the provision of primary dental care, both currently and in the future; and (2) there is a need for health services to routinely collect data that can inform workforce analysis and planning.

Source: Gallagher et al. (2013).

Although these case studies are limited to a specific type of (dental) health care, they demonstrate how workforce modelling can test and refine task redistribution before implementation. Both the Netherlands and the United Kingdom used simulation-based approaches to explore how changing professional roles affects capacity, cost and training needs, thereby providing evidence-based guidance for policy and education reforms.

Across sectors, the lessons are consistent:

- start with a shared service vision defining desired outcomes and team composition;
- use scenario modelling to explore who does what, to what extent and under which conditions;
- adjust education and training intakes, accordingly, ensuring the workforce pipeline supports new skill-mix realities; and
- support change iteratively, combining top-down policy direction with local experimentation.

6.2 Key implementation priorities

To translate these insights into action, countries can focus on five interconnected priorities.

1. **Establish multiprofessional planning** – mandate regular, scenario-based planning cycles that integrate health and social care, explicitly including nursing and allied and support roles of health professionals (Lee et al., 2024; Ono, Lafortune & Schoenstein, 2013).
2. **Link planning to policy levers** – ensure forecasts directly to inform education (curricula and admissions, *numerus clauses*), regulation (scope of practice, advanced roles), and funding and contracting mechanisms.
3. **Invest in data and analytic capacity** – build interoperable data systems that capture tasks and competencies, not just headcounts; develop modelling expertise for dynamic, multiprofessional forecasts.
4. **Foster learning and trust** – institutionalize national learning systems (as in Sweden) and cross-ministerial education governance (as in Norway) to support iterative adaptation and collaboration.
5. **Address workforce imbalances** – rebalance generalist and specialist roles, expand nursing and allied professions' responsibilities, and strengthen career pathways in primary and community care (Kyriopoulos et al., 2025).

7. Conclusions

Innovating HCWF planning is a whole-system endeavour that links policy, education, data and governance. Evidence from a number of countries, for example, Sweden, Norway, the Netherlands and the United Kingdom, shows that aligning strategic vision, interprofessional education and data-driven planning enables systems to manage change proactively rather than reactively.

As emphasized, the future of workforce planning lies in multiprofessional, needs-based and adaptive models that anticipate how changing technologies, service models and patient expectations reshape work itself. Embedding these approaches into policy will ensure that Europe's HCWF remains resilient, equitable and ready for the demands of tomorrow.

HCWF planning and forecasting must therefore be seen not just as a technical exercise, but rather as a strategic level supporting system transformation. With populations ageing and service demands rising, integrated workforce planning can help address both workforce shortages and funding pressures. Strengthening primary care as the core of innovative care models will be essential as will improving working conditions, particularly for nurses and GPs, to make the profession more attractive and sustainable.

Although quantitative capacity remains critical, qualitative imbalances, such as skill mismatches and uneven role recognition, are equally pressing. Future planning should focus on key professions central to innovative care, ensuring they have the broad competencies required for effective collaboration, coordination and communication.

Education reform will be pivotal. Training systems must prepare a future-proof health workforce, equipped for interdisciplinary work and continuous learning. Current HCWF planning, which largely projects the supply and demand for single professions, needs to evolve towards skill mix and team-based projections that reflect integrated service delivery. To achieve this, three enabling conditions are essential:

1. **political and stakeholder commitment** to align workforce policy with system transformation;
2. **integration of HCWF planning** as a core component of health workforce and service delivery policy; and
3. **continuous refinement and practical testing** of models to guide implementation and policy design.

Finally, future research and policy work should also pay more attention to patient and informal carer competencies, recognizing their roles in self-management and community-based care. Without adequate support for patients, carers and volunteers, innovative care models risk widening inequalities in access and outcomes.

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Part 2: Aligning health workforce forecasting and planning with changing care models: the role of integrated data, mixed methods, and professional registers

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Authors

Maria Joachim – Consultant

Eszter Kovács – Semmelweis University, Health Services Management Training Centre, Hungary

Zoltán Cserháti – Semmelweis University, Health Services Management Training Centre, Hungary

Gemma A Williams – European Observatory on Health Systems and Policies, United Kingdom

Michelle Falkenbach – European Observatory on Health Systems and Policies, Belgium

Matthias Wismar – European Observatory on Health Systems and Policies, Belgium

Editors

Gemma A. Williams, European Observatory on Health Systems and Policies

Michelle Falkenbach, European Observatory on Health Systems and Policies

Matthias Wismar, European Observatory on Health Systems and Policies

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Abbreviations

AMDS	advanced minimum data set
Co.Ge.A.P.S.	CPD Health Professions Register Consortium
EU	European Union
FTE	full-time equivalent
GDPR	General Data Protection Regulation
HEROES	HEalth woRkfOrce to meet health challEngeS (EU Joint Action)
HCWF	health and care workforce
ISTAT	Istituto Nazionale di Statistica (National Institute of Statistics) (Italy)
JA EUHWF	Joint Action on European Health Workforce Planning and Forecasting
MDS	minimum data set
NHWA	National Health Workforce Accounts
NIJZ	National Institute of Public Health (Slovenia)
OECD	Organisation for Economic Co-operation and Development
RIZIV/INAMI	Rijksinstituut voor ziekte- en invaliditeitsverzekering/Institut national d'assurance maladie-invalidité (National Institute for Health and Disability) (Belgium)
SEPEN	Support for the health workforce planning and forecasting expert network
WHO	World Health Organization

Key messages

Using planning and forecasting to respond to future health and care workforce needs is central to a health system's ability to meet the challenges of population ageing and workforce shortages. This is the second of a set of three briefs that reflect the evidence collected under the auspices of the Joint Action HEROES project. These briefs cover:

- how forecasting and planning can support innovative care models (Part 1)
- data and tools for forecasting and planning (Part 2); and
- making forecasting and planning sustainable through institutionalization (Part 3).

- **Effective planning links the care that is needed and the (workforce) capability to deliver it.** Policy-makers may plan with a normative future in mind but the range of health needs, the way they change with time and the constraints in place also require a dynamic approach.
- **Forecasting can only match supply to demand if it goes beyond counting professionals** and incorporates demographic, epidemiological and utilization data, as well as information on care organization, skill mix, productivity and working time.
- A mix of forecasting methods improves accuracy and policy relevance. Combining supply- and demand-based models with routine scenario analysis helps test alternative futures, anticipate skill-mix and capacity needs, and design better recruitment, retention and training strategies.
- Embedding health and care workforce (HCWF) forecasting and planning in institutional structures is a vital part of strong governance and encourages sustainability and impact.
- **Regular forecasting across the health, education and labour sectors is key** but forecasting cycles are only sustainable if backed by long-term, secure funding and by coordination across sectors**.**
- **Policy-makers need better data and planning methods to be able to meet future workforce needs.** Countries depend on timely, comparable HCWF data to align supply with evolving demand and to support integrated, team-based models of care.
- Countries can make forecasts more reliable and useful by closing key data gaps and ensuring data integration. There is an urgent need to improve the measurement of full-time equivalents, inflow, outflow and migration; to include nursing and allied professions in the data; and to harmonize definitions.
- Enriching planning with qualitative insights **supports better planning and more adaptive care models.** Qualitative data can reveal integrated insights on contextual factors affecting HCWF forecasting and planning. The HEROES Advanced Minimum Data Set

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includes a quantitative dataset that focuses on the main drivers of change and a qualitative set for care organization, HCWF health indicators and the labour market.

- Interoperable health professional registers with a clear legal basis underpin workforce intelligence. Effective registers that integrate data from education, licensing and employment systems are essential if countries are to forecast better at the national and regional levels. Implementation requires policy support; enabling legislation; appropriate technical and IT expertise; stakeholder participation and collaboration.

Executive summary

Health and care workforce planning is central to the capacity of health systems to deliver accessible, high-quality and integrated care. Building on the system transformation perspective set out in Part 1, and taking into considerations the governance focus of Part 3, this brief emphasizes that workforce planning must be explicitly linked to population health needs, evolving models of care and the competencies required to deliver them. Planning for a normative future remains important, but demographic change, epidemiological transitions, technological developments and fiscal and labour market constraints demand a dynamic and adaptive approach.

Traditional workforce planning approaches based primarily on headcounts and historical trends are no longer sufficient

Effective planning must move beyond counting professionals to incorporate demographic, epidemiological and service utilization data, alongside information on skill mix, productivity, working time and evolving scopes of practice. Integrating supply and demand-side perspectives allows countries to better anticipate future needs and align workforce capacity with changing care delivery models, including integrated, team-based and multidisciplinary care. Further improvements and harmonisation of health workforce (HWF) data through the Joint Questionnaire of Eurostat, WHO and OECD can support more evidence-based planning and policy development. In addition, the establishment of the European Health Data Space (EHDS) offers an opportunity to better contextualize health workforce planning within a data-rich environment, enabling a more comprehensive understanding of evolving healthcare needs and service demand.

Using a mix of forecasting methods improves accuracy and policy relevance

Evidence from EU-funded initiatives shows that combining multiple forecasting and planning methods improves both accuracy and policy relevance. While many countries plan against a normative vision of future care, the use of mixed methods, bringing together supply-based, demand-based and needs-based models, supported by routine scenario analysis, helps test alternative futures, anticipate skill-mix and capacity requirements, and design more robust recruitment, retention and training strategies.

Reliable planning depends on access to timely, comprehensive and comparable data

While many EU Member States have strengthened quantitative data availability over the past decade, significant gaps persist – particularly in measuring full-time equivalents, workforce inflow and outflow, and mobility, and in capturing data on nursing and allied health professions. Fragmented data sources, inconsistent definitions and limited integration across education, regulatory and employment systems continue to constrain forecasting accuracy and scenario modelling.

Quantitative data alone are not sufficient

Enriching planning with qualitative insights helps capture contextual factors affecting workforce behaviour, care delivery and labour market dynamics, supporting more realistic and adaptive planning. The HEROES Advanced Minimum Data Set (AMDS) was introduced to complement core quantitative indicators with a structured qualitative dataset. The qualitative component captures key drivers of change in the HCWF, including care organization, workforce health and well-being and labour market conditions. By integrating these dimensions, the AMDS supports more resilient and adaptive workforce planning that is better aligned with evolving care models.

Interoperable health professional registers with a clear legal basis provide a cornerstone of workforce intelligence

When interoperable, and supported by a clear legal and governance framework, registers can integrate data from education, licensing and employment systems, improve data completeness and accuracy, and enable more granular national and regional forecasting. Realizing this potential requires sustained policy support, including appropriate legislation, technical and analytical capacity, investment in IT infrastructure and active engagement of professional stakeholders.

Overall, strengthening HCWF planning in Europe requires simultaneous investment in better data, more sophisticated methods and stronger governance arrangements. Health professional registers and enriched minimum datasets such as the AMDS provide a practical foundation for aligning workforce capacity with future health system needs and for supporting the transition towards more integrated, people-centred models of care.

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1. Introduction

Health systems in Europe are in the midst of an ongoing, multifaceted health and care workforce (HCWF) crisis (Azzopardi-Muscat, Zapata & Kluge, 2023). European Union (EU) Member States and other European countries face simultaneous challenges with the HCWF, including persistent shortages, an ageing workforce, skill and geographical imbalances, and suboptimal working conditions, which leave workers feeling under-valued, exacerbate burnout and hinder HCWF recruitment and retention. As such, understanding recruitment and attrition trends has become an urgent HCWF policy priority (OECD & European Commission, 2024; WHO Regional Office for Europe, 2022; Zapata et al., 2023).

These workforce challenges, combined with an ageing population and the growing burden of noncommunicable diseases and multimorbidity, necessitate new approaches to care and service delivery. As highlighted in Policy brief 1: Implementing innovative care models in European countries: what are the implications for health and care workforce planning and training?, integrated, multidisciplinary and team-based service delivery models are increasingly required to address these evolving needs (Box 1). Implementing these changing care models requires countries to have adequate health planning and forecasting models that can anticipate who will be needed (by profession and specialty), where they will be needed, what skills and scopes of practice they will require, and how productivity and work patterns may evolve.

Box 1. Implementing innovative care models in European countries: what are the implications for health and care workforce planning and training?

The service delivery models proposed in Policy brief 1 support early detection and treatment of major noncommunicable diseases, and are also designed to reflect the needs of an ageing population with multiple and complex chronic and long-term care needs. As such, as health systems experience a shift towards integrated, team-based and community-based care, with primary care playing a central role across the different models, supporting continuity and coordination of care. To accommodate the adoption of new service delivery models, Policy brief 1 proposes two HCWF planning directions.

The **first direction** aims to explore how policies can support and shape generic HCWF skills and competencies such as interprofessional and multidisciplinary collaboration, coordination and teamwork. It is proposed that this can be accomplished through supporting opportunities for interprofessional and multidisciplinary education and training. This could also be accomplished through HCWF roles in consultation and joint care coordination.

The **second direction** proposes supporting collaboration and role adaptation through interprofessional skill mixes and task shifting to accommodate necessary team composition needs. This involves HCWF planning that goes beyond the number of HCWF professionals a Member State needs or should train, to exploring what would be the best mix of HCWF professionals for the specific needs of emerging models of care. Emerging HCWF roles and skill mixes for changing models of care could encompass advanced practice, dedicated prevention, care coordination and patient and caregiver empowerment, as well as the potential relocation of services.

Sources: Maier et al. (2022); Winkelmann (2022).

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Over the past 15 years, various initiatives funded by the EU (Box 2) have supported Member States with establishing and developing their national HCWF forecasting and planning. Although Member States have started from different points in their HCWF forecasting and planning approaches, they have also varied in their HCWF forecasting and planning development, depending on their local policy context, capacity and governance, as well as their learning partnerships with other countries (Batenburg, 2015). Governance is discussed further in Policy brief 3, Moving towards a resilient health care workforce: how to institutionalize health and care workforce planning and forecasting.

Box 2. A sample of EU co-funded initiatives supporting health workforce planning

- Joint Action HEalth woRkfOrce to meet health challEngeS (HEROES); 2023–2026
- Blueprint Alliance for a future health workforce strategy on digital and green skills (BeWell); 2022–2026
- Promoting evidence-based reforms on medical deserts (OASES); 2021–2024
- Empowering EU health policies on Task Shifting (TaSHI); 2021–2024
- Action for Health and Equity: Addressing Medical Deserts (AHEAD); 2021–2023
- Support for the health workforce planning and forecasting expert network (SEPEN); 2018–2021
- Joint Action on European Health Workforce Planning and Forecasting (JA EUHWF); 2013–2016
- A Roadmap Out of medical deserts into supportive Health WorkForce initiatives and policies (Route-HWF); 2021–2024
- Mental Health: Focused on Retention of Healthcare Workers (METEOR); 2021–2024

Sources: Maier et al. (2022); Winkelmann (2022).

However, although methodological capacity has improved in many settings, planning efforts frequently remain constrained by a lack of comprehensive, timely and standardized information on the stock, flow and characteristics of health professionals that does not fully capture the diversity of health professions, emerging roles or patterns of mobility within and across Member States. Fragmented data sources, inconsistent definitions and limited linkages between education, employment and regulatory datasets hinder the ability to model future needs accurately. These limitations hinder countries' abilities to forecast future needs, model alternative scenarios or align training capacity with evolving service demands.

Health professional registers represent a potentially powerful but underused resource to improve data availability and quality for HCWF planning. When well-designed and integrated into broader workforce intelligence systems, registers can improve data completeness,

enhance accuracy and support more dynamic monitoring of workforce trends. However, their use varies widely across Europe, and implementation raises important considerations related to governance, data protection, interoperability and administrative burden.

1.1 Purpose and structure

This policy brief examines how HCWF planning and forecasting can be strengthened in Europe, with a particular focus on improving methods and availability and quality of HCWF data. Drawing on European experiences and existing evidence (Box 3), the brief aims to support policy-makers, planners and regulators in improving the evidence base for workforce decision-making. The following sections explore five key areas:

- **methods of HCWF planning**, reviewing current approaches, their strengths and limitations and the shift towards more sophisticated, needs-based and scenario-driven models.
- **EU-level initiatives to support HCWF planning**, outlining the main instruments, collaborations and policy frameworks that have shaped European action to date.
- **data requirements and gaps**, identifying the core datasets needed for effective planning, the challenges countries face in obtaining them and the opportunities for harmonization.
- **the role of health professional registers**, analysing how registers can contribute to more complete, accurate and timely workforce data and what conditions enable their effective use.
- **implementation considerations**, discussing governance and the technical, legal and operational factors that countries must address when strengthening or expanding professional registers.

The brief concludes by outlining priorities and options for strengthening HCWF planning in Europe and identifies areas for future action. By synthesizing evidence and experiences from across Europe, the brief aims to provide practical insights for policy-makers seeking to build more resilient and future-ready workforce planning systems. Strengthening the foundations of workforce intelligence is essential not only for addressing current shortages but also for preparing health systems for the transformations ahead, including accelerated digitalization, implementation of new care models to evolving patient expectations and cross-border patient mobility. This policy brief should be read in conjunction with the other two briefs in this series,[6] which together address complementary dimensions of HCWF planning and system transformation in Europe.

[6] Part 1: Implementing innovative care models in European countries: what are the implications for health and care workforce planning and training?; Part 3: Moving towards a resilient health care workforce: how to institutionalize health and care workforce planning and forecasting.

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Box 3. Methods in brief

This policy brief draws on outputs produced as part of the HEROES JA, as well as evidence from peer-reviewed and grey literature, including reports from the Organisation for Economic Co-operation and Development (OECD) and the World Health Organization (WHO), from and across EU-funded HCWF initiatives including JA EUHWFand SEPEN). Additionally, it integrates data synthesized from presentations delivered by HCWF professionals. Information for the country case studies was provided by country experts and synthesized by the authors for the purposes of this brief.

2. What types of methods are used for HCWF planning?

HCWF planning relies on a range of methodological approaches that help countries anticipate future staffing needs and align workforce supply with population demand. These methods vary in complexity – from simple supply-based projections to more sophisticated demand- and needs-based models that incorporate demographic change, disease patterns, service delivery reforms and labour-market dynamics. Understanding the strengths and limitations of these approaches is essential for designing planning systems that can respond to evolving health system priorities.

2.1 Supply, demand and methods for HCWF forecasting and planning

Literature and practice differentiate between various forecasting and planning approaches, all of which consider two main factors: the supply and demand of health and care workers (Ansah et al., 2017; Batenburg, 2015; Kroezen, Van Hoegaerden & Batenburg, 2018; Lee et al., 2024; Lopes, Almeida Á & Almada-Lobo, 2015; Ono, Lafortune & Schoenstein, 2013; Parzonka, Ndayishimiye & Domagała, 2023; Rees, Willis & Scotter, 2025; SEPEN et al., 2021; Sutton et al., 2023; WHO, 2010; WHO, 2022). Supply and demand are composed of different dimensions that need to be included in forecasting and planning.

2.1.1 Supply: understanding who can actually deliver care – now and in the future

The current and future HCWF supply is determined by three factors: the activity of health workers engaged in health care related activities (stock), incoming health workers (inflow) and the exit of health workers from health care related activities (outflow) (Fig. 1).

Each of these three supply categories are considered as subdimensions to be used in HCWF forecasting methods: the existing **stock** of health professionals can be determined by the number of health workers in the HCWF and their productive working hours. **Inflow** of health professionals is determined by the number of newly graduated or newly licensed health professionals, returning health workers after temporary exits from the health sector, immigrant health workers and workers joining from other sectors. **Outflow** takes into consideration health worker retirement and exits to other areas of the labour market, or exits for other reasons (temporary or permanent), and emigration (Kroezen, Van Hoegaerden & Batenburg, 2018; OECD, 2016; OECD & European Commission, 2024; Ono, Lafortune & Schoenstein, 2013; SEPEN et al., 2021).

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2.1.2 Demand: understanding what care is needed

In addition to the dimensions of stock, inflow and outflow for estimating HCWF supply, different demand dimensions need to be incorporated to understand whether HCWF supply meets population needs (Fig. 1). The HCWF demand "reflects the capacity and willingness to pay (of government, the private sector or international actors) for the purchase of health care, which in turn drives the demand for employing health workers in public or private hospitals, health centres, and other parts of the health system, including self-employed health workers" (WHO, 2022). The current and future demand for health workers is affected by multiple system and population drivers, including the following drivers.

- Demographic data are used to describe a population's size and age structure, by sex. The size and structure of a population are directly affected by changes in birth rates, death rates and migration.
- Epidemiological data are used to determine the incidence and prevalence of disease in a population. Epidemiological data is the key driver for health service utilization or health service needs.
- Health service utilization refers to the actual use of health services by individuals or populations. It is determined by how different groups in the population use health care services. Health service utilization may be broken down by age and sex, by health facility (primary care, tertiary care, long-term care), by disease or by socioeconomic group.
- Health care consumption reflects the total amount of health care resources consumed by an individual or population, in monetary, volume or resource-use terms. It moves beyond utilization to consider the economic consumption of health care goods and services, the services used and their intensity and cost.
- Health care needs consider population health needs. These extend beyond health service utilization to consider suboptimal health service utilization and the existence of health needs that might not be met because of individual, cultural, socioeconomic or institutional barriers, or unwillingness to pay for services not covered by the basket of care provided by the government.
- Health service delivery is organized differently at the national, subnational and organizational levels. Health service delivery is also organized differently across primary care, tertiary care or long-term care. The responsibilities of different HCWF professionals may also differ under different delivery models, considering skill-mix, task shifting, multidisciplinary and team-based service delivery models. Technical instruments such as the Workforce Indicators of Staffing Needs (WISN) are applied in health facilities across different countries and can serve as a basis for HCWF planning. WISN determines the number of workers of each HCWF cadre that are required to meet the demands of a particular facility and their workload pressure, allowing the estimation of actual and optimal staffing requirements, HCWF projections and task sharing (WHO, 2023b).

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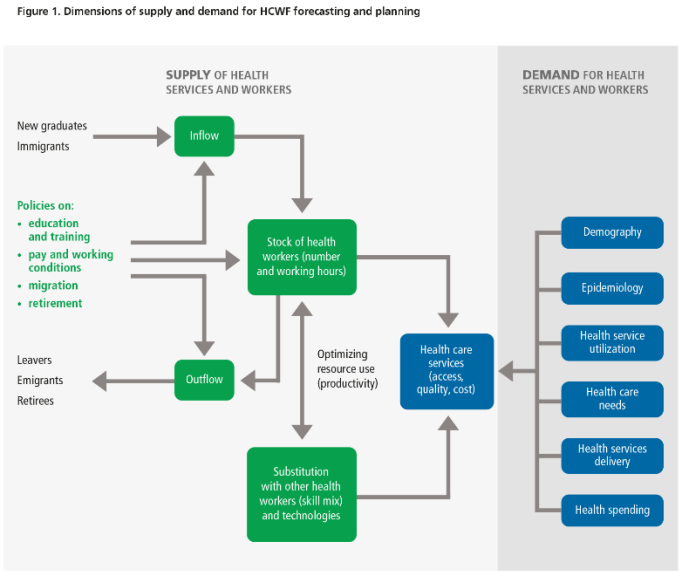
- Health spending reflects the country's investment in health services, and implicitly defines which health needs are addressed through public financing and which are left to individual private financing and willingness to pay. In many EU countries, there is a balance between the basket of care financed by the government and the services patients may purchase privately. In the context of this brief, health spending primarily refers to public investments and spending for health services. National investments in health coverage through insurance benefit packages decreases out-of-pocket payments and allows for higher health service utilization (Fig. 1) (Kroezen, Van Hoegaerden & Batenburg, 2018; OECD, 2016; OECD & European Commission, 2024; Ono, Lafortune & Schoenstein, 2013; WHO, 2022; WHO, 2023a).

While HCWF analyses in the past have mostly focused on supply and overlooked demand, considering demand is essential to understanding how supply and demand interact and shape overall workforce needs. For example, policies that only expand supply to address shortages may fail if demand-side factors are not also addressed (WHO, 2022). This is particularly important as new models of care require both filling current HCWF shortages by expanding and retaining the HCWF and redesigning roles and competencies to respond to the new models of health service delivery. See Part 1 for further details.

Fig. 1. Dimensions of supply and demand for HCWF forecasting and planning.



Source: Adapted from OECD & European Commission (2024).

2.2 Methods used for HCWF forecasting and planning

Forecasting models are used to estimate HCWF supply, demand, and the likely supply–demand gap, using a combination of the dimensions of supply and demand explained in section 2.1. Forecasting and planning methodologies involve supply-side and demand-side analyses, and policy-demand driven methods (Table 1).

***Supply-side analysis*:** Many studies report stock-and-flow as a supply-side analysis. Stock-and-flow approaches estimate workforce requirements based on tracking HCWF supply dimensions, including stock, inflow and outflow indicators (size, working hours, education, migration, attrition). The stock-and-flow model is commonly used as it is straightforward to calculate from supply data. The stock-and-flow model does not consider the HCWF age distribution, health service utilization, health needs or dynamic system changes in health service delivery.

Demand-side analysis: Following the dimensions of demand above, the demand side can be estimated in different ways. First, the simplest supply-side analysis is the population-to-provider model which uses HCWF supply and demographic data. Similar to the stock-and-flow models, population-to-provider models are easy to calculate from supply and demographic data, however, they do not account for health service utilization, health needs or dynamic system changes in health service delivery.

Demand-based approaches include utilization models which depend on health service utilization patterns. While utilization models depend on actual service utilization patterns, they may not capture unmet needs or shifts in health service delivery which may cause changes in future health service utilization rates. For example, changing national investments in health coverage through better health insurance benefit packages allows for higher health service utilization as it removes the out-of-pocket expenditure barrier.

Demand-based models also tend to be needs-based; that is, they estimate workforce requirements based on population health needs, often using demographic and epidemiological data in the population. Although these are more comprehensive, they require high-quality and granular data which is often lacking, mostly at the regional level. In addition to population-to-provider, utilization and needs-based models, some models try to estimate future HCWF demand by modelling the organization of health service delivery. These models include skill-mix models. Furthermore, some models include health spending as a HCWF demand-based driver.

Policy-driven demand methods: In addition to the linear, forward-looking forecasting methods that project future developments based on current trends, HCWF planning experts increasingly recommend incorporating normative futures methods. These approaches start by defining the desired future HCWF a country needs and then involve stakeholders in working backwards (normative backcasting) to identify the steps needed to reach that goal. Backcasting has the potential to strengthen stakeholder engagement and improve HCWF planning, ownership and governance through setting clearer milestones, responsibilities and monitoring mechanisms to track progress (Rees, Willis & Scotter, 2025).

Table 1. Strengths and limitations of HCWF forecasting models

	Model	Strength	Limitation
Supply-side analysis	Stock-and-flow model	• Simplicity	• Oversimplified
Demand-side analysis	Population-to-provider model	• Simplicity	• Oversimplified • Disregards skills and productivity
	Utilization-based model	• Considers demographic changes	• Data-dependent

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		(e.g. population ageing)	• Disregards unmet needs
	Needs-based model	• Considers changes in health needs/disease prevalence	• Data-dependent • Does not account for team-based care • Disregards patient preferences or societal benefits
	Skill-mixed model	• Considers team-based care (horizontal and vertical substitution)	• Data-dependent • Disregards patient preferences
Policy-driven demand models	Backcasting	• Strengthens governance through milestones and monitoring • Improves stakeholder engagement and ownership	• Can be time-consuming • Requires specialized skills • Requires strong governance structures

Sources: Lee et al. (2024); Rees, Willis & Scotter (2025).

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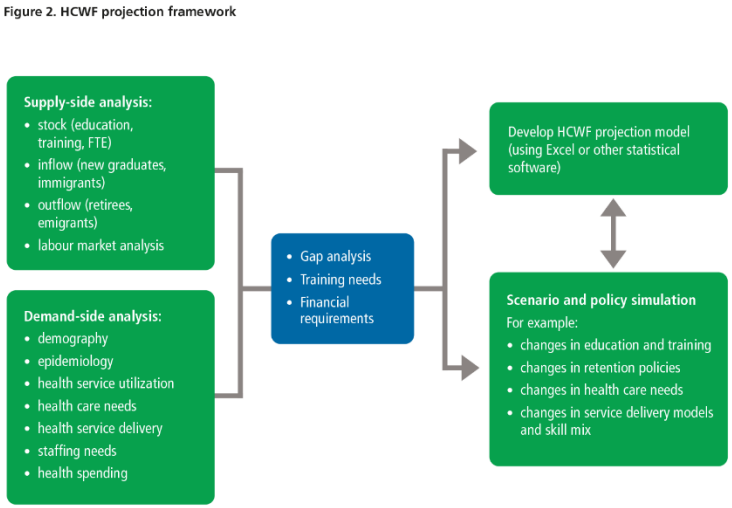
Fig. 2. HCWF projection framework



FTE: full-time equivalent; HCWF health and care workforce.

Source: Adapted from Lee et al. (2024).

Both literature and practice show that forecasting models used across country contexts integrate supply and demand dimensions. A systematic literature review of HCWF forecasting models from 2010–2023 (Lee et al., 2024) identified HCWF projection models, including: stock-and-flow models (n = 40), needs-based models (n = 25), utilization models (n = 10), population-to-provider ratio models (n = 7), skill-mix models (n = 5), and budgetary models (n = 5). Many of the identified studies integrate more than one model in their approach. In addition, the literature highlights the prevalent use of scenario analysis in HCWF forecasting and planning. For example, in the same systematic literature review, about 80% of the studies were reported as having used scenario analysis. Scenario analysis involves changing one or more model parameters and observing changes in the model output. Some common parameter changes include increases in HCWF training; changes in working hours and productivity levels; policy interventions that affect HCWF participation, attrition or retention; alternative care delivery models; changes in population size, levels of health insurance coverage, and immigration (Fig. 2) (Ansah et al., 2017; Batenburg, 2015; Kroezen, Van Hoegaerden & Batenburg, 2018; Lee et al., 2024; Lopes,

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Almeida Á & Almada-Lobo, 2015; Ono, Lafortune & Schoenstein, 2013; Parzonka, Ndayishimiye & Domagała, 2023; Rees, Willis & Scotter, 2025; SEPEN et al., 2021; Sutton et al., 2023; WHO, 2010; WHO, 2022).

Box 4. Forecasting and planning models in Joint Action HEROES participating countries

At the beginning of the Joint Action HEROES in 2023, a survey held among all 19 participating countries indicated the level of HCWF forecasting and planning that was in place at the time. Table 2 shows the level of development of HCWF forecasting and planning arrangements in participating countries, based on the scale developed by Batenburg (2015).

Table 2. Level of development of HCWF forecasting and planning arrangements in participating countries, 2023

Forecasting/planning model maturity level	Countries
Level 1: No specific model in place or use, but some monitoring projects and HCWF policy support processes are in place	Croatia, Czechia, Estonia, Greece, Hungary, Malta, Romania
Level 2: A specific HCWF model is in place that only monitors and projects the workforce supply side	Spain, Sweden
Level 3: A specific HCWF model is in place that both monitors and projects the supply of the workforce and its demand based on demographic factors only (demand-based planning)	Germany, Italy, Lithuania, Norway, Poland, Portugal, Slovakia, Slovenia
Level 4: A specific HCWF model is in place that both monitors and projects the supply side of the workforce and its demand in terms of demographic and nondemographic factors (needs-based planning model)	Belgium, Netherlands[7]

Contributed by: Ronald Batenburg.

HCWF supply and demand policy implications

- Workforce planning must reflect both supply dynamics (stock, inflow, outflow) and demand drivers (population utilization, needs, service-delivery changes).
- Countries using only supply-based methods risk underestimating future HCWF needs.

[7] Note that Netherlands (Kingdom of the) comprises six overseas countries and territories and the European mainland area. As data for this Report refer only to the European territory, the Report refers to it as the Netherlands throughout.

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- Hybrid approaches, including backcasting, offer more reliable HCWF planning.

What policy-makers could do now

- Require national planning to include both supply and demand elements.
- Invest in improving supply and demand data, particularly on epidemiologic trends, service utilization and health needs.
- Use multiple models and compare results to reduce uncertainty.

3. What data is needed for HCWF planning?

Effective HCWF planning depends on access to timely, comprehensive and high-quality data that capture not only the size of the workforce, but also its composition, distribution and patterns of participation. Planners require information across the workforce lifecycle, including education and training pipelines, labour market participation, mobility and retirement. Without consistent and comparable data on where health professionals work, how much they work and the roles they perform, HCWF planning risks relying on incomplete or misleading signals.

3.1 Minimum data sets for forecasting and planning in EU Member States

The JA EUHWF aimed to support EU Member States by establishing a minimum data set (MDS) for forecasting and planning. An MDS contains the necessary and sufficient (minimum) data to create the key planning indicators and consists of a core set of standard variables used to build indicators which are generally collected at a national level. While the MDS framework was intended to provide Member States with a minimum set of data for forecasting and planning within their national boundaries, it was also meant to allow easier forecasting and planning dialogue, learning and comparisons across Member States based on a set of comparable MDSs. The MDS considered dimensions of supply, including domestic and foreign labour force, training, retirement, migration and emigration. The MDS also considered dimensions of demand, including population and health consumption (JA EUHWF, 2014; Kovács et al., 2017). Building on this minimum quantitative foundation, the evolution from the MDS to the advanced minimum data set (AMDS) under the Joint Action Heroes, integrating structured qualitative domains alongside core indicators, is outlined in Box 6 and summarized in Table 2.

3.2 Complementary use of qualitative data

In addition to promoting the MDS, the JA EUHWF has promoted the collection and use of qualitative data for more integrated and in-depth insights into HCWF forecasting and planning (Fellows & Edwards, 2014). The JA EUHWF highlighted that qualitative approaches

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strengthen HCWF planning by capturing dimensions of workforce dynamics, system performance and policy impact that cannot be fully understood through numerical indicators alone.

Relying solely on demographic and numeric projections fails to account for the dynamic evolution of health systems. To ensure long-term resilience, planning must move beyond static counting to a multifaceted approach that incorporates in-depth interpretation of quantitative indicators. Qualitative evidence is essential to moving beyond basic data collection towards strategic utility. Qualitative insights provide the clarity required to navigate complex strategic directions and helps to look behind aggregated data. Planners can determine why specific interventions succeed or fail, providing insights about implicit workforce realities that numerical data alone cannot generate.

In summary, while quantitative data describe the size, distribution and trends of the workforce, qualitative data reveal the underlying mechanisms, motivations, perceptions and contextual factors shaping those trends. When systematically integrated with quantitative approaches, qualitative data enhance the relevance, feasibility and sustainability of HCWF policies and contribute to more resilient, responsive, and people-centred health systems (Bell, Bryman & Harley, 2019; Fellows & Edwards, 2014; Gerring, 2017; Moriarty, 2011; Pope, Ziebland & Mays, 2000).

Qualitative data can be generated through a continuum of methods that complement traditional forecasting approaches based on historical supply and demand. These include stakeholder analysis, literature reviews, interviews, surveys and focus groups, scenario planning and Delphi studies. Together, these methods support the estimation of future supply and demand parameters under different assumptions and policy choices, and they help embed workforce planning within broader health system transformation processes.

EU Member States have been encouraged to use qualitative methods as they are relevant for their individual HCWF and institutional contexts without ranking them by importance (Benahmed, Lefèvre & Stordeur, 2023; Fellows & Edwards, 2014; Kovács et al., 2017; Malgieri, Michelutti & Van Hoegaerden, 2015; Parzonka, Ndayishimiye & Domagała, 2023; Sutton et al., 2023; WHO, 2023a). For example, Belgium has adopted the Delphi approach and scenario planning and further plans to obtain and combine more quantitative and qualitative data about the activity of health professionals, including the evolution of their careers, their well-being, motivation, burnout, and their intentions for career changes (Box 5), while the Netherlands is considering policy scenarios into the HCWF system with new demand data, planning for accessible, affordable and sustainable health care which goes beyond planning to solve the gap between demand and supply (Cserháti et al., 2025).

Box 5. Advanced data infrastructure and scenario-based planning in Belgium

Planning the health care professional workforce in Belgium is essential to ensuring that the supply and demand for care remain aligned, preventing shortages and anticipating surpluses. The Federal Planning Commission, established in 1996, brings together representatives from universities, mutual health funds, professional organizations, ministries, communities and the National Institute for Health and Disability Insurance (RIZIV/INAMI), and is supported by the institute's planning unit.

Because of Belgium's institutional structure, two community-level planning commissions representing the Flemish and French-speaking Communities have existed since 2021. An inter-cabinet working group for HCWF planning has been established to strengthen collaboration in policy-making and to ensure coherent strategies for the entire country. Introduction of a convergent policy at every level of government, data exchange and transparency are key pillars currently being developed.
A key ongoing project is the establishment of a practice registry (*Portail ProSanté – ProGezondheid*). This is a portal for all health care professionals which, based on the Only Once Principle, will enable the monitoring of professionals at federal level and provide direct access to activity data for all health care professionals. This will allow for more accurate mapping of the geographical distribution of the workforce and determining the activity of health professionals.

Facilitators for implementing the practice register include:

- legislation enabling access to necessary data;
- coordination and willingness to create a single-entry point with the National Institute for Health and Disability Insurance and the Federal Public Service of Health;
- standardized data collection through mandatory registration;
- integration with reimbursement systems, ensuring data completeness; and
- growing policy demand for evidence-based workforce planning due to demographic pressures.

The barriers encountered include:

- initial reluctance from some practitioners due to the administrative burden;
- technical challenges in harmonizing indicators and data from multiple sources; and
- ensuring consistent access, quality, accuracy and completeness across professions.

The HCWF practice registry informs the supply side of the stock-and-flow model. Demand estimates have been primarily based on demographic evolutions and current care usage, and they are currently being optimized to also include epidemiological trends, sociocultural developments, unmet care needs and changes in care organization.

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Through the JA EUHWF project (2013–2016), Belgium piloted the use of qualitative data, including the Delphi method and scenario planning, to enhance forecasting and planning for general practitioners. Tools developed during the Delphi study have been incorporated into Belgium's planning process. While planning initially focused on doctors and dentists, it now covers a growing number of professions. Future scenarios have already been developed for doctors, dentists, nurses, midwives, physiotherapists and speech therapists. Attention is also given to incorporating technological developments and interdisciplinary care (skill mix) into planning tools, with a pilot already implemented for dentistry.

Contributed by: Peter Jouk.

Box 6. From MSD to AMDS, integrating qualitative dimensions into HCWF planning

Building on the MDS, which was developed under the JA EUHWF, the Joint Action HEROES created an AMDS, which complements the existing quantitative indicators with a structured qualitative data component (Table 3). The AMDS reflects the growing recognition that HCWF planning must account for high-level drivers of change in contemporary labour markets and care delivery models, factors that are often difficult to quantify but have substantial impact on workforce supply, demand and performance.

The HEROES AMDS incorporates quantitative data into three main categories (Table 3). These categories capture:

- care organization, including teamwork, task shifting, and digital transformation;
- HCWF health and well-being, including mortality, morbidity, mental health and equity; and
- labour market and system-level conditions, including financial investment, productivity and performance.

Integrating these qualitative domains with quantitative indicators enables more dynamic and resilient HCWF planning. It supports scenario building that reflects changes in service-delivery models, evolving professional roles and working conditions, rather than relying solely on static, occupation-based projections. Care organization data are particularly relevant for planning workforce needs in integrated and multidisciplinary care models (see Part 1). Without systematic data on task shifting, skill mixes and new professional roles, planning remains anchored in traditional occupation-based models rather than reflecting how care is actually delivered. An evaluation of the quantitative and qualitative domains in the MDS/AMDS can be found in boxes 8 and 9.

Table 3. Quantitative and qualitative domains in the MDS/AMDS in Joint Action HEROES countries

Quantitative data set

	Supply side	Demand side

	Labour force	Training	Retirement	Outflow migration	Inflow migration	Population	Health consumption
Profession	X	X	X	X	X		
Age	X	X	X	X		X	X
Head count			X	X		X	X
Full-time equivalent	X						
Geographical area	X	X	X	X		X	X
Specialization	X	X	X	X			
Country of first qualification	X	X	X	X			
Gender	X						
Qualitative data set							
							Care organization
Teamwork							X
Task shifting and skill mix							X
Reconfiguring health services, including digital							X
							Health indicators
Mortality and morbidity of HCWF							X
Mental health and well-being of HCWF							X
HCWF equity							X
							Labour market
Financial investment, economical background							X
Performance and productivity							X
Governance							X

HCWF: health and care workforce.

Sources: Eszter Kovacs, Anna Kozak and Zoltán Cserhati.

MDS policy implications

- Many countries still lack essential data needed for HCWF planning.
- The MDS provides a starting point: a simple, harmonized framework that countries can achieve.

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What policy-makers could do now

- Establish plans for implementing the MDS as a basic guideline.
- Mandate annual collection of the MDS across all regulated professions.
- Build an interoperable central data warehouse or platform.

AMDS policy implications (for countries with an existing MDS)

- The AMDS provides more detailed data to address complex HCWF aspects including care organization, mental health and well-being and financial investments in HCWF.

What policy-makers could do now

- Continuously improve quantitative and qualitative data for HCWF planning.
- Expand data collection to include qualitative methods for more comprehensive data collection and planning defined by the AMDS.

4. What are the sources, availability and quality of data for HCWF planning in the EU?

HCWF forecasting and planning in EU Member States relies on a combination of national and international data sources that vary in coverage, quality and degree of integration. These sources provide information on workforce supply and demand, but their usefulness for planning depends on data completeness, comparability, timeliness and analytical use. As outlined in section 3, data requirements extend beyond basic headcounts to include information on workforce flows, working patterns, service needs and changing care models.

Across the EU, Member States are at different stages of maturity in developing workforce data systems. While significant gaps in data availability and quality remain, countries are increasingly working to strengthen data infrastructures, ranging from defining core datasets for planning to implementing more advanced approaches that support multiprofessional planning, skill-mix analysis and scenario-based models.

This section explores some of the data sources and assesses the availability and quality of data for forecasting and planning, drawing from the experience of EU Member States. While gaps in data availability and quality remain, this section will also discuss how EU Member States are working to improve HCWF data, with efforts varying from initial efforts in defining a dataset for planning to more advanced approaches such as expanding data collection on multiprofessional planning and skill mix, according to Member State HCWF planning maturity.

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4.1 National supply-side data sources[8]

At the national level, supply-side data for HCWF planning are typically drawn from multiple administrative and statistical sources, including:

- professional HCWF registers of regulatory bodies and professional associations;
- population registers;
- labour market or employment registers;
- labour market surveys;
- administrative and payroll databases;
- health insurance and reimbursement systems;
- education and training institution databases; and
- national statistics databases and surveys.

These sources vary in coverage, update frequency and level of detail. Countries with more mature planning systems increasingly seek to link multiple datasets to improve completeness, granularity and consistency. For example, in Belgium, data sources for HCWF forecasting and planning include the professional HCWF register (*Portail ProSanté – ProGezondheid*), the health insurance and disability institute (RIZIV/INAMI), and the Federal Public Service of Health (Box 5). In Italy, data sources include its Health Professional Register, labour registers, registers of public, private and non-profit institutions, the Ministry of Higher Education and Research, the CPD Health Professions Register Consortium (Co.Ge.A.P.S.) and ISTAT (National Institute of Statistics) (Box 11).

4.2 International data sources

International data sources that collate and harmonize national data provide an essential foundation for benchmarking, cross-country comparison and understanding of broader labour market dynamics. These sources help situate national workforce challenges within a European context and support mutual learning across countries (Box 7).

Box 7. International data sources for HCWF planning

International data sources offer comparable indicators, support benchmarking and help countries understand broader labour-market dynamics that shape national workforce needs. They help planners situate national challenges within a wider European context, identify emerging risks and draw lessons from countries facing similar pressures. Three major sources underpin this international evidence base: Eurostat, the OECD Health Statistics database and WHO's National Health Workforce Accounts (NHWA).

[8] This list is drawing from the country cases and the OECD reports consulted for Part 2. There might be other entities beyond these.

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Eurostat compiles harmonized data on health employment, education and mobility across EU Member States. Its use of standard classifications and consistent time series enables countries to compare workforce size, age structures and cross-border flows. The OECD Health Statistics data base complements this with detailed indicators on practising, professionally active, and licensed-to-practice health workers, as well as information on training capacity and remuneration. These datasets help identify structural imbalances, such as shortages in specific professions or mismatches between training output and labour-market demand.
WHO's NHWA provides a comprehensive framework for monitoring HCWF stock, distribution, education, labour-market dynamics and governance. By encouraging countries to report across a standardized set of indicators, NHWA supports consistency and helps countries strengthen their national workforce information systems (WHO, 2023a).
These international sources draw on national administrative data, including professional registers, labour-force surveys, education databases and regulatory records.
Since 2010, Eurostat, the OECD and WHO have carried out a joint data collection exercise to improve the consistency of data reported on human resources for health, known as the Joint Questionnaire on non-monetary health statistics. Through a Joint Questionnaire, Member States submit a single dataset that is validated and then shared across the three organizations. This aims to reduce the reporting burden, improve coherence and enhance data quality. The Joint Questionnaire is an important step towards comprehensive data collection on human resources for health and supporting international benchmarking. However, the quality of the data submitted by Member States makes analysis unreliable, despite the growing number of categories for which data is provided.

4.3 Supply data types: availability and quality

Supply-side indicators describe HCWF stock, inflow and outflow, each of which presents specific challenges related to data availability and quality.

Stock: HCWF stock can be determined by headcounts of practising HCWF professionals or full-time equivalents (FTEs). FTE is considered the best measure of HCWF stock, as it adjusts for working hours, including part-time work. However, FTE requires detailed data on working hours which may be hard to collect and report across health care workers, and this presents a challenge for most countries. FTE data could be strengthened by better data collection on private practice, dual practice and self-contracted health professionals. Many Member States, such as Belgium, Hungary, Lithuania, Malta, Slovakia and Slovenia, are improving their stock data by establishing or upgrading health professional registers and increasing their level of detail. Other countries are strengthening private sector coverage through labour market data linkages (e.g. Malta via Jobsplus; Norway through integration of private provider data) (Cserháti et al., 2025).

Inflow: Inflow includes newly graduated or newly licensed health professionals, health workers after temporary exits from the health sector and immigrant health workers. Most Member States have relatively strong data on education and training outputs and foreign-trained professionals. Examples include Italy's use of registry and education data to set university intake quotas, Hungary's regular data exchange with vocational training institutions and Malta's collaboration with education providers to forecast inflows. Several countries

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also complement quantitative data with qualitative approaches to understand education-to-employment transitions (Cserháti et al., 2025).

Outflow: Outflow of health professionals is determined by health worker retirement, exit from the health sector for reasons other than retirement and emigration. Unlike inflow, outflow remains the most difficult supply dimension to measure. Data used to measure outflow rely on limited data in registers, the outflow reported in the OECD HCWF data reporting and through proxies such as intention-to-leave certificates which are requested of the health professional country of origin for practising in a new host country. Countries such as Estonia and Sweden are developing improved methodologies to better capture migration patterns and retirement behaviour (Cserháti et al., 2025; Kroezen, Van Hoegaerden & Batenburg, 2018; OECD & European Commission, 2024; Ono, Lafortune & Schoenstein, 2013; SEPEN et al., 2021).

Beyond individual indicators, Member States face common structural challenges that limit effective use of supply data for planning:

- fragmentation and lack of integration – data spread across multiple institutions, levels of government and professional bodies with weak interoperability;
- data quality and harmonization challenges – variations in definitions, coding and timeliness across institutions or regions reduce comparability;
- underrepresentation of non-physicians in health professional registers and forecasting models – health professional registers often cover only certain professions (e.g. physicians and dentists) while excluding others (e.g. nurses, allied health);
- legal and regulatory barriers – data compliance and protection approval delays, and complex governance structures hinder data sharing;
- limited use, analytical capacity and modelling expertise – even where data exist, analytical use in forecasting and policy decisions is uneven and technical expertise and modelling capacity are limited.

4.4 Demand-side data sources and developments

Demand-side data are primarily derived from:

- national health insurance and reimbursement systems;
- national statistics databases and surveys;
- Eurostat population projection data;
- the European Health Interview Survey;
- the Survey of Health, Ageing and Retirement in Europe;

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- Global Burden of Disease database.

Demand indicators typically cover demography, epidemiology, service utilization, health needs, organization of care delivery and health spending. Compared to supply data, demand-side data are more diverse and less standardized, with many countries relying heavily on utilization data and fewer incorporating epidemiological or needs-based indicators (SEPEN et al., 2021).

Nevertheless, progress is evident: Belgium has integrated burden-of-disease and expenditure projection models into demand planning; Slovenia is transitioning towards needs-based models; Italy is expanding demand indicators linked to service models and technologies; and Portugal is mapping demand-side data categories to better capture population health needs (Cserháti et al., 2025).

Emerging care models are further driving improvements in demand data. Countries, such as the Netherlands, Poland and Sweden, are developing new data and analytical approaches to support multiprofessional planning, task shifting, and team-based care, including work on competencies and capability-based frameworks (Cserháti et al., 2025).

Evidence from the 2024 AMDS assessment across Joint Action HEROES participating countries shows that while quantitative data are generally well developed (Box 8), qualitative data remain unevenly available and inconsistently used in planning processes (Box 9). Examples of the concrete actions being taken by Member States to improve data availability, quality and integration through Joint Action HEROES are presented in Box 10.

Box 8. Quantitative data availability and quality for supply and demand

Comparison between the JA EUHWF MDS (2016 assessment) and the HEROES AMDS (2024 assessment) indicates clear long-term progress in quantitative data availability reflecting professional coverage, stock, flows and demand (Table 4). Overall, the data suggest a shift from data scarcity towards data complexity. This increases the need for governance, integration, analytical capacity and translation into policy-relevant forecasts, which remain key challenges for HCWF planning.

- Data availability and professional coverage: Analysis of quantitative data within the HEROES AMDS shows substantial progress in data availability and expanded professional coverage across a wider range of health professions, reflecting a more inclusive and system-wide view of the HCWF. However, systematic use of this data for HCWF planning remains uneven.
- Supply-side data: Stock data are widely available, with most countries reporting headcounts disaggregated by age, gender, specialty and geography. FTE data remain less consistently available and represent a key area for improvement. Flow data on training and immigration are generally stronger than data on retirement and emigration.
- Mobility: International mobility indicators have improved over time, and several countries now explicitly account for mobility in planning models. However, differences persist in how essential these indicators are perceived at national level.

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- Demand-side data: Coverage of demand indicators is generally good, with growing interest in expanding beyond utilization data to include epidemiology, service models and unmet needs.

Table 4. Quantitative data collection comparison, 2016 and 2024

Quantitative data set in 2016

	Supply side					Demand side	
	Labour force	Training	Retirement	Outflow migration	Inflow migration	Population	Health consumption
Profession	12	10	9	4	8		
Age	12	5	7	2	5	11	8
Head count	12	10	10	4	7	11	8
Full-time equivalent	7						
Geographical area	11	6	7	2	5	9	7
Specialization	11	8	6	2	6		
Country of first qualification	6	3	3	2	5		
Gender	10						

Quantitative data set in 2024

	Supply side					Demand side	
	Labour force	Training	Retirement	Outflow migration	Inflow migration	Population	Health consumption
Profession	20	20	18	12	14		
Age	20	17	18	12	15	19	17
Head count	20	19	19	14	15	18	16
Full-time equivalent	15						
Geographical area	19	18	17	10	14	17	14

Specialization	19	18	18	10	14		
Country of first qualification	15	13	14	11	14		
Gender	19						

Note: Scores indicate the number of countries in which the stated indicator is measured, considering a total of 19 countries participating in HEROES. Scores <=3 are red; scores 10-15 are yellow; scores >=16 are green.

Sources: Eszter Kovacs, Anna Kozak and Zoltán Cserhati.

Box 9. Qualitative insights for forecasting and planning in the AMDS framework

The Joint Action HEROES project, building on earlier initiatives such as JA EUHWF and SEPEN, has consistently emphasized the importance of qualitative data and methods for HCWF planning and forecasting. Despite this recognition, the systematic collection and practical use of qualitative information remain limited in many countries.

Assessment of qualitative data availability within the AMDS framework in 2024 shows that, although countries increasingly acknowledge the value of qualitative insights, their integration into workforce planning remains fragmented.

- Care organization: Data on task shifting, changing scopes of practice and teamwork were available at an advanced level in 47% (9 out of 19) of countries. While interest in capturing the impact of digital technologies on service delivery and workforce composition is high (63% or 12 out of 19 countries), only around 32% (6 out of 19) of countries currently report having the relevant data.
- HCWF health and well-being: Approximately 68% (13 out of 19) of countries have satisfactory information on physical health, mortality and morbidity trends among health workers. In contrast, data on mental health and well-being remain scarce, available in only 32% (6 out of 19) of countries (WHO Regional Office for Europe, 2025).
- Labour market conditions: Information on financial investment and workforce performance is more widely available, with over half of countries reporting access to such data.

The Netherlands, Spain and Sweden emerge as leading examples in the systematic use of qualitative methods, including consensus-building, scenario planning and use of Delphi exercises within national planning commissions (Bayona-Huguet et al., 2025). Lithuania, Slovakia and Slovenia are making notable progress, while other countries remain focused on strengthening basic quantitative datasets before expanding qualitative components.

Overall, robust HCWF planning depends on the integration of quantitative data and qualitative insights, supported by stakeholder engagement, transparency and consensus. Although awareness of the value of qualitative approaches is growing, their practical

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application remains uneven. Expanding the routine use of qualitative tools alongside quantitative indicators will make workforce planning more participatory, adaptive and policy-relevant. Current Joint Action HEROES efforts to strengthen minimum datasets such as the (A)MDS provide an important foundation for this transition.

Contributed by: Eszter Kovacs, Anna Kozak and Zoltán Cserhati.

Box 10. Optimizing data and data sources: development actions in Joint Action HEROES

The Joint Action HEROES project supports Member States in strengthening HCWF data systems through coordinated, implementation-oriented activities. Building on earlier EU joint actions, it contributes to coordinated European capacity-building to address shared HCWF data and planning challenges. Support is delivered through technical assistance, peer learning and a shared development framework. Countries developed national action plans specifying objectives, timelines and resource needs, as well as identifying preconditions and policy implications.

Across countries, HEROES-supported actions clustered around six areas:

- improving data sources and minimum planning datasets;
- creating or strengthening integrated databases;
- improving monitoring of the practising workforce;
- expanding data availability for demand planning;
- improving data visualization and analytical tools; and
- generating additional information to support comprehensive and multiprofessional planning.

Many Joint Action HEROES actions also addressed data fragmentation, interoperability barriers and legal constraints. Expanding demand-side data represents an important shift, as demand indicators have historically been less developed than supply-side data.

The progress that has been made reflects different starting points and levels of system maturity. In some contexts, HEROES accelerated already planned reforms; in others, it played a catalytic role by raising awareness and enabling actions that would not otherwise have been implemented. Experience shows that data improvements are most effective when aligned with existing policy priorities, supported by legislation and embedded within sustained governance, funding and analytical capacity.

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Data sources, availability and quality policy implications

- Data availability and quality remain a challenge because of definition variation, lack of integration, data sharing.

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- There is limited HCWF analytical expertise and modelling capacity.

What policy-makers could do now

- Incentivize stakeholders to collaborate on definition standardization, harmonization and data quality.
- Ensure data governance and legal pathways for data integration and sharing in national and EU-wide databases, observatories and platforms.
- Continuous national and EU-wide investment in technical and analytical capacity.

5. How can health professional registers help improve data systems and availability and quality of data for HCWF planning?

5.1 Establishment of health professional registers

In addition to applying an (A)MDS to forecasting and planning and supporting the use of qualitative data, EU-funded HCWF projects have also supported Member States with establishing health professional registers. A health professional register is an official, usually mandatory, system that records information on individuals who are authorized to practise a regulated health profession. Registers are typically maintained by professional regulators or public authorities and contain data such as professional qualifications, scope of practice, licensing status and – depending on the system – information on employment, sector, working hours and location.

Their primary purpose is to support professional regulation and patient safety, but they can also serve as a critical source of workforce intelligence. At the same time, when designed and maintained with workforce planning needs in mind, health professional registers represent a critical source of high-quality, routinely updated workforce intelligence. They provide a robust empirical foundation for understanding the size, composition, distribution, and activity patterns of the HCWF and can inform a wide range of policy functions, including workforce forecasting and planning, education and training capacity, regulation, distribution and budgeting. By enabling more accurate, timely and integrated decision-making, well-functioning health professional registers play a central role in strengthening HCWF governance and supporting sustainable health system development (Kovács et al., 2017; WHO, 2015).

5.2 The advantages of health professional registers for data systems and forecasting and planning

WHO's Human resources for health information system states that:

the establishment of a national health workforce registry is essential for strengthening national health systems at all levels. Accurate and timely health workforce data is crucial for health workforce planning, national referral, training, reducing or eliminating

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misinformation and duplicate health worker records, improving regulation of practice, and tracking appropriate licenses of health professionals (WHO, 2015).

As such, health professional registers are not only data repositories but core health system infrastructure tools that support workforce governance, planning and accountability.

5.3 Integrating multiple data sources for completeness, standardization and interoperability

Health professional registers have the potential to decrease the uncertainty of forecasting and planning by consolidating and integrating all supply data under one platform. Registries are increasingly used to connect data across education, employment and professional systems, closing information gaps. In line with WHO guidance, a health professional register allows easy access to information on the production, and distribution of health personnel, and can assist both national and subnational level planning entities (WHO, 2015). Italy's HCWF database integrates data across many registers and sources, preventing possible double counting (Box 11). Slovenia's Registry links with the central population register and professional associations (e.g. medical and nurses' chambers) to ensure granularity across the 47 occupational groups included (Box 13). In addition to improving completeness and comparability, such integration supports standardization and interoperability between information sources, reducing misinformation and duplication of HCWF records, and strengthening overall data quality for HCWF planning, emphasised by WHO.

5.4 Supporting planning, budgeting, research and advocacy

Beyond data standardization and consolidation, WHO also highlights the broader system functions that could be supported by health professional registers. According to WHO, a health professional register can assist in HCWF budgeting, research development and advocacy. By strengthening the HCWF evidence base to policy-makers, health professional registers can support more transparent prioritization, workforce investment decisions and broader health system goals, thereby extending their role beyond technical data collection into broader, strategic health system decision-making (WHO, 2015). For example, Italy's HCWF database is directly linked to determining annual university student quotas, making it a core instrument for planning of training capacity. In Spain, HCWF data underpin discussions between ministries, universities and professional associations, reinforcing the registry's role in policy formulation, and system-wide advocacy.

5.5 Enabling broader workforce coverage and supporting multidisciplinary care

Health professional registers contribute to efforts across countries to expand data coverage beyond physicians, thus creating multiprofessional registers that will further enable multiprofessional and skill-mix planning. For example, Slovenia (Box 13) has expanded its HCWF register to 47 HCWF cadres, while Belgium (Box 5) plans to extend its register beyond physicians and dentists to include nurses, midwives, physiotherapists, speech therapists and audiologists. Spain is gradually expanding coverage beyond doctors to nurses and allied health workers (Box 12). A multiprofessional register could facilitate the integration across the HCWF cadres

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included in the health professional register. The integration could be low, with each professional cadre being looked at individually; intermediate, where there is some integration across professional cadres; or high. This progressive integration aligns with WHO's recommendation on improving regulation of practice, tracking licenses across professionals and supporting training across increasingly interdisciplinary models of care.

Box 11. National integration of administrative data for planning and education in Italy

A national HCWF database in Italy was legally approved and mobilized into action between 2018–2021 across ISTAT, the Ministry of Health, the Ministry of Higher Education and Research and the CPD Health Professions Register Consortium (Co.Ge.A.P.S.). The objective was to establish a statistical information system on the supply of health professionals to support forecasting, planning and student quotas for university courses (numerus clausus).

The project aimed to integrate available data on licensed health professionals across the population register, health professional registers, the Labour Register, and the registers of public, private and non-profit institutions. Integration with the Ministry of Higher Education and Research and Co.Ge.A.P.S allows visibility of professionals in university training and continuous professional development (mandatory for health professionals in Italy). The database was piloted between 2021–2023 by integrating data on pharmacists and physiotherapists.

The experience highlighted the potential of integrating data from different sources at the individual level, including harmonizing information, ensuring internal consistency and enabling high-quality statistical analysis. The use of individual data prevents double counting problems and allows analysis of changes in status over time.

Granularity of information on work and training activities is fundamental given the increasingly complex demand for data from policy-makers at national, regional and local levels. Following the pilot, the database has been extended to doctors, nurses, dentists and midwives.

Factors facilitating the database establishment include the availability of many administrative data sources, cooperation among institutions with different aims but a common objective to support the establishment of the HCWF database, and the collaboration of a multidisciplinary team.

The main barrier has been the approval of the National Statistical Programme and compliance with personal data protection legislation, which delayed implementation from 2018 to 2021. The database is expected to be ready for use in the HCWF forecasting model in 2026.

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On an annual basis, the Ministry of Health collaborates with the regions, the National Associations of Health Professions, and the Ministry of Higher Education and Research to forecast and plan the needs of the Italian HCWF for each of the 31 health professionals recognized in Italy. The purpose of this process is twofold: 1) to determine the future HCWF needs at national and regional levels; and 2) to determine annual university student quotas for each health professional category.

The forecasting model is based on stock-and-flow parameters developed under the Joint Action on Health Workforce Planning and Forecasting (2013–2016), considering projections of current supply and future supply and demand based on demographics and health service needs. Collaboration between ISTAT and the Ministry of Health is expected to result in an updated forecasting model based on more robust data.

Contributed by: Alessandra Burgio.

Box 12. From fragmentation challenges to integrated, multisource planning in Spain

Spain is currently developing a national HCWF registry. A Delphi study identified 15 essential variables for inclusion in a developing national registry, including projected retirements, entry rates, attrition, vacancies, foreign professionals and demographic and nondemographic drivers. In addition, the Delphi study indicated the need for investment in interoperable data infrastructure and standardized definitions across Spain's autonomous regions.

Several factors have been facilitating the ongoing development of Spain's HCWF registry. At the European level, these have included initiatives such as SEPEN and HEROES, and OECD/WHO frameworks have provided methodological guidance. Domestically, the existing legal framework, the *Ley de Ordenación de las Profesiones Sanitarias*, established a mandate for HCWF professional registries. In addition, there is stakeholder consensus among policy-makers, unions and human resource managers towards establishing a HCWF register. Finally, Spanish autonomous communities already operate robust human resources databases, which could be scaled nationally.

Barriers to establishing the HCWF register in Spain include fragmentation of governance due to Spain's decentralized health system governance and harmonization between regions. In addition, data silos exist because professional councils, regional human resources units and private providers collect data separately with limited interoperability. Establishing a national HCWF register through integration of data sources has also been slower due to legal and privacy concerns related to General Data Protection Regulation (GDPR) compliance and data-sharing restrictions. Finally, sustained national investments made in health information technology (IT) infrastructure and workforce analysts are still insufficient.

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The information currently available in the HCWF registry is used in different ways to support forecasting and planning and workforce development and policy. For forecasting and planning, the register supports distribution analysis across specialties and regions, informs shortage and surplus reports at national and regional levels, and estimates retirement waves and training needs. Due to existing data gaps and resulting limitations of the HCWF register, forecasts often rely on complementary surveys and academic studies.

For workforce development and policy, the HCWF register provides data for discussion and decision-making between ministries, universities and professional associations. Registry data is also used to support analysis regarding skill mix and task shifting for professional distribution as well as opportunities for role redefinition. Available registry data is also used to inform policy reforms such as gender equity strategies, retention policies and international recruitment. Furthermore, the registry data is meant for monitoring professional mobility by tracking outflows to other regions/countries and to guide retention incentives.

Regarding the methods currently used for forecasting and planning, Spain uses a combination of supply- and demand-based approaches. Spain also applies scenario modelling with sensitivity analyses that consider technological change, new care models and migration flows. Finally, ad hoc expert panels, organized as Delphi studies or consensus processes supplement quantitative forecasts with qualitative expert knowledge.

Contributed by: Xavier Bayona-Huguet.

Box 13. An operational and multiprofessional HCWF register in Slovenia

The main source of national HCWF and health facilities data in Slovenia is the Registry of Healthcare Providers and Healthcare Workers (the Registry). The legal basis for the Registry is the Healthcare Databases Act, which is intended for planning and monitoring the public health care network and the movement of health care personnel, monitoring of the delivery of the health care, and implementing the health insurance system. The National Institute of Public Health (NIJZ) handles the operational management of the Registry, including the data validation processes.

Factors which have enabled the establishment of the Registry include clear goals and vision, availability and accessibility of data, a permanent working group, consistent continued efforts and a favourable legal context.

The Registry collects data on all workers involved in delivery of health care. Currently, there are 47 recognized groups of health workers included in the Registry. The data set for each worker includes general information, which is directly linked to the central population register (name, address, ID number, date of birth, citizenship, etc.). Specific data, related to the profession include data

such as level, type and country of education, licensure status, vital status, current and previous employments and granted consent for additional employment. The employment status provides greater granularity of data, as it includes health worker information for different types of activities or locations. As such, the Registry allows to distinguish the exact sites of work activity for each worker, resulting in good knowledge on workforce distribution and activity patterns.

The Registry is a living database, and it constantly undergoes updates, expansions and increasing functionalities to further assist with HCWF planning. For instance, the Registry is now expanded to include HCWF professionals that were not obliged to be registered, e.g. nurse aides. Data quality and accuracy is an important aspect, and the Registry is now in the process of being linked to the registry of the nurses' association, as is already linked with the medical chamber registry. The Registry is pivotal in providing data on current HCWF stock and distribution trends, which are needed for comprehensive HCWF planning.

The Registry provides a detailed look into current HCWF supply, including stock, inflow and outflow of health care workers. Registry data is complemented with demand data including demographic indicators and utilization of health care services in primary care, outpatient and inpatient care, with an intention to transition to a needs-based model. Forecasting and planning in Slovenia are currently primarily focused on doctors; there are currently 55 different specializations for medical and dental doctors combined. In addition, four different nursing specializations have been recently approved for inclusion in forecasting and planning.

Contributed by: Blashko Kasapinov.

6. How can health professional registers be effectively implemented?

Despite their recognized value for workforce governance, health professional registers are unevenly implemented across Europe, and their availability, scope and functionality vary widely, reflecting differences in regulatory models, institutional capacity and political priorities.

Differences in availability of health professional registers in Member States often stem from distinct regulatory and governance traditions. In some countries, registration for health care practitioners is a mandatory legal requirement tied closely to licensing and patient safety, whereas in others it is voluntary and fragmented across professions. Responsibility may rest with ministries, independent regulators, chambers or professional associations, resulting in uneven coverage and inconsistent data collection practices. These institutional differences directly shape who appears in professional registers, how frequently information is updated and what data elements are captured.

Variation in the strength and role of professional self-regulation further contributes to uneven implementation. In countries where self-governance is strong, professional chambers often maintain registers that prioritize licensing and disciplinary oversight rather than

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broader workforce intelligence. In more state-led systems, standards may be more uniform, but integration with independently run professional bodies can be limited. As a result, data quality, transparency and accessibility differ substantially, with many registers not designed to interface with wider health system datasets.

Legal frameworks also play a significant role. Although the GDPR provides an EU-wide baseline, Member States interpret and implement data protection rules differently. Some adopt restrictive approaches that limit secondary uses of register data, creating uncertainty around data linkage, reuse and cross-institutional access. Registers built primarily for regulatory compliance often lack explicit mandates for planning, monitoring or research, making it difficult to transform regulatory data into strategic workforce intelligence.

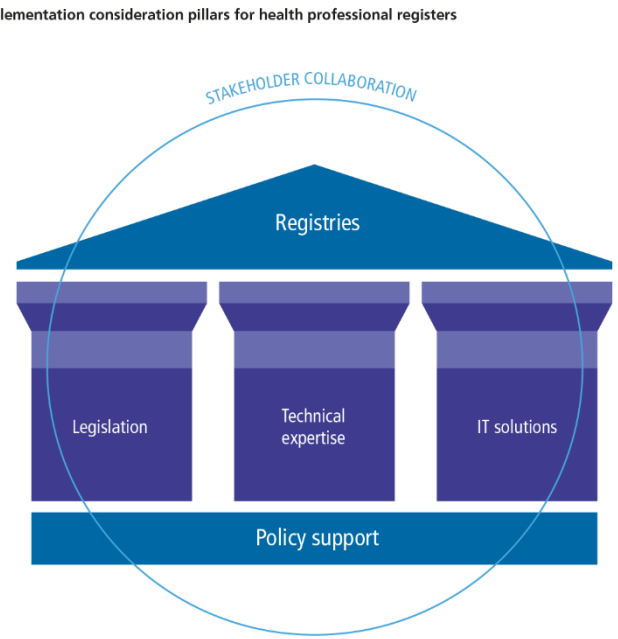
Differences in how countries prioritize workforce planning compound these issues. Some governments have institutionalized workforce planning with dedicated units, long-term forecasting models and established data requirements. Others rely on ad hoc or politically sensitive processes, which weakens incentives to invest in comprehensive, modern registers. Where planning capacity is limited, the perceived value of high-quality workforce data is lower and register development lags behind.

Resource and capacity constraints add further barriers. Building and maintaining modern, interoperable registers requires sustained investment in IT infrastructure, standardized data architecture and skilled analytical capacity – resources that smaller countries or those under fiscal pressure may struggle to allocate. Consequently, many registers remain basic, outdated or poorly integrated with other systems.

6.1 Effective health professional registers require coordinated action across legislation, technical capacity and IT infrastructure

The implementation and sustainability of health professional registers rest on three interdependent pillars (Fig. 3).

Fig. 3. Implementation consideration pillars for health professional registers



IT: information technology.

Source: Cserháti et al. (2025).

Legislation: A key enabler of better data quality and sustainability is the creation of legally mandated health professional registers, central data warehouses with clear institutional ownership. For example, Belgium's *Portail ProSanté – ProGezondheid* has been legally established as a professional practice register, ensuring mandatory registration and standardized data collection (Box 5), and Spain's legal framework (*Ley de Ordenación de las Profesiones Sanitarias*) has created a clear mandate for the national HCWF registry (Box 12). Even though legal frameworks and compliance can delay health professional register implementation, they are foundational for implementation and future sustainability.

Technical expertise and IT solutions: In addition to legislation, health professional registers require technical expertise and IT solutions that are sustainably funded to design, maintain and update interoperable systems that allow data exchange and validation. For

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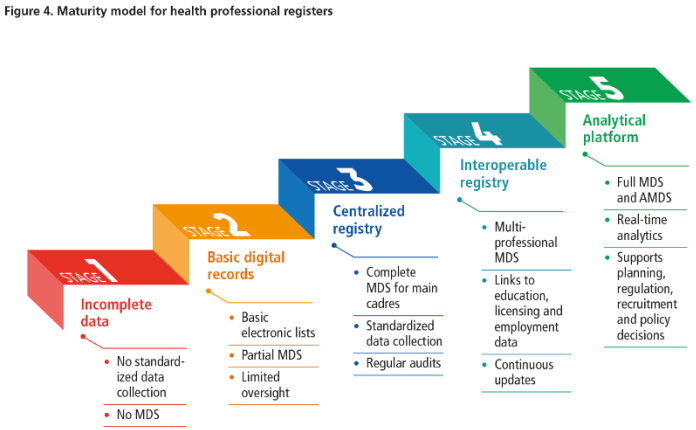
example, Belgium ensures data completeness by integrating *Portail ProSanté – ProGezondheid* with reimbursement systems (Box 5). Slovenia's NIJZ oversees data validation and continuously upgrades the Registry's functionalities to improve accuracy and alignment with evolving data needs (Box 13). Italy has been developing an integrated, centralized statistical information system for health professionals based on the integration of different individual data sources to improve estimates in the forecast model and training needs for health professions (Box 11).

Legislation, technical expertise and IT solutions need to be strengthened by policy (and political) support as well as stakeholder collaboration. Sustained cooperation among ministries, statistical offices and professional bodies enables data completeness, validation and shared ownership. Buy-in from multiple stakeholders at the beginning of establishing health professional registers also increases the likelihood for both register establishment and sustainability.

Health professional registers represent a growing maturity from administrative data repositories with limited functionalities to institutionalized, interoperable and analytical policy-relevant systems that link HCWF data with strategic workforce planning. Their evolution towards multifunctionality (integration across professions, monitoring of skill mixes and tracking continuous professional or interprofessional development) strengthens their role both as evidence and policy-relevant tools (Fig. 4). Continued collaboration across ministries, professional associations and European initiatives, such as Joint Action HEROES, can help ensure that health professional registers evolve into dynamic, policy-relevant national platforms that not only close data gaps, but actively support HCWF policy and HCWF forecasting and planning.

Fig. 4. Maturity model for health professional registers



AMDS: advanced minimum data set; MDS: minimum data set.

Note: Countries can enter at any stage but progression to Stages 4–5 delivers the greatest value for workforce planning.

While health professional registers are key data sources for national level HCWF planning, they also hold the potential for the exchange of information across the EU. The opportunity to link health professional registers within the EU internal market could enable better monitoring of practising health professionals in the EU. At the same time it is important to continue efforts in improving health workforce data through the joint questionnaire developed by Eurostat, WHO Regional Office for Europe and OECD. As a harmonised data collection instrument used to gather comparable health workforce data, the joint questionnaire presents an opportunity for further improvement of data on health workforce and its stronger use to inform policies. Results of the Joint Action Heroes could inform further developments in this area. Furthermore, the European Health Dataspace could provide an opportunity for Member States to integrate HCWF planning data in brooder analyses of changing healthcare systems. Finally, there could be the added value of an HCWF EU-wide observatory, which would monitor data in health professional registers across Member States and also monitor HCWF planning policies (see the SEPEN HCWF planning and policy repository as an example (SEPEN et al., 2021)). Building on the SANDEM health workforce planning model developed by the Joint Research Centre, and aligning further efforts with initiatives under the Union of Skills — including

the planned establishment of the EU Skills Observatory — represents a valuable opportunity to further recognise and strengthen the strategic importance of health workforce planning.

Health professional registers policy implications

- Robust health professional registers are a critical element for accurate workforce planning and governance.
- Countries have varying degrees of health professional register maturity and use for HCWF planning.

What policy-makers could do now

- Establish or update the legal framework for a national, multiprofessional health professional register.
- Ensure registers collect the full MDS.
- Create a governance mechanism with clear roles for regulators, ministries and professional bodies.
- Prepare conditions to link national health professional registers to one European health professional register.

7. Conclusion

Although forecasting and planning systems across EU Member States vary in their maturity and methodological approaches, they increasingly demonstrate a shared commitment to strategic planning and concrete actions, driven by better data collection and more robust planning processes. Persistent challenges remain with respect to data availability, quality and integration, hindering comprehensive forecasting and planning efforts. However, EU co-funded projects and contracts, such as JA EUHWF, SEPEN and Joint Action HEROES have enabled countries to better understand the data needs for forecasting and planning, and to create learning opportunities for countries to close key data gaps within and across national boundaries. These opportunities have included steps such as the AMDS, and the increasing use of qualitative approaches and scenario planning, as well as advancing previous MDS for planning and enhancing exchange about data categories, and facilitating data availability for the demand side. In addition, there is growing awareness of the need to strengthen data collection with respect to multiprofessional planning and skill-mix optimization to respond to changing health care needs and service delivery models. Health workforce data continues to be improved and harmonised through the joint questionnaire developed by Eurostat, WHO Regional Office for Europe and OECD and the results of the Joint Action Heroes can inform developments in this area. Furthermore, the establishment and refinement of health professional registers is of critical importance and needs to involve policy support for legislation, technical expertise and IT solutions, with multistakeholder participation and collaboration for successful and sustainable implementation. Finally, it is important to highlight that even strong data coverage or established health professional registers may not systematically be used for HCWF planning. Therefore, another factor for HCWF planning could be the existence of formal national mandates that would require the actual use of data collected in health professional

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registers for HCWF planning. Finally, it would be important to connect work on health workforce planning with the broader EU agenda on skills and labour shortages and priorities fostering better use of data. This would ensure greater coherence between sector-specific workforce policies and cross-cutting initiatives on skills intelligence and data systems. Results of the Joint Action Heroes can inform developments in this area.

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Annex. Research methodology

This policy brief draws on outputs produced as part of the HEROES JA as well as evidence from a review of the peer-reviewed and grey literature, including reports from the OECD, WHO and across EU-funded HCWF initiatives (including JA EUHWF and SEPEN). Additionally, it integrates data synthesized from presentations delivered by HCWF professionals. Information for the country case studies was provided by country experts and synthesized by the authors for the purposes of this brief.

First, the peer-reviewed literature review comprised of data searches on PubMed and Google Scholar, using the search terms: "methods for forecasting and planning health workforce" and "strategic workforce planning and health." Titles and abstracts were reviewed for relevance, followed by a full text review. The review of articles paid particular attention to literature reviews, scoping reviews and systematic literature reviews that included cross-country studies on the methods used for HCWF forecasting and planning. These were further reviewed for relevant articles. In addition, the literature review paid attention to studies regarding national forecasting and planning efforts compared to facility-level studies.

Second, a Google search to identify grey literature published by organizations such as the OECD or WHO was conducted. The search used the terms: "methods for forecasting and planning health workforce and OECD" and "methods for forecasting and planning health workforce and World Health Organization." A similar approach was used to collect evidence on health professional registers using the search terms: "health workforce registry and OECD" and "health workforce registry and World Health Organization."

In addition to the peer-reviewed and grey literature, websites, reports, and presentations across EU-funded HCWF projects were searched and HCWF experts were consulted.

All data sources were reviewed to identify themes relevant to our overarching research questions:

1. What forecasting and planning methods are needed for the future HCWF?
2. What are the requirements for effective health professional data and registers?
3. How can methods and data be effectively coordinated and implemented?
4. How data, forecasting tools, and complementary approaches could be leveraged to reflect the changing needs of different new health delivery models discussed in Part 1?

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Part 3: Moving towards a resilient health care workforce: how to institutionalize health and care workforce planning and forecasting

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Authors

Ellen Kuhlmann – Institute for Economics, Labour and Culture, Goethe-University Frankfurt, Germany

Gareth H Rees – ESAN University, Lima, Peru

Michelle Falkenbach – European Observatory on Health Systems and Policies, Belgium

Gemma A Williams – European Observatory on Health Systems and Policies, United Kingdom

Matthias Wismar – European Observatory on Health Systems and Policies, Belgium

Editors

Michelle Falkenbach, European Observatory on Health Systems and Policies

Matthias Wismar, European Observatory on Health Systems and Policies

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Abbreviations

AAAQ	Availability, Accessibility, Acceptability, Quality of the HCWF framework
ACMMP	Advisory Committee for Medical Manpower Planning
AI	artificial intelligence
CoP	community of practice
COVID-19	coronavirus disease
EHDS	European Health Data Space
EU	European Union
HCWF	health and care workforce
HEROES	HEalth woRkfOrce to meet health challEngeS (EU Joint Action)
HLMA	Health Labour Market Analysis
HRH	human resources for health
HRHIS	health workforce information systems
IT	information technology
JA EUHWF	Joint Action on European Health Workforce Planning and Forecasting
NHS	National Health Service
NIVEL	Netherlands Institute for Health Research
PlanCad	Planning Commission for the Supply of Medical Professionals, Belgium
SANDEM	Supply ANd DEMand model
SEPEN	Support for the health workforce planning and forecasting expert network
SHI	Social Health Insurance
WHO	World Health Organization
WISN	Workforce Indicators of Staffing Needs

Key messages

Using planning and forecasting to respond to future health and care workforce (HCWF) needs is central to a health system's ability to meet the challenges of population ageing and workforce shortages. This is one of a set of three briefs that reflect the evidence collected under the auspices of the Joint Action HEROES project. They cover:

- how forecasting and planning can adapt to support innovative care models;
- data and tools for forecasting and planning; and
- making forecasting and planning sustainable through institutionalization.

- **Forecasting and planning are only truly effective in shaping the health and care workforce where they become institutionalized** i.e. embedded in formal, durable governance structures, supported by legal frameworks and sustainable funding.
- **Institutionalization works best when a named organization or agency is given statutory responsibility for data collection, forecasting and planning**, whether as part of a centralized (national health service), decentralized/Nordic, or Social Health Insurance/hybrid model.
- **Legal and regulatory frameworks are the foundation for making workforce planning central to health system governance**. Defining institutional mandates and regular forecasting cycles in law ensures data can inform practice and policy. Aligning national policy with EU policy initiatives also supports the institutionalization of forecasting and planning.
- **Understanding and adapting to the national context will be instrumental in the success of any institution responsible for health and care workforce planning**. Countries can combine national agencies and independent bodies to address geographical or demographic diversity or use independent bodies to bridge gaps (between government, professionals, insurers or trainers). The important thing is that the approach reflects the health and education system contexts.
- **Forecasting and planning are most effective when they are enabled to respond to changing conditions** with agility and speed. They require:
  - the right tools to capture and analyse data;
  - the right people with the capacity, knowledge and skills to translate evidence into practical, implementable plans;
  - the right systems to routinely and proactively link their analysis to policy action in real time including to the following:
    - education systems, and particularly to curricula and admission quotas;
    - professional roles, including those beyond medicine and nursing; and
    - workforce regulations.
- **Building human (forecasting and planning) capacity is one of the crucial things that governments can do to promote good practice**. This includes providing planners and analysts with the skills to collect data, analyse it and develop planning options as well as to interpret and communicate what these mean for policy.

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- **Strong governance is the glue that ensures planning translates into real-world policy impact**, this means:
  - clear mandates, transparent accountability and sustainable funding to enable implementation, including across and beyond electoral cycles;
  - multi-level, participatory governance that connects national, regional and local actors;
  - collaboration between the health, education and labour sectors;
  - aligning resources, education and governance mechanisms to accommodate new technologies, support shared long-term health goals and foster resilience; and
  - linking HCWF governance to broader mechanisms to strengthen cross-sector coordination and policy uptake.

Executive summary

Using planning and forecasting to respond to future health and care workforce (HCWF) needs is central to a health system's ability to meet the challenges of population ageing and workforce shortages. This brief is part of a three-part series developed under the Joint Action HEROES project, which focuses on how institutionalizing forecasting and planning can make them sustainable, effective and actionable. The other briefs address how countries can move towards new models of care and how countries can strengthen the data and tools required to do so.

Forecasting and planning are only truly effective when they become institutionalized

Forecasting and planning need to become embedded within formal, durable governance structures, supported by legal frameworks and sustained funding. Institutionalization moves workforce forecasting beyond technical exercises to become an integral part of governance. It ensures that planning is continuous, adaptive and insulated from short-term political cycles. Without it, even high-quality data and forecasts fail to influence real-world policy and implementation.

Legal and regulatory frameworks are the foundations of institutionalization

Legal and regulatory frameworks are the foundation for making workforce planning a core component of health system governance. Laws that define institutional mandates and establish regular forecasting cycles give planning bodies the authority and stability to act. When aligned with European Union (EU) policies, and broader frameworks, such as the World Health Organization's (WHO's) Global Strategy on Human Resources for Health: Workforce 2030, they promote comparability, accountability and sustainability across countries.

Institutionalization works best when a designated organization or agency is given statutory responsibility for workforce data collection, forecasting and planning. These functions may sit within centralized National Health Service structures (as in England or Malta), decentralized or Nordic systems (such as Sweden or Norway), or hybrid Social Health Insurance (SHI) models (such as the Netherlands[9] or Belgium). The institutional form is less important than ensuring that mandates are clear, capacities are adequate and responsibilities are embedded in law.

Successful institutionalization means adapting institutional models to national contexts

Countries can tailor their arrangements to reflect system characteristics, governance traditions and demographic diversity. Some may combine national agencies with independent advisory bodies (e.g. Norway's Health Personnel Commission) to bridge the gap between government, professionals and education providers. Others may rely on autonomous capacity bodies (as in the Netherlands) to enhance transparency and stakeholder trust. What matters most is that planning and forecasting mechanisms are adapted to the health, education and labour market systems in which they operate.

The building blocks of effective institutionalization include the right tools, people and systems

For forecasting and planning institutions to operate effectively, they require three critical enablers: (1) the right tools to capture, integrate and analyse comprehensive data on the health and care workforce; (2) the right people, such as skilled planners, analysts and researchers, who can interpret evidence, model

[9] Note that Netherlands (Kingdom of the Netherlands) comprises six overseas countries and territories and the European mainland area. As data for this Report refer only to the European territory, the Report refers to it as the Netherlands throughout.

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planning options and translate results into actionable plans; and (3) the right systems to ensure that forecasts directly inform education and training policies, professional regulation and service delivery in real time.

Institutionalized forecasting would connect routinely with education systems (to align curricula and admission quotas), professional structures and workforce regulation. Building human capacity in forecasting and planning, for example, through training, mentorship and technical support, is one of the most valuable investments governments can make.

Strong governance is the glue that holds institutionalization and capacity together and translates planning into impact

Effective governance requires:

- clear mandates, transparency and accountability that persist across electoral cycles;
- multi-level, participatory governance linking national, regional and local actors;
- collaboration across health, education and labour sectors to align resources, roles and reforms; and
- the integration of HCWF governance into broader policy processes to strengthen cross-sector coordination and long-term policy uptake.

Governance also provides the continuity needed to adapt to technological change, manage workforce transitions and foster shared long-term health goals.

1. Introduction: why this brief and why now?

A well-trained and adequately staffed health and care workforce (HCWF) is the backbone of resilient health systems, a safeguard for health security (both in terms of patient safety and sustainable health services) and a driver of social and economic stability. The coronavirus disease (COVID-19) pandemic exposed vulnerabilities in workforce preparedness, but also highlighted that proactive, coordinated planning is essential to protect health systems from both sudden crises and long-term pressures (Rees, Batenburg & Scotter, 2024). Without such planning, countries risk being unprepared to meet population health needs, respond to emergencies or adapt services as demands change.

Today, countries face a worsening global HCWF crisis that is driven by ageing populations, shifting disease patterns, growing service demands, supply-induced demand and workforce attrition. Shortages are particularly acute in rural and remote areas, and in health systems that are already understaffed and underfunded. This threatens the quality of care, universal health coverage and access to services. While access to healthcare is high on the political agenda, as one of the principles of the European Pillar of Social Rights, significant disparities persist, with the greatest impacts felt by people with lower incomes, vulnerable groups and those living in underserved regions. The health workforce crisis has a clear gender dimension as a majority of workers in the sector are women, underscoring the need for gender-responsive planning and policies. Left unaddressed, the HCWF crisis risks eroding trust in institutions, weakens social cohesion and can threaten political stability.

Importantly, Europe is not starting from scratch. Over the past decades, the EU has invested in health workforce planning and forecasting through successive Joint Actions and projects. Early work on health workforce planning and forecasting helped identify good practices, strengthen planning methodologies, and assemble practical tools, including the Health Workforce Planning Toolkit that several Member States adapted and used (Semmelweis University, 2025). The follow-up SEPEN (Support for the health workforce planning and forecasting expert network) project consolidated these gains by building an active community of practice updating the evidence base and strengthening knowledge exchange and mutual learning across Member States (SEPEN et al., 2021). Together, these initiatives improved data, methods and skills for forecasting and planning and demonstrated that better evidence can inform policy.

Yet technical gains alone are not enough. Improved forecasting models, scenario planning and simulations will not deliver better population health outcomes if they remain disconnected from policy decisions, financing, education and training pipelines, and implementation capacity. Without robust institutional frameworks, adequate capacity and strong governance, forecasts and projections risk remaining theoretical and the planning ends up failing to influence population health outcomes or deliver the government's health strategy aims (Rees, Willis & Scotter, 2025).

This policy brief focuses on the institutionalization of HCWF planning and forecasting, ensuring that these processes are not one-off exercises but continuous, adaptive and embedded in governance structures (boxes 1, 2 and 3). Strong institutions help translate analysis into action by sustaining planning cycles, coordinating key actors (governments, professional associations, training providers and other stakeholders) and keeping workforce strategies aligned with evolving population needs and models of care (Box 4).

Institutionalization depends, in turn, on **capacity**. This includes the people, resources, data infrastructure and tools needed to produce credible projections, review and revise them, and apply them in policy and operational decisions. Skilled personnel, adequate resources, interoperable data systems and fit-for-purpose indicators are what make institutional arrangements effective in practice rather than symbolic. Without capacity, even the best institutional arrangements cannot deliver effective workforce planning.

Finally, governance is the glue that holds institutionalization and capacity together. Clear governance structures ensure that responsibilities are defined, stakeholder engagement is consistent and decision-making is transparent. Governance frameworks anchor HCWF planning in national and regional priorities, foster accountability and maintain the political will needed to drive implementation. In an era of global permacrises, resilient and equitable health systems depend on a stable, well-prepared HCWF. Institutionalizing HCWF planning and forecasting, supported by adequate capacity and strong governance, are essential steps for EU Member States to address current shortages, prepare for future challenges and ensure access to quality health care for all.

This policy brief examines how to institutionalize HCWF planning and forecasting. It asks: what are the policy options for institutionalizing HCWF planning and forecasting, what capacity is needed to achieve this and how can such an institution be governed?

Box 1. Methods in brief

Evidence for the policy brief is drawn from previous deliverables of the Joint Action HEROES project (JA HEROES, 2023a; 2023b; 2024) and the SEPEN project (SEPEN et al., 2021). A rapid scoping review of the available reports and grey and peer-reviewed literature was carried out and a narrative synthesis drawn with a focus on existing approaches and institutions for HCWF forecasting and planning. Evidence was also taken from selected case studies across the countries included in the Joint Action HEROES project, which were prepared by project members.

Box 2. Definitions as used in this policy brief

- **Institutionalization** refers to embedding HCWF planning and forecasting into formal and durable structures of governance, supported by legal frameworks, mandates and sustainable funding (Correia et al., 2025; WHO, 2016; WHO Regional Office for Europe, 2022b).
- **Capacity** describes the tools, skills, knowledge, infrastructure and human resources required to carry out effective HCWF planning and forecasting. This includes technical instruments and foundations of HCWF planning, such as quality data (Workforce Indicators of Staffing Needs (WISN) (WHO, 2010) and forecasting models), skilled professionals (policy analysts, statisticians, information technology (IT) experts, qualitative and quantitative researchers) and organizational infrastructure (registries, health workforce information systems (HRHIS), interoperable IT systems). Capacity is what

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makes institutional structures operationally effective rather than symbolic (Azzopardi-Muscat, Zapata & Kluge, 2023; Correia et al., 2020; WHO, 2022; Zapata et al., 2023).

- **Governance** is "the systematic, patterned way in which decisions are made and implemented" (Greer et al., 2019). In the context of the HCWF, governance refers to the arrangements, processes and relationships through which governments, agencies and stakeholders set priorities, coordinate action, allocate resources and monitor outcomes. It determines who has authority, how responsibilities are distributed, how stakeholders are involved, and how transparency, accountability and equity are ensured.

Box 3. Framework for sustainable workforce intelligence systems

One of the technical products emerging from HEROES is a framework and self-assessment tool to support Member States in developing a sustainable approach to improving their workforce intelligence and planning systems.

We define sustainability as the continuation, maintenance and improvement of the intelligence system(s), with the outcome of enhancing workforce planning and achieving the intended long-term benefit of ensuring a health system has a health workforce capable of meeting the population's health needs (Moore et al., 2017; Rees et al., 2023).

The framework adopts a systems approach, focusing on capability building and understanding the relationships and dependencies between areas of activity and planned interventions. Key factors for planning (data, tools, staffing, monitoring and evaluation, governance, political support, economic factors, etc.) have been identified through literature reviews and expert interviews and grouped into four domains (Table 1). These domains have been mapped against a general hierarchy for capability building (Potter & Brough, 2004) to provide a specialized framework for capability building for health workforce intelligence systems.

Table 1 Key domains and enabling factors for effective HCWF planning and forecasting

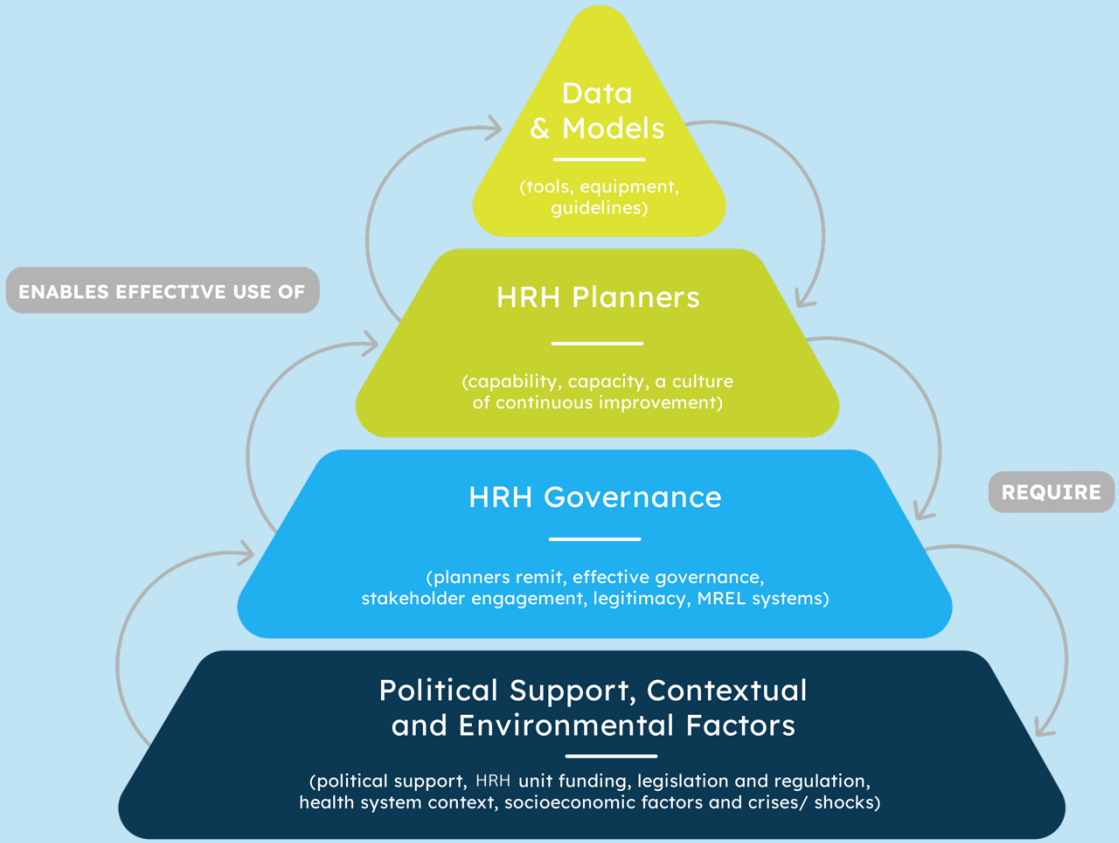
Domain	Key factors
Data and models The tools used by planners to effectively plan	• Strong and reliable minimum data set • Reliable models addressing more HCWF roles and staff • Adaptability of tools to regional and local contexts

HRH planners capabilities The collective skills and capacity of planners across the health system	• Institutionalized continuity, succession and handover for planning teams • Common understanding and language about the HCWF between stakeholders • Commitment to retention and lifelong learning
HRH governance The institutional arrangements, which are broadly within the control of planners, underpinning planning, the prioritization and resourcing of planning	• Commitment to ample and sustainable resourcing and management • Institutional responsibilities for planning and policy-making clearly defined • Mobilizing, collaborating and engaging with stakeholders • Monitoring, reporting, evaluation and learning • Collective recognition HCWF planning is medium- to long-term
Political and contextual support The environment in which planning is taking place. The cross-government working, macro level investment in the health system, and the legislative and regulatory environment	• Political and senior leadership support and funding • Improved cross-government governance and policy processes • Collaborative and intersectional approach to policy • Legislation, regulations and policies to advance workforce solutions

HRH: human resources for health; HCWF: health care workforce.

The framework is illustrated in Fig. 1. The foundation of planning systems is political support and engagement; this enables effective human resources for health (HRH) governance, which in turn enables planners to utilize their full capabilities, allowing data and models to be fully leveraged in the development of workforce plans.

Fig. 1 Hierarchy of the elements of a sustainable HCWF intelligence system



HRH: human resources for health; MREL: monitoring, reporting, evaluation and learning.

Source: Adapted from Potter & Brough (2013).

The approach taken in the framework makes explicit the dependencies between interventions; it also moves away from approaches that solely focus on technical elements of planning to one which embraces the social nature of all work in health systems and supports countries to develop practical approaches to improving their workforce planning system.

2. What are the policy options for institutionalizing HCWF planning and forecasting?

2.1 Rationale for institutionalization

Institutionalization turns planning into a continuous, adaptive process

Institutionalization can pave the way for bringing evidence into practice. It involves more than embedding a new process into a system, and, rather, is about creating durable systems that ensure HCWF planning and forecasting are continuously updated, adapted and implemented in ways that improve population health and strengthen system resilience. By rooting HCWF planning within formal governance structures (Bernini et al., 2024; Girasek et al., 2016; Kroezen, Van Hoegaerden & Batenburg, 2018; Lee et al., 2024), it is possible to ensure that countries are able to collect data, analyse it and develop planning options out of that analysis so that they can be systematically translated into policy action. This also allows for countries to respond to changing conditions with agility and speed.

Without such institutional frameworks, valuable tools (including models developed under the Joint Action Heroes, Health Labour Market Analysis (HLMA) (WHO, 2022), WISN (WHO, 2010), Availability, Accessibility, Acceptability, Quality of the HCWF framework (AAAQ), (Campbell et al., 2013) artificial intelligence (AI)-based models) may remain underused and disconnected from decision-making. Institutionalization can ensure that data and forecasting lead to action: aligning workforce supply with changing demographic needs; adapting services to new technologies; and integrating gender-responsive, equity-focused policies (Rees, Batenburg & Scotter, 2024; Williams et al., 2024; SEPEN et al, 2021). For instance, the COVID-19 pandemic has highlighted the importance of tailored gender-responsive measures to maintaining HCWF capacity and to counteract resignation and attrition (Williams et al., 2024; Klude &Azzopardi-Muscat).

Institutionalization can be useful for:

- systematic planning – preventing reactive crisis responses;
- continuous evaluation – adapting to shifting population needs, technologies and political contexts;
- supporting intersectorality – aligning health, education and labour market policies;
- embedding equity – ensuring diverse needs (gender, regional disparities, migration flows, etc.) are addressed.

2.2 Pathways to institutionalization

Different health system models institutionalize HCWF planning in different ways (Batenburg, 2015). These approaches can be grouped into centralized National Health Service (NHS) models, decentralized/Nordic models, and Social Health Insurance (SHI) or hybrid models.

2.2.1 Lessons from NHS models

In tax-funded NHS systems, institutionalization often involves a strong central authority with direct control over planning processes, which is linked to training, recruitment and service delivery.

In England's NHS, for example, workforce planning is coordinated nationally and regionally through an evolving set of analytical and strategic methods. In recent years, NHS England has strengthened its integrated planning approach, combining horizon scanning, scenario modelling, system dynamics, simulation and workforce impact analysis to link long-term service planning with education and training policies (NHS England, 2023; SEPEN et al., 2021). The Department of Health and Social Care works in close partnership with NHS England to align national forecasts with recruitment, training, and retention strategies, producing regular multi-year workforce plans that are embedded in the Long Term Workforce Plan (NHS England, 2023).

Ireland, on the other hand, provides an example of a fully centralized NHS model that integrates multiprofessional health and social care workforce planning under strong political leadership. The system demonstrates comprehensive multiprofessional HCWF planning aligned with social care, underpinned by strong political support and an emerging HCWF research base (SEPEN et al., 2021). It also highlights the importance of governance structures for advancing HCWF planning capability. For instance, maturity assessment, a structured method for assessing how well national systems perform across dimensions such as governance, data, modelling, stakeholder engagement and policy use of evidence, was identified as a governance tool (European Commission, 2025). Although Ireland has made substantial progress, full institutionalization is not yet complete, as workforce planning is still not fully embedded in formal legal frameworks. Legal frameworks are essential to achieve durable and optimal institutionalization because they provide statutory authority for data access, define mandates and responsibilities for planning bodies and ensure continuity beyond political cycles. Such frameworks guarantee accountability, secure sustainable funding and ensure that HCWF planning remains an integral and enforceable part of national governance.

The case of Malta, for instance, illustrates how a small country with centralized institutional NHS pathways organizes its institutional capacities (Box 4). Planning is guided by structured and collaborative stakeholder dialogue covering all health professions and based on both quantitative and qualitative data (SEPEN et al., 2021). This dialogue informs a three-year workplan with annual evaluation and follows the World Health Organization (WHO) Regional Office for Europe (2022d) recommendations. The country has further advanced

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institutionalization through the adoption of a forecasting tool from the Netherlands Institute for Health Research (NIVEL), and using integrated workforce data from multiple national sources and targeted training for senior decision-makers.

Box 4. Supporting the institutionalization of HCWF planning: the example of Malta, WHO and the EU

Malta has embraced a data-driven, evidence-based approach to HCWF planning to ensure a sustainable and high-quality health care system. This journey began in 2019–2020 with a WHO-led health workforce consultation meeting and workshop held in Malta, marking the beginning of a collaborative initiative. Funded by the WHO Regional Office for Europe under the Biennial Collaborative Agreement 2018–2019 and framed within the Country Cooperation Strategy 2016–2021, this effort aimed to strengthen national capacities in HCWF planning and forecasting with a focus on long-term sustainability and quality.

A significant milestone came in 2022, when the People Management Division within the Ministry for Health and Active Ageing launched Malta's first Health Workforce Strategy (2022–2030). This strategy aligns national efforts with EU Joint Action initiatives and WHO collaborations, marking a significant step towards institutionalizing workforce planning.

A pivotal aspect of Malta's Health Workforce Strategy was the adoption of a Health Workforce Planning and Forecasting tool developed by WHO and NIVEL in the Netherlands.[10] This was achieved under the Recovery and Resilience Plan co-funded by the EU budget. WHO facilitated Malta's introduction to NIVEL's experts and helped organize workshops and discussions. This tool, tailored to Malta's specific health care needs, provides systematic data analysis and workforce projections. The dissemination of this tool across different government entities has initiated crucial discussions on strategies, such as training expansion and task shifting to address workforce shortages.

As part of the Joint Action HEROES project, Malta is taking significant steps to centralize and harmonize workforce-related data within the Ministry for Health and Active Ageing. This initiative integrates information from key sources, including: (1) regulatory bodies; (2) Jobs Plus (the national employment agency); (3) Identita' Malta (the identity and immigration agency); and (4) educational institutions. By consolidating data through unique identifiers, Malta ensures accurate, up-to-date workforce intelligence for strategic decision-making.

Malta's success in institutionalizing workforce planning hinges on stakeholder engagement, capacity-building and continuous political commitment. Through funding from the Joint Action HEROES project, Malta is training key decision-makers – including chief executive officers, clinical chairpersons, senior clinical managers and human resources leaders – to analyse workforce data and anticipate future needs.

Malta's approach – leveraging EU and WHO collaborations, forecasting tools, data integration and stakeholder training – represents a major step towards sustainable workforce planning. While progress has been significant, the country's sustained political commitment remains one of the key success factors for advancing long-term institutionalization, ensuring that workforce planning continues to evolve and adapt to meet future health care challenges.

Contributed by: Andrew Xuereb.

[10] Note that Netherlands (Kingdom of the Netherlands) comprises six overseas countries and territories and the European mainland area. As data for this Report refer only to the European territory, the Report refers to it as the Netherlands throughout.

2.2.2 Lessons from Nordic models

Sweden illustrates a Nordic, community-based health system with strong regional imbalances and challenges due to large remote and scarcely populated areas in the northern parts. Sweden's constitution enshrines regional government independence, meaning that national-level health policies must be translated into regional health service planning (Government Offices of Sweden, 2025). As such, Sweden has shifted from focusing on workforce numbers to redesigning care delivery itself, using e-Health infrastructure, virtual appointments and digital information-sharing to improve coverage in remote areas (SEPEN et al., 2021). This technology-driven approach expands HCWF planning capacity without relying solely on recruitment in underserved regions (Box 5).

Box 5. Moving workforce planning towards a learning system approach: the example of Sweden

Over the next five years, Sweden's population aged 80 years and above will increase by 30%. This demographic shift will significantly reshape health care, increase system complexity and place even greater strain on an already stretched workforce. The current governance model – anchored in New Public Management and focused on markets, managerial control and performance metrics – has struggled to respond to these complex realities. New Public Management often undermines public services' ability to achieve meaningful human outcomes, leading to systems that are rigid, expensive and less adaptive to changing needs.

Sweden is now embracing a more adaptive, patient- and staff-centred workforce planning approach, grounded in the principles of capabilities and learning systems (Centre for Public Impact, 2024). A learning systems approach means embracing complexity, fostering trust and placing continuous learning at the heart of planning, delivery and governance. In this new model, workforce planning becomes a co-creation process where patients, professionals, researchers, policy-makers collaboratively explore what matters most, what works best and can we continuously adapt to new challenges. Instead of saying "You should implement what we've learned", the approach encourages "Use our learning as a starting point for your own". The goal is to spread the practice of learning itself – not just predefined solutions.

The National Board of Health and Welfare is now exploring how to build multi-level learning systems that connect insights from local practices to national policy. This is not about scaling a fixed solution but about growing the collective capacity to learn, adapt and act together. This approach is built on four key foundations: (1) understanding the system; (2) co-designing; (3) experimenting; and (4) embedding and influence.

In Sweden's decentralized health care system, learning capabilities must be developed both horizontally and vertically – across different levels of governance and professional networks. A key element will be strengthening system stewardship within the different parts of the system (Fig. 2).

Fig. 2 Building multi-level learning capabilities for HCWF planning in Sweden

	Increasing thematic breadth	
Increase geographical	*Scale of system*	*Organizational function*
	Individual	Multidisciplinary roles

	Team	Other teams
	Organization	Support functions
	Municipality	Different committees
	Country	Different committees
	National	Different ministries

By adopting this learning approach, Sweden is pioneering a more adaptive and sustainable workforce strategy – one that responds to real-world challenges, values collaboration and continuously evolves to meet the needs of an ageing population.

Contributed by: Åsa Olsson.

Norway provides another example of how countries can combine national agencies and independent bodies to align data, forecasting and strategy across a geographically and demographically diverse system (Box 6).

Box 6. Collaborative efforts for HCWF planning in Norway

Norway has one of the highest densities of health care workers in Europe, with 15% of its workforce employed in the health sector. However, demographic changes, including an ageing population and a stagnating workforce, pose significant challenges for the future. To address these concerns, Statistics Norway, the Norwegian Government and the independent Healthcare Personnel Commission have collaborated to enhance workforce planning and forecasting.

The role of Statistics Norway

Statistics Norway plays a central role by publishing forecasts on health care workforce supply and demand for 14 key professions. These forecasts are based on extensive registry data, including an employer–employee database. Government agencies, particularly the Norwegian Directorate of Health, use these projections to estimate the required number of health care graduates and inform discussions between the Ministry of Health and Care, the Ministry of Education and Research and the Ministry of Finance as part of the state budget process.

The Healthcare Personnel Commission's contribution

Recognizing the need for strategic workforce planning, the Norwegian Government appointed an independent Healthcare Personnel Commission to analyse labour shortages and propose targeted policy measures. The Commission consisted of participants from the municipalities responsible for primary health care, the specialist health care sector, various health professions, academia and both employee and employer organizations, to name a few. The Commission relied heavily on Statistics Norway's forecasts, concluding that the rapid expansion of the health care sector was unsustainable. They warned that continued growth would deplete other essential sectors of skilled labour and advised against reliance on international recruitment.

Government response and policy development

The Commission's findings generated significant national debate, and the Norwegian Government integrated several of its recommendations into the National Health and Coordination Plan (2024–2027). The health workforce is part of this white paper which outlined measures in three key areas:

- recruitment, qualifications and skills development;
- work environment and conditions; and
- task-sharing and workforce organization.

Concrete actions include requiring assessments of how new policies affect health care worker demand and prioritizing the adoption of technology to reduce workforce pressures.

Impact and future outlook

Statistics Norway's forecasts and the Commission's recommendations have significantly shaped workforce policy discussions, ensuring a coordinated approach across Norway's decentralized health care system. While the need for health care workers has been increasing in previous years, it was only in the 2024 long-term economic outlook by the Ministry of Finance that labour market pressures – particularly in the health sector – were emphasized. For the first time, workforce competition was presented as the most pressing long-term challenge, underscoring the urgency of sustainable, cross-sector labour strategies. This shift highlights the growing importance of data-driven collaboration in securing a resilient health care system for Norway's future (Norway, 2025).

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2.2.3 Lessons from SHI-based and hybrid systems

In SHI and mixed systems, institutionalization often relies on independent bodies that bridge government, professional associations, insurers and training providers. This can reduce political influence and foster stakeholder trust but requires clear mandates and sustainable funding.

The Netherlands are characterized by their complex mix of SHI institutions with market elements, strong corporatist actors, state interventions and innovative health policy approaches (Box 7). Other SHI countries, such as Belgium and France, operate multistakeholder forecasting bodies under ministerial authority (PlanCad in Belgium; Observatoire National de la Démographie des Professions de Santé in France). Germany, with its federalist SHI system, has no centralized independent body but instead a patchwork of regional monitors, federal committees and national and regional SHI institutions.

Box 7. Institutionalizing HCWF planning: the Netherlands experience with governance, stakeholder collaboration and evidence-based decision-making

The Netherlands offers a well-established model for institutionalized HCWF planning, where governance, technical modelling and stakeholder collaboration are integrated to support evidence-based policy decisions on medical workforce needs. Over the past 25 years, this system has continuously evolved to ensure a sustainable and well-distributed health workforce (OECD & European Commission, 2024).

At the heart of workforce planning is the Advisory Committee for Medical Manpower Planning (ACMMP), an independent body responsible for supporting the government on medical student intakes and postgraduate training allocations (OECD, 2023). What sets ACMMP apart is its inclusive and participatory governance structure, ensuring equal representation and voting power among key stakeholders (OECD & European Commission, 2024): medical professionals (doctors, dentists, and paramedics), training institutes and health insurance companies.

Stakeholder engagement and collaboration

This collaborative process fosters trust, shared ownership and accountability among stakeholders. Input is gathered through specialized Chambers of the ACMMP, which are co-responsible for estimating planning model inputs making scenario recommendations based on profession-specific insights (OECD & European Commission, 2024).

Evidence-based decision-making process

HCWF planning follows a three-year cycle ensuring continuous learning and adaptation. ACMMP's recommendations to the government are highly data driven, integrating both quantitative and qualitative evidence. For the technical expertise, the ACMMP collaborates with semi-governmental organizations, such as NIVEL, to conduct forecasting and continuously refine the forecasting model (ACMMP, 2013; OECD & European Commission, 2024). Key elements of the forecasting model include:

- future supply and demand projections, factoring in (among others) health care needs, population growth, task shifting, technology and changes in working hours, and outflow of the workforce and return to training;
- stakeholder and expert insights on expected changes in health care demand; and
- scenario analysis and policy simulations, allowing decision-makers to anticipate different workforce needs.

The government uses ACMMP's recommendations to allocate budgets for medical training programmes, ensuring that investments align with projected workforce needs. ACMMP then reconsiders workforce developments over the next three years to refine the next cycle of inflow recommendations (OECD & European Commission, 2024).

The Dutch approach demonstrates how strong governance, stakeholder engagement, collaboration and data-driven forecasting can create a sustainable, adaptable and institutionalized system (OECD & European Commission, 2024). By continuously evolving and collaborating internationally on various EU-level projects, the Netherlands not only secures its own workforce sustainability but also contributes to global efforts in strengthening HCWF planning capacity.

Contributed by: Ines Mogami.

2.3 Legal and regulatory frameworks for institutionalization

Legal frameworks make institutionalization durable and enforceable

Legal and regulatory frameworks are the foundation for making HCWF planning a permanent part of health system governance (European Parliament & Kuhlmann, 2025; Wismar & Goffin, 2023). They provide the authority, legitimacy and procedural clarity necessary for sustained, systematic action. These legal frameworks are important for several reasons. First of all, laws give HCWF planning bodies the statutory power and authority to collect and manage sensitive workforce data, set methodologies and issue recommendations. Secondly, legislation secures planning functions beyond electoral cycles or changes in political leadership thereby ensuring continuity. Thirdly, clearly defined legal mandates make it possible to evaluate performance, enforce compliance and hold institutions responsible for results and thus guaranteeing accountability. Finally, statutes require alignment across health, education and labour market policies, avoiding duplication or contradictory measures helping to integrate policies across various sectors. This can help also reap benefits of existing cross-sectoral governance structures (see also Wismar and Goffin (2023)). Without a legal mandate, planning efforts risk being informal or temporary and thus heavily dependent on the political will of current leaders. This can lead to discontinuity when priorities change.

Legal frameworks build the groundwork for institutionalization by:

- defining institutional mandates for HCWF planning and forecasting, which implies that the agency, committee or independent body responsible for planning is specified and the scope is defined (Joint Action Health Workforce Planning and Forecasting, 2016; Kovács et al., 2016);
- establishing a statutory authority for data collection and integration to allow for the legal right to access registries, educational data, employment records and migration data and specifies standards for interoperability and confidentiality (Joint Action Health Workforce Planning and Forecasting, 2016; Kovács et al., 2016);
- mandating regular forecasting cycles to establish regular intervals for forecasting, with the aim to plan long, act short and update often (e.g. the three-year ACMMP cycle in the Netherlands); and
- linking planning outcomes to education and training quota mandates that inform admission quotas and curriculum design (e.g. the legal framework for PlanCad in Belgium links directly to reimbursement and professional regulation) (SEPEN et al., 2021).

Box 8. Points to consider when institutionalizing HCWF planning and forecasting

Strengthening policy implementation through governance
Governance is the connection between planning and implementation (Greer et al., 2019; Greer, Wismar & Figueras, 2016). Clear governance arrangements assign roles, responsibilities and accountability, ensuring policies are not only designed but actively carried out and refined over time. Dedicated structures enable adaptation to emerging priorities, such as new competencies in response to technological change or public health emergencies (EOHSP et al., 2020; Kuhlmann et al., 2025b; Williams et al., 2024). Reaping benefits from the existing governance mechanisms at the cross-sectoral level, created by the European Semester in EU Member States, is an opportunity for HCWF planning to become more central in policy decisions with cross-sectoral repercussions. Governance for HCWF planning has the potential therefore to go beyond boundaries of the health sector, increasing chances for stronger connection between planning and implementation.

Embedded systematic planning
Sustainable institutionalization requires moving from ad-hoc responses to structured, long-term workforce strategies. This includes planning for demographic shifts, growing service demands and competition for health care workers across sectors and borders. Institutionalized planning addresses both shortages and surpluses, aligning education and training capacity with projected needs (SEPEN et al., 2021; WHO Regional Office for Europe, 2022b; WHO Regional Office for Europe, 2023).

Ensure continuous data-driven decision-making
Sustainable systems depend on high-quality, regularly updated data that capture evolving realities such as working patterns, HCWF mobility, migration, mental health, digitalization and gender dynamics. Institutionalization must include mechanisms for ongoing evaluation, new indicator development and integration of both quantitative and qualitative insights (WHO Regional Office for Europe, 2022e). The EHDS can provide comprehensive insights into workforce demographics, distribution and skills, enabling more informed workforce planning and policymaking. Improved data accessibility can help identify trends, gaps and emerging needs, supporting strategies to address shortages, optimize training programmes and improve workforce mobility and deployment. Ultimately, the EHDS can support more data-informed decision-making that strengthens the resilience and efficiency of health systems across Europe.

Link workforce planning to health outcomes
Sustainable HCWF planning must also improve health equity, quality and safety. Institutionalized processes can align workforce deployment with service delivery reforms, for example by reinforcing primary health care (EOHSP, 2023; Kuhlmann et al., 2024a), or building capacity in emerging specialized areas, for instance, in response to technological innovation and AI (BeWell, 2025).

Build for long-term sustainability and health system resilience
Workforce training, recruitment and deployment take time to develop and produce results. Institutionalization helps secure the political and financial commitments needed to maintain investment in line with future health needs, reducing reliance on reactive crisis management and fostering preparedness for emerging challenges (McPake et al., 2024). Institutionalization is also crucial to drive informed discussions and policy developments on the productivity of the HCWF linked to opportunities brought by digitalization, use of AI and new ways of working.

Ultimately, there is no health without a workforce (Campbell et al., 2013). Meeting this complex demand for planning and forecasting requires strong institutions and governance that are capable of coordinating sectoral strategies across health, education and labour market sectors, public and private actors and diverse occupational groups. Institutionalization is the foundation for building a workforce that can deliver high-quality, equitable and sustainable health care now and in the future.

3. Building capacity for HCWF planning and forecasting

Without adequate capacity, institutionalization may not achieve its full potential. Effective HCWF planning and forecasting requires more than robust methodologies, in fact, they depend on the capacity of institutions, systems, and people to generate, interpret and apply evidence in ways that guide policy and practice. Capacity (defined in Box 2) can be built in different ways: by expanding the mandates, resources and coordination of existing institutions or by creating new bodies where current structures are weak or fragmented. AI can support HCWF planning by analysing the vast amount of data to predict workforce needs, identify skills gaps and optimize resource allocation. Digital twins present an opportunity in building capacity for HCWF planning. Regardless of the approach, the goal is to establish sustainable capabilities that can adapt to evolving health system needs.

Data, tools, skills, knowledge and infrastructure are the cornerstones to capacity-building

Among the most widely used methods and frameworks for HCWF planning are analytical tools that help countries link data, evidence and policy. HLMA is not a single validated tool but rather an analytical framework that combines key indicators on labour supply, demand, education and financing to understand workforce dynamics (McPake et al., 2024; WHO, 2016; WHO Regional Office for Europe, 2022b). It serves as a conceptual approach within HEROES that is used to inform the development of indicators and analyses within the HEROES advanced minimum data sets (AMDS). This allows for the integration of quantitative and qualitative dimensions, enabling countries to track factors such as teamwork, task shifting, digital transformation and health worker well-being, all of which are key drivers of change that influence planning outcomes.

The WISN tool, developed by WHO, is a validated and widely recognized tool that estimates staffing requirements based on actual workload data (WHO, 2023). The AAAQ framework is a validated normative framework rooted in human rights and used to assess equity in health workforce distribution and performance (Azzopardi-Muscat, Zapata & Kluge, 2023; Correia et al., 2020; WHO, 2022; WHO Regional Office for Europe, 2022b; Zapata et al., 2023).

Advanced analytical techniques, such as scenario modelling, system dynamics and AI-assisted analytics (i.e. AI driven scheduling systems for staff (Kuhlmann et al., 2025a)) or machine learning that supports hospital planning capacities (Qian, Alaa & van der Schaar, 2021), are increasingly used to estimate future workforce demand and supply under different demographic, economic and policy scenarios, refining forecasting accuracy and supporting adaptive decision-making.

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Together, these frameworks and approaches – underpinned by skilled analysts, interoperable data systems and institutional learning – form the foundation for robust, adaptive and forward-looking workforce planning capacity across Europe (see Part 2 for more information).

Capacity is more than tools – it requires skills, infrastructure and people

Tools and data frameworks are only as effective as the people who use and develop them. A skilled workforce capable of interpreting evidence and translating it into policy is essential for sustainable HCWF planning. Planning teams, such as communities of practice, require a blend of expertise in policy analysis, social sciences, demography, health economics, statistics, informatics and digital technologies (Box 9).[11] Equally important are qualitative research skills that capture the human face of the HCWF (Kuhlmann, Dussault & Wismar, 2020), thereby enabling an understanding of factors such as motivation, well-being, gender equity and factors influencing retention that quantitative models alone cannot fully explain.

These skills must be supported by a solid infrastructure. Comprehensive national registries of licensed health professionals, integrated HRHIS and interoperable IT platforms are critical for ensuring timely, accurate and actionable data. The best systems enable real-time data sharing between ministries, training institutions, employers and regulators, creating a living evidence base that supports responsive decision-making. Furthermore, progress in the implementation of the EHDS opens new opportunities for comprehensive data collection on the HCWF.

[11] The health workforce planning toolkit, developed within the Joint Action HEROES project by Semmelweis University can be useful to countries, specifically tools 4, 6 and 8 (Semmelweis University, 2025).

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Box 9. Communities of practice as learning infrastructures for policy and practice: an example from the Joint Action HEROES project

Capacity for health workforce planning and forecasting is not only about tools, data and models. It also depends on **people**, **relationships** and the **learning infrastructures** that enable continuous knowledge exchange, skill development and trust across institutions. **Communities of practice (CoPs)** are a key mechanism for building this kind of capacity, particularly in complex and evolving policy areas such as health workforce planning (Greenhalgh et al., 2004; Wenger, 2008).

The Joint Action HEROES project provides a concrete example of how CoPs can strengthen capacity across countries. As part of its approach, the HEROES project established a structured **CoP series** to complement technical work on workforce data, models and tools. The series brought together policy-makers, planners, researchers and practitioners from Member States, EU institutions and international organizations to engage in practice-oriented learning and exchange.

Across 13 sessions, the HEROES CoP addressed topics such as workforce flexibility and skill mix, minimum data sets and workforce mobility, how to model demand and need, advanced practice roles, national forecasting models (e.g. Norway) and workforce retention challenges.

The HEROES CoP functioned as a **learning infrastructure** rather than a formal governance body and involved 60–70 participants in each meeting with most attending regularly, indicating perceived value. In line with the benefits of a CoP, it supported capacity-building, strengthened analytical skills, enabled peer-to-peer learning, allowed tacit knowledge to be shared and fostered professional networks across countries and sectors (Wenger, 2008; WHO Regional Office for Europe, 2022b). Importantly, participation extended beyond HEROES partner countries, demonstrating demand for, and the value of, open and inclusive learning platforms. More generally, CoP can act as a **bridge between technical capacity and governance**, supporting adaptive, evidence-informed and sustainable health workforce planning (Greenhalgh et al., 2004). This is particularly the case when the CoP is connected to institutional processes, such as policy boards, advisory structures and national policy dialogues, and can help ensure that learning feeds into planning and implementation.

Countries build capacity in diverse ways, shaped by system context

Although these core components of capacity, the right tools, skilled personnel and robust infrastructure, define what capacity looks like in principle, their value is only realized when they are actively developed, maintained and adapted to national and regional contexts. Across Europe, countries have taken different paths to building this capacity, shaped by their governance models, resource availability and specific health workforce challenges. The following examples illustrate how diverse systems have approached the task, highlighting both innovative solutions and persistent limitations in turning institutional potential into operational strength.

Malta, for example, adopted an adapted NIVEL forecasting tool, integrated workforce data from regulatory bodies, employment agencies, immigration authorities and education institutions, and trained senior decision-makers to interpret and act on forecasts (Box 4). Sweden uses e-health infrastructure, virtual appointments and digital information-sharing to mitigate regional workforce shortages, supported by a multi-level learning system approach (Box 5). Statistics Norway produces profession-specific forecasts used in national budget planning, while the independent Healthcare Personnel Commission translates them into policy recommendations (Box 6). The

ACMMP in the Netherlands works closely with NIVEL and other research bodies to refine its models, integrating qualitative and quantitative inputs into a three-year cycle of recommendations (Box 7).

Box 10. Points to consider for capacity development

- **Develop advanced, data-driven models** that make use of demographic, epidemiological and workforce data, e.g. advanced minimum data sets (see Part 2), to predict future needs, balance supply and demand conditions in an adaptive and flexible manner and integrate qualitative indicators and research data into statistical analysis.
- **Establish multiprofessional planning** and include new groups (e.g. Maier et al. (2018)). These approaches can move beyond the medical and nursing professions and shift towards a more comprehensive national health system and capacity planning and include other health care workers as well as higher and lower-level health labour market segments. Sex/gender compositions and skill-mix changes would (logically) also be considered.
- **Integrate interprofessional and intersectoral cooperation** by engaging education, labour market, and social care sectors to improve evidence quality and ensure planning reflects the full ecosystem affecting HCWF supply and demand (Caffrey et al., 2023).
- **Apply dynamic, transformative approaches** that align workforce planning with changes in the organization of care, health priorities, migration flows, disruptive events and digital innovation, ensuring adaptability over time.
- **Strengthen participatory governance** by involving a wide range of stakeholders – governments, professional bodies, unions, training providers, civil society – in all stages of planning to ensure relevance, legitimacy and buy-in (Greer et al., 2019; SEPEN et al., 2021).
- **Promote equity** to reduce regional disparities within and between countries that might include sectoral imbalances, and existing social inequalities (i.e. gender-based, ethnic, sexual and other forms of inequalities and their intersections) (WHO Regional Office for Europe, 2022c).
- **Focus on the human side of the workforce** (Kuhlmann, Dussault & Wismar, 2020) by considering employment conditions, workplace safety, mental health and migration realities, integrating qualitative data and gender-sensitive indicators into planning (SEPEN et al., 2021). This point also supports the use of qualitative data and indicators (Byrne et al., 2023; Kluge & Azzopardi-Muscat, 2023).
- **Link national planning to global and European frameworks** by aligning with international recommendations to foster knowledge exchange, coordinate cross-border workforce strategies and strengthen resilience against political and social pressures that threaten HCWF stability.

By combining these elements, countries can build capacity that is technically sound, socially responsive and politically sustainable. Strong capacity ensures that planning and forecasting are not isolated technical exercises, but integral, adaptable processes embedded within health system governance, broader European Semester governance mechanisms and thus capable of meeting population needs.

4. How to govern HCWF planning and forecasting?

Governance determines who makes decisions, how they are made and how they are implemented. In the HCWF context, governance connects political leadership, institutional mandates, stakeholder networks and implementation capacity. It sets the rules of engagement for translating evidence into practice, aligns diverse actors towards shared goals and ensures accountability.

Governance (defined in Box 2) is the elephant in the room – "crucial to successful policy-making and implementation" (Greer et al., 2019) – yet rarely assessed, invested in or systematically strengthened. As a result, the importance of governance for effective implementation of planning and forecasting is both underresearched and insufficiently documented, with limited systematic evidence available. Much of the evidence comes from individual country cases or COVID-19 pandemic reviews (Caffrey et al., 2023; Williams et al., 2024; Wismar & Goffin, 2023).

There have been longstanding efforts to improve HWF forecasting and planning in countries notwithstanding there is a lack of research reflecting the high heterogeneity of EU Member States' administrative and governance arrangements, which makes the identification of universally applicable practices difficult. Countries often develop and institutionalize governance for HCWF planning on their own terms and timelines, responding to local political priorities, institutional legacies and capacities. However, this individualized approach also creates several problems: it limits comparability across countries, leads to uneven levels of maturity, and makes it harder to accumulate shared evidence on what works (Batenburg, 2015). In this context, articulating common principles has added value not because countries should adopt uniform structures, but because shared reference points can help guide system development, support mutual learning and reduce the risk that fragmented, or path-dependent arrangements, impede effective planning. Policy dialogues among countries participating in the HEROES Joint Action also highlighted a strong interest in continuing the exchange of practical solutions to common challenges in health workforce planning. Such principles offer a light-touch, top-down framework that countries can adapt to their context, while still enabling more coherent progress across the European Region.

Filling this gap would enable countries to better design and sustain their workforce planning systems, by identifying which governance actions and contextual factors most influence long-term resilience and effectiveness. This represents a key opportunity for comparative health system research, which could systematically explore patterns, extract transferable lessons and define a set of governance benchmarks or maturity criteria for institutionalizing HCWF planning across Europe.

Political leadership and appropriate funding are the backbone of governance

Political will is vital to set priorities based on population health needs, provide the necessary infrastructures and allocate resources for HCWF planning. Leadership is also essential for balancing diverse stakeholder interests and ensuring that planning processes promote equity. In this context, equity has two interconnected and equally relevant dimensions: ensuring fair opportunities, working conditions

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and career pathways within the health and care workforce, and ensuring equitable access to health and care services for the population. Effective leadership helps align these goals, for example, by addressing geographical maldistribution, skill-mix gaps or unequal training opportunities. Although some leadership functions can be delegated to independent bodies, success depends on strong statutory powers, harmonized governance measures, linked to cross-sectoral governance mechanisms such as those established by the European Semester in EU countries, and secure resources for HCWF planning.

Long-term funding is critical yet often lacking. In NHS systems, funding is especially vulnerable to political change. Independent bodies, multistakeholder networks and academic involvement can help, but they do not replace the need for committed, accountable government leadership.

Leadership must also promote new narratives for HCWF planning, moving beyond crisis response towards the co-benefits of effective implementation (Greer et al., 2024) – linking resilient health systems, worker well-being (BeWell, 2025; Kuhlmann, Dussault & Wismar, 2020; Kuhlmann et al., 2024b), labour market stability and economic growth (Caffrey et al., 2023).

Multi-level, participatory governance is the core of effective HCWF implementation

Effective governance requires a multi-level approach (Greer et al., 2022) that connects national, regional and international levels (Wismar & Goffin, 2023), aligns capacities across sectors (health, education, labour) and addresses the needs of diverse health care worker groups (Kuhlmann et al., 2021; SEPEN et al., 2021). Multi-level participatory governance is central to implementing HCWF planning, enabling countries to build more resilient and sustainable workforces (Azzopardi-Muscat, Zapata & Kluge, 2023). Linking governance for HCWF planning with existing cross-sectoral policy governance mechanisms, especially the European Semester, presents an opportunity for the uptake of results in policy implementation.

Policy dialogues and improved stakeholder involvement strengthen participatory governance

Policy dialogue is a powerful mechanism to strengthen participatory governance. It creates space for structured discussion between policy-makers, professionals, researchers and civil society, ensuring that workforce planning is grounded in both evidence and shared ownership. Such policy dialogues can be embedded in different institutional settings and follow either top-down or bottom-up approaches, depending on a country's governance model and administrative culture.

A top-down approach, sustained through an institutional stakeholder dialogue, can be seen in the following cases:

- the Netherlands' independent ACMMP (Box 7) (SEPEN et al., 2021);
- Malta's NHS bodies with triennial plans monitored annually (Box 4) (SEPEN et al., 2021) (WHO Regional Office for Europe, 2022a);

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- Ireland's evidence-focused stakeholder forums (Bruen & Brugha, 2020); and
- Czechia's rapid assessment engaging 39 stakeholder groups, with the support of WHO personnel (WHO Regional Office for Europe, 2025).

Bottom-up approaches, by contrast, are often network-driven and thrive in decentralized systems. In England's NHS, workforce modelling and data generation have been closely linked to implementation through collaboration with providers and professional groups, creating new transformational capacities (Willis, Cave & Kunc, 2018). In Germany's decentralized SHI system, regional workforce monitors, such as those in Rhineland-Palatinate and the Nursing Monitor in Hesse (IWAK, 2025), connect monitoring and research directly with stakeholder-driven policy-making (Kuhlmann, Lauxen & Larsen, 2016).

Participatory governance can be further expanded by including new stakeholders, such as non-health professionals (e.g. computer scientists, engineers and data scientists) (Frenk et al., 2022) and private-sector education providers (Fieno et al., 2016). This diversification can increase innovation and data quality but also introduces risks, such as conflicting interests or governance fragmentation – underscoring the need for structured coordination. Participatory governance can be advanced and used to build consensus and capacity through national and regional policy dialogues (Box 11).

Box 11. Policy dialogue and stakeholder involvement as pillars of participatory governance: an example from the Joint Action HEROES project

Policy dialogues are a valuable instrument for participatory governance. They provide structured spaces where governments, professional bodies, education providers, employers, researchers and social partners can jointly deliberate priorities, trade-offs and implementation pathways (Greer et al., 2020; Greer, Wismar & Figueras, 2016). They improve transparency, clarify roles and responsibilities, and foster shared ownership of workforce strategies. They also bring diverse perspectives into decision-making helping align planning with population needs, service delivery realities and labour market conditions, while increasing legitimacy (WHO Regional Office for Europe, 2022b).

Effective health workforce planning and forecasting require governance that enables inclusive decision-making, coordination across sectors and sustained political commitment. Policy dialogues enable this as illustrated by the Joint Action HEROES project. More than 50 policy dialogue sessions were organized across 18 countries in 2025, reaching over 350 stakeholders and helping participating Member States turn the evidence data and analysis into policy action. At the national level, countries such as Croatia and Belgium have used structured dialogue processes to build shared capacity including on workforce data standards, modelling approaches and digital skills development, while establishing foundations for continued collaboration.

Similarly, at the European level, international policy dialogues complemented national efforts by strengthening collective capacity across countries. These forums bring together Member State authorities, EU institutions, international organizations and stakeholders to exchange experiences, share practices and address cross-cutting workforce challenges. They contribute to mutual learning, the alignment of approaches and networks that support coordinated action, and help institutionalize participatory governance particularly where they are part of an iterative process rather than one-offs.

Coordination and collaboration connect sectors and professional groups

Coordination and collaboration are the ties that align institutions and stakeholders, spanning across macro- and micro-levels of governing, while transsectoral and multiprofessional interventions, together with strong leadership, are the cornerstones on which to build the implementation of HCWF planning outcomes.

Countries have expanded their analytical capacities and involved new professional associations to improve skill mix and planning (e.g. Belgium, Italy, Norway (Box 6), Spain, Sweden (Box 5), the Netherlands (Box 7)). This has increased the need for coordination, particularly to connect national and regional planning, strengthen subnational capacity and improve equity.

Coordination can be improved by either delegating leadership to independent bodies (Netherlands, some other SHI countries) or by using NHS institutions to integrate planning and coordination (Ireland, England, Malta). Finally, coordination must also operate internationally, facilitating an interface between global policy and national implementation – as shown by Malta's use of WHO and EU guidance (Box 4).

Research evidence and science must guide planning and implementation

Research is the basis for monitoring, forecasting and planning models, and is essential for evidence-based policy (George, Campbell & Ghaffar, 2018; Kuhlmann et al., 2018). Many countries have scaled up HCWF research, meaning they are investing in stronger research infrastructures, interdisciplinary networks and data systems that enable systematic study of workforce trends, policies and governance. Scaling up involves not only increasing research output but also enhancing the capacity, coordination and institutional integration of research, so that findings are comparable across countries and routinely feed into policy-making. These developments, accelerated during the COVID-19 pandemic (WHO Regional Office for Europe, 2022b), mark an important shift from ad-hoc analyses towards a more sustainable, scientific approach to workforce planning.

Yet, a persistent gap remains between evidence production and policy use (Correia et al., 2025; Kuhlmann et al., 2024c; WHO, 2022). Closing this gap requires governance structures capable of coordinating multisector, multistakeholder networks and translating findings into actionable strategies.

Academic institutions can play several roles in this process: acting as independent governing bodies (e.g. ACMMP in the Netherlands (Box 7)) or as partners to government (e.g. NHS systems in Ireland, England, Portugal; regional monitors in Germany). Furthermore, academic innovators and research champions, individuals or organizations advancing new models of analysis, education or collaboration, can strengthen workforce planning by connecting evidence with implementation. Developing health workforce research as a distinct academic field, with its own methodologies, career pathways and funding mechanisms, is a key condition for effective governance and long-term system learning (George, Campbell & Ghaffar, 2018; Kuhlmann et al., 2018).

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EU regulatory frameworks and international collaboration strengthen country action

Over the past decade, the EU has played a crucial role in supporting Member States to strengthen HCWF planning and forecasting. Initiatives such as the Joint Action on European Health Workforce Planning and Forecasting (JA EUHWF), SEPEN and now HEROES, have helped countries build analytical capacity, improve data infrastructure and move towards greater institutionalization of workforce planning (JA HEROES, 2023a; SEPEN et al., 2021). These long-standing efforts demonstrate the added value of EU-level collaboration: countries benefit from shared methodologies, peer learning and collective investment in capacity-building that would be difficult to achieve independently (Azzopardi-Muscat, Zapata & Kluge, 2023; WHO Regional Office for Europe, 2022b).

These efforts would be sustained and expanded by encouraging the participation of more Member States in the various projects and actions. EU-supported mechanisms already provide an established governance platform for coordinating policy priorities and guiding investment decisions (European Commission, 2023). Embedding HCWF planning more explicitly within this framework could further enhance policy coherence and long-term sustainability, linking workforce goals with broader economic, education and social strategies (Greer et al., 2019; Rees, Willis & Scotter, 2025; WHO Regional Office for Europe, 2022b).

Collaboration at the EU level also facilitates the harmonization of monitoring and planning systems. The SANDEM (Supply ANd DEMand) model (European Commission & Directorate-General for Health and Food Safety (DG SANTE), 2021), developed at the EU level, represents a promising step towards a more unified and transparent approach to health workforce monitoring. By integrating data on employment, education and population needs in a consistent analytical framework, SANDEM complements the national-level modelling work under the HEROES project and could serve as a common reference for cross-country comparisons (European Commission, 2024; Maurer et al., 2023; Wismar & Goffin, 2023).

The policy dialogues, held within the scope of the Joint Action HEROES project, underscored broad agreement that strengthening workforce planning requires more strategic, institutionalized approaches aligned with EU mechanisms and shared learning across Member States. Ultimately, strengthening European collaboration is not about starting from scratch but about consolidating and scaling what works: building on JA EUHWF, SEPEN and HEROES to deepen coordination between national and EU processes, consistently embedding workforce considerations into cross-sectoral governance frameworks and ensure that evidence continues to guide equitable and resilient health systems (Azzopardi-Muscat, Zapata & Kluge, 2023; Caffrey et al., 2023; WHO Regional Office for Europe, 2022b).

Box 12. Points to consider to create and maintain strong governance

- **Creating multistakeholder** partnerships to coordinate professional associations, academia and policy-makers, grounded in trust, equity and gender equality.
- **Aligning and coordinating regulatory agencies** across the health, education and labour sectors.
- **Integrating education policy** with workforce planning, linking forecasting to training quotas and programme design.
- **Engaging regional stakeholders** to address disparities and adapt strategies to local realities.
- **Integrating international expertise** to exchange knowledge, foster policy learning and support EU and global collaboration.

5. Implementation considerations

Turning institutionalization, capacity-building and governance frameworks into practical, system-level improvements requires careful implementation strategies. Lessons from the European experience, including those documented through the Joint Action HEROES country cases (Boxes 4–7), show that successful implementation is systematic, multi-level and sustained rather than ad hoc (Winkelmann et al., 2022).

Anchor reforms in legal and institutional frameworks

Institutionalization is more sustainable when embedded in law and supported by statutory mandates. Clear frameworks define responsibilities, scopes of practice and accountability that ideally shield planning processes from short-term political cycles. The Netherlands' ACMMP (Box 7) demonstrates how legally mandated forecasting cycles safeguard continuity, while Belgium's PlanCad ties legal mandates directly to training quotas.

Secure sustainable resources such as funding and supportive payment models

Sustainable, multiannual funding is essential for ensuring that planning and forecasting of the health workforce is considered as a statutory function and also for implementing capacity reforms. Financing arrangements could reward training, role expansion and multiprofessional teamwork. The Netherlands (Box 7) underpins its workforce planning with statutory, recurrent funding for the planning infrastructure itself, whereas Malta (Box 4) has relied primarily on project-based support from EU and WHO programmes.

Invest in multi-level governance and stakeholder engagement

Implementation succeeds when governance connects national, subnational and regional levels and when stakeholders are meaningfully engaged. Evidence shows that reforms are more sustainable when professional associations, providers and other actors are included not only in discussions on task shifting and role redesign, but also in shaping capacity-building efforts, data and forecasting approaches, and decisions on resource allocation (Bruen & Brugha, 2020; IWAK, 2025; Willis, Cave & Kunc, 2018).

Build capacity through education, infrastructure and workforce planning

New institutional arrangements require skilled personnel, interoperable data systems and interprofessional training. Without investment in education and continuous professional development, reforms stall (Maier et al., 2022).

Integrate skill-mix and team-based innovations into planning

Planning can do more than anticipate workforce numbers. It can address roles and competencies. Evidence from skill-mix innovations shows that task shifting, relocation of care and coordination roles (e.g. case managers, patient navigators) improve efficiency and outcomes of HCWF planning (Apuzzo et al., 2023; Dubois & Singh, 2009; Maier et al., 2022).

Monitor, evaluate and adapt through learning systems

To be effective, implementation must be adaptive, with regular evaluation of forecasting models, planning processes and governance arrangements. Sweden's learning system approach (Box 5) demonstrates how iterative monitoring allows planning to evolve with changing needs. Broader evidence from skill-mix reforms confirms that feedback loops, i.e. monitoring new roles, documenting outcomes, and scaling up what works, are essential for its success (Greenhalgh et al., 2004; Maier et al., 2022).

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Annex. Rapid scoping review methodology

A rapid scoping review was carried out, drawing on the methodology described by Arksey and O'Malley (2005) that comprises a database search (e.g. PubMed), grey literature and hand search, documents and expert information. Against the backdrop of extensive information from systematic reviews published elsewhere, European Union (EU) reports (SEPEN et al., 2021), and the Joint Action HEROES projects materials, the search strategy for this policy brief was limited to more recent research published from 2015 onwards and the research questions; the focus was on the institutions for health care workforce (HCWF) planning.

A PubMed search was carried out on 5 February 2025.

- Search term: *(health workforce planning Europe) AND (institutions)* gained 741 results; after reviewing the titles (if necessary, also the pubmed summaries), 19 articles were selected for an abstract review, and 10 of these were finally included in the analysis following a full text review. Exclusion criteria were: articles published before 2015, not available in English, with a focus on a single profession/workforce group and/or one or more countries outside Europe (with a few exceptions that served as case studies to highlight broader issues), commentaries without original research/literature reviews, study protocols without results and statements from professional associations and interest groups.
- In addition, the search term was specified: (health and care workforce) AND (monitoring)) AND (planning)) AND (Europe)) AND (forecasting); 18 results were reviewed applying the same review and exclusion criteria; after excluding one duplicate already identified in the previous search, two articles were selected for full text review and included in the analysis.

An additional hand search made use of bibliographies of relevant articles, information from websites and documents from WHO and the European Observatory on Health Systems and Policies, HEROES project websites and reports and other relevant EU HCWF projects, and additionally, website material from national/regional governments. Expert information and selected country case studies from the HEROES members provided further insights.

The selected material was analysed, using qualitative thematic analysis, and considered for the country analyses and the development of policy recommendations.

The country cases primarily serve to illustrate several available options to govern and institutionalize HCWF planning, forecasting and monitoring. The case study design does not intend to provide a comparative overview of health systems and HCWF characteristics in the EU.

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Joint Action HEROES Contact Details

National Agency
for Regional Health
Services (Age.Na.S), Italy

heroes@agenas.it
@ja_heroes
www.healthworkforce.eu