Advice on unmet health care infrastructure needs in Italy

SUMMARY OF THE EVIDENCE ON 12 REGIONAL HEALTH SYSTEMS

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1. Introduction

The current health emergency has placed health investments at the top of the international and national policy agenda (Policy Objective 4 of the Cohesion Policy "*A more social and inclusive Europe"*; NextGenerationEU; national Recovery and Resilience Plan; etc.). Incentives for public investment projects to make European health systems more resilient, sustainable and better prepared for future health challenges will be soon available therefore a proper identification of specific and evidence-based unmet health investments in peace and crisis times is required both at national and local level.

This document provides a summary of the current gaps / challenges and long-term investment priorities for a representative group of Italian regional health systems (RHS). The Italian RHS analysed are displayed in Figure 1: Piemonte, Lombardia, Veneto, Liguria, Toscana, Umbria, Sardegna, Campania, Basilicata, Puglia, Calabria and Sicilia. Country-specific recommendations are also drawn.

Specifically, the report displays a picture of the performance of the 12 Italian RHS before the Covid-19 pandemic, a summary of the types of health investment required and a synthesis of the investment expected at regional level to strengthen access and provision of healthcare services and the resilience and sustainability of the health systems to cope with Covid-19 pandemic.

Figure 1. **Italian Regions analysed**

2. Sources and methods

To facilitate the discussion of the summary of regional healthcare infrastructure needs, we have refered to the conceptual framework proposed in deliverable 1[1]. The framework is an extension of the OECD conceptual framework proposed by Arah et al. (International Journal for Quality in Health Care, 2006) and focuses on the quality of health care adapting the broader perspective on health and its other determinants. Indeed, population health status is determined by multiple interdependent factors: non-healthcare determinants of health (e.g. behaviour and lifestyle, socio-economic conditions), health care performance (e.g. quality, accessibility, appropriateness) and, health care system design and context (traditionally financing, delivery and governance model). Due to the renewed strategic relevance of ICT and e-health for strengthening health system performance and boosting resilience, the framework emphasized also this dimension.

Investments in healthcare infrastructure should consider all the above aspects. The analyses was carried out combining desk research and interviews. The first step involved the selection of publicly available statistics and indicators traditionally used to represent the performance of key determinants of population health status complemented with the analysis of the last regional health and social care strategic documents. This evidence has been complemented with interviews to regional policy-makers and experts. A structured discussion of the statistics and indicators selected have been also presented in three thematic deliverables (deliverable 2) on: i) acute, community and long-term-care; ii) public health, primary care and care pathways; iii) ICT and e-Health.

Health investment needs have been identified on the basis of the analysis of the latest data/statistics publicly released (2018 or 2019), official national and regional acts or public reports (in this case information include also updates referred to 2020 and the first months of 2021).The level of analysis was carried out at regional level. Table 1 captures the main sources consulted for each health dimension considered.

Table 1. Main sources of information used

Dimension	Sources	Year
Population health status	ISTAT Health for All databases (National Statistical Institute)	2018
Non health care determinants	ISTAT Health for All databases (National Statistical Institute)	2018
Health care performance	• Griglia LEA (Ministry of Health) • Rapporto SDO (Ministry of Health) • Annuario Statistico (Ministry of Health) • PNE (National Outcome Program) managed by Agenas • Sistema di valutazione del Network delle Regioni (Inter-Regional Performance Evaluation System) managed by Laboratorio Management & Sanità - Scuola Superiore Sant'Anna Pisa	2018 2019 2018 2019 2019

[1] Deliverable 1 "A framework for assessing priority in health investments needed in Italy under the programming period 2021/2027 of the Cohesion Policy".

Health system design and context	• Ministero della Salute • Ministero dell'Innovazione Tecnologica • Agenzia per l'Italia Digitale (Agid) • Corte dei Conti Report • Financial statement from Ragioneria Generale dello Stato • Regional documents and institutional websites	2018-2019 or the latest strategic regional health acts referred to the Regional Health organization
Information on Covid-19	Official documents and info available on institutional websites: • Ministero della salute • Istituto Superiore di Sanità (ISS) • Agenzia Nazionale per i servizi sanitari regionali (Agenas) • Regional websites • Daily press (Sole 24 ore; Quotidiano Sanità; etc.)	From 2020
ICT & eHealth	Official documents and info available on institutional websites: • Ministero della salute (MoH) • Ministero dell'Innovazione tecnologica • Ministero dello sviluppo economico (Mise) • Istituto Superiore di Sanità (ISS) • Regional websites • Daily press (Sole 24 ore) • WHO and OECD	From 2018

3. Summary of the priority areas

Table 2 provides the level of investment priority by area of performance in the 12 RHS analysed. In particular, for each area of care performance we have identified the level of investment priority based on the relative performance achieved by each RHS. Three priorities of investment' needs are identified: high, medium, and low in accordance with the relative low, medium or high performance registered throughout the indicators and documents retrieved. Hence, the three levels of priorities provide the level of expected attention that should be given to the investment in each area/setting of care.

Table 2. Level of investment priority (high – medium – low) across the determinants of health in the 12 regions analysed

	Northeren Italy				*Central Italy*		*Mezzogiorno*					
	PIEMONTE	**LOMBARDIA**	**VENETO**	**LIGURIA**	**TOSCANA**	**UMBRIA**	**CAMPANIA**	**PUGLIA**	**BASILICATA**	**CALABRIA**	**SICILIA**	**SARDEGNA**
Population health status												
Population health status	Medium-Low	Low	Low	Medium-High	Low	Medium	Medium	Medium-High	Medium	Medium-High	High	Medium-Low
Non - health care determinants of health												
Healthy life style	Low	Low	Low	High	Low	Low	High	High	High	High	High	Low
Healthcare system performance												
Public health	Medium	Medium	Medium-Low	Medium-High	Medium	Medium-Low	Medium-High	High	High	High	High	Medium-High
Acute care	Low	Low	Low	Medium-High	Low	Medium	Medium-High	Medium	Medium	High	Medium	Medium-High
Primary and community care	Medium	High	Medium	Medium	Medium	High	High	Medium-High	High	Medium-High	Medium-High	Medium
Long term care	Medium-Low	High	Medium-Low	Medium	High	High	High	Medium-High	High	High	Medium-High	High
Chronic path	Medium-High	Medium	Medium-Low	Medium	Medium	High	High	Medium	High	Medium-High	High	Medium-High
Health system design and context												
Fixed tangible assets (obsolescence)	High	Medium-High	High	High	Medium-High	High	High	High	High	High	High	High
Capital investments (use of framework agreement)	High	Medium	Medium	Medium	Medium	Medium-High	High	High	Medium-High	High	High	High
ICT solutions	Medium	Medium-Low	Medium-Low	Medium	Medium-Low	High	High	Medium-High	High	High	Medium-High	Medium-High
ehealth services	Medium	Medium	Medium-Low	Medium	Medium	Medium-High	High	Medium-High	High	High	High	High

4. Summary of the healthcare unmet needs and type of investments

From the priorities identified a list of investment has been developed using the analyses of evidence, official documents as well as the consultations with regional policy-makers and experts. This list should not be considered a ranking of the strategies because each area that needs investments is interdependent with the others. Hence, with this list we intend to provide an indicative trend for supporting resource allocation and planning of related interventions.

Table 3 reports the types of investments required to close the gap of the unmet needs identified during the analyses. In particular, *tangible investments* are related to the acquisition or renovation of equipment, other fixed assets and information systems; *intangible investments* concern the training, the incentives provided to personnel and the software solutions including new data information flows; *new technology investments* include investments in research and advanced information technology systems; *organizational investments* are related to regulations, use of monitoring systems and classification systems, financial reimbursement and so on.

Table 3. The suggested areas of intervention by type of investment

Area of intervention	**Region interested**	**Tangible investments**	**Intangible investments**	**New technology investments**	**Organizational investments**
Renovate equipment and fixed assets	All	✓	✓		✓
Train, recruit, and retain the health workforce	All		✓		
Digital literacy and skills	All		✓		✓
Support the new generation of (integrated) health information system	All		✓	✓	✓
Introduce/ further deploy telemedicine and digital solutions	All	✓	✓		✓
Reinforce the role of primary care and chronic care management	Piemonte, Basilicata, Calabria, Campania, Liguria, Sardegna, Sicilia	✓	✓		✓
Strengthen the governance of the regional health system	Basilicata, Calabria, Campania, Liguria, Lombardia, Puglia, Sardegna, Sicilia	✓	✓		✓
Support the strengthening of continuity across settings of care	Lombardia, Toscana , Veneto, Umbria	✓	✓		✓

Area of intervention	Region interested	Tangible investments	Intangible investments	New technology investments	Organizational investments
Strengthen intermediate care and long term services	Basilicata, Campania, Liguria, Puglia, Sardegna, Umbria	✓	✓		✓
Strengthen palliative care	Basilicata, Umbria	✓	✓		✓
Strengthen prevention and health promotion	Basilicata, Calabria, Campania, Liguria, Puglia	✓			✓
IT advanced solutions	Lombardia, Puglia, Piemonte, Veneto, Toscana	✓		✓	✓
Strengthen the governance of the hospital networks	Calabria	✓	✓		✓
Waiting list management	Calabria		✓		✓
Support health planning and new Regional Health System governance	Piemonte		✓		✓

5. Investment common among Regions

Table 3 highlights that there are five investment areas that are common to all 12 RHS analysed. When the same investment are needed in all RHS is possible to assume that those kind of investments are of national relevance. The five interventions suggested across all the Regions refer to the health system design and context and in particular, concern physical resources, human resources and ICT and eHealth.

1. **Physical resources** refer to structural capital investments and technology. In particular, data from the regional healthcare financial statements highlight a high obsolescence rate for fixed assets (63% on average going from 51% to 89% among all Italian regions) and for health equipment (88% on average going from 81% to 96% among all Italian regions) which suggest to pay attention to renovation/substitution of medical technologies. Hence, there is the need to **renovate the equipment and fixed assets of public providers.** In doing this, it is important also to address resources to boost the capacity to use the earmarked funds **reinforcing both multiannual planning and the management of capital and infrastructural investments.**

2. **Human resources.** During the Covid-19 pandemic a significant amount of resources have been addressed or planned to be spent for personnel, both hiring new healthcare workers as well as incentivizing them to work extra hours. The investment strategies considered essential in this period are **the training, recruitment, and retention of the health workforce.** In this case, the training is critical beyond this epidemic. In particular, training is needed to support the

organizational changes in the chronic care model and long-term care. Training of health workforce for upgrading and upskilling of staff, with particular attention to the newly recruited community and family nurses on their extended roles. A strong investment in recruitment and retention strategies for the general practitioners (pediatricians included) is also a priority.

3. Another intervention related to **human resources** include the acquisition of **digital literacy and skills.** Specific actions like training sessions and communication/awareness-raising campaigns for increasing digital literacy towards different target users are a priority (citizens/elderly patients, primary care physicians, and health workforce in general). Investments for the training of healthcare professionals in promoting the use of digital technologies are needed, particularly for those working in health facilities and hospitals that still show a low usage level of the *Fascicolo Sanitario Elettronico* and other integrated digital solutions.

4. **ICT and ehealth. Supporting the new generation of (integrated) health information system** based on innovative methods: interoperability and application integration **and governance/analytics tools** for monitoring and managing intermediate care, long term care and synergies among public and private providers.

5. **ICT and ehealth. Introduction/ further deployment of telemedicine and digital solutions.** The new telemedicine services introduced for the management of the Covid-19 pandemic should be supported in terms of investments for the "reuse" and development beyond the pandemic to become ordinary services of the regional health services overcoming their status of piloting tools. According to the health status indicators of each Region, they should be applied for improving the daily care of the primary, acute, and community settings particularly for chronic and fragile patients.

6. Investment suggested for specific regions

In this section are reported the investments identified in Table 3 for single or group of regions. In particular, following the conceptual framework we listed the area of investments suggested first for the health system design and context and then for the health care performance.

With the regard to the **health system design and context** the interventions refer to the governance mechanisms and ICT & health information system.

1) Governance mechanisms. From the analysis carried out through the documental analysis and performance data, nine over twelve regions need to strengthen the governance of their health system. The aspects which seem to be common to at least two regions are: a) the integration and use of health information systems, b) the planning phase and c) the detection of the low level of quality perceived by population.

a) Concerning the **integration and use of health information systems,** it is mainly reported to better monitor and control the performance at providers' level strengthening their integration at different settings of care (Lombardia, Campania, Liguria, Sicilia and Sardegna). In particular, Lombardia needs new health information systems to support the governance of the high fragmentation of ownership of both hospitals and long-term care facilities; Sardegna seems to have some difficulties in collecting information on community care and long term

care, and waiting times, while in the other cases the regional health information systems already in place should be more used from both regional and provider level.

b) The support in the **planning phase** seems to be an issue for Piemonte and Sardegna. Both Regions have been reorganizing their health care system but the planning stage is getting longer. In particular, Piemonte needs to pay attention to a faster release of its broader regional triennial plans to provide an updated picture of long-term strategies for healthcare. In fact, whilst there are setting-specific health plans, namely the regional prevention plan, updated every 3 years, the latest overall regional health plan is that of 2012-15. Instead, Sardegna may need the support in the implementation of the pending 2020 regional reform that introduced a number of institutional changes (such as the new agency ARES) but also Sardegna needs to speed up the process of the approval of the health plans and programs. Indeed, the long-lasting legislative processes led Sardegna introducing new organizational models with large delay with the respect of the other regions as it happened for instance for the chronic care or the hub & spoke model in the hospital setting.

c) The **detection of the low level of quality perceived by population** regards primarily Basilicata, Calabria and Puglia. Both regions displayed low level of quality perceived by population in terms of escape rate for acute care (among the highest), rate of patients leaving the hospital against medical advice (among the highest) and level of satisfaction of inpatients towards medical doctors and nurses (among the lowest). This evidence is a clear alert that deem to be further analyzed to better understand the reasons of such performance and then identify the appropriate strategies to be pursued.

Another cross-cutting element that could be referred to the governance mechanisms is the **implementation gap.** Often what is written into strategic and planning documents has not yet put in place. This aspect has been reported more in detail when dealing the health performance dimension.

Other aspects related to governance seem to be region-specific.

Specifically, given the strategic relevance of the **upcoming introduction of the medicine faculty** in Basilicata, investments could be channelled to help this region **redesigning its organizational structure and its governance tools given the** benefits of this opportunity.

Piemonte may need to ensure better communication among all actors and citizens, investments could be also channelled to **ease the access to key information related to the RHS** (i.e. Regional Health Plan, Performance data, key legislative acts such as regional law and proposal of law) also through a more efficient web portal of the RHS.

Instead, stronger support is needed to help Calabria region. The region needs strategic projects as well as an **intelligence** (team) that provides evidence and solutions on how to manage the **change both at the regional level** to lead all public and private providers to align their activities at a system perspective **and at local level** supporting the local managers to lead the change within the hospitals' walls. In this direction, **there is the need to reinforce the implementation of strategies included within the so called "*Decreto Calabria*" issued by the national government such as the tight outcome monitoring system for general manager**. Yet, there is an issue of who wants to take the role and responsibility to work in a critical region at the same financial conditions of executives and middle management working in other regional health systems. In this situation, leading the change can be seen difficult and risky. Hence, **there is the need to envisage human resource strategies**

mixing both financial incentives and other rewarding systems that can attract and retain experienced health care managers and professionals at the various level (regional and local).

2) **ICT, Health information systems and IT advanced solutions.** There are some local experimental solutions but there is no quantum leap towards solutions on a large scale that are fully integrated with the RHS and/or NHS. Investments for IT advanced solutions can be appropriated for regions such as **Lombardia, Veneto, Toscana, Piemonte** and **Puglia** that already have got a high IT maturity level in terms of integration and application of interoperability standards in their digital health services. Dedicated funds can be allocated for a more systematic introduction of IT advanced solutions for improving technological development and for facilitating the potential transfer/re-use of best practices among the different Italian regions so strengthening a more advanced national ecosystem perspective.

With regard to the **health system performance** the interventions refer to public health, primary and community care, long term care, acute care and care pathways.

1) **Public health.** From the analysis carried out through the performance data, the majority of RHSs in Southern Italy reported poor performance for prevention and health promotion. The aspects which seem to be more common are: a) poor attendance to prevention programs (screening and immunization); b) healthy lifestyles.

   a) Investment supporting the attendance to the free population-based cancer screening programs (breast, cervical and colorectal) is highly needed in **Calabria, Campania, Puglia, Sicilia,** and **Sardegna** since the coverage is very low, while **Lombardia** should reinforce the attendance to cervical cancer screening. Childhood immunisation should be boosted in **Sicilia** where both hexavalent and MMR coverage is below the standard. Among prevention strategies, another significant immunisation to reduce morbidity, complication and mortality is influenza vaccination. Boosting flu vaccination coverage for the elderly is a priority in **Lombardia, Piemonte** and **Sardegna**.
   b) In **Basilicata**, **Calabria**, **Campania**, **Puglia,** and **Sicilia** there is the need to identify effective strategies in the promotion of healthy lifestyles (e.g. physical activities and correct diets), especially among the young given the high share of the obese population. In these regions, investments in outdoor fitness equipment in public spaces to ease and encourage physical activity as well as multifunctional spaces to host health prevention and promotion actions should be envisaged. Such an unmet need has already been reported within the strategic document "*Piano per il Sud 2030*"[2], proposed by the Ministry for Southern Italy and Territorial Cohesion. **Liguria** shall also keep an eye on the rise of the adult obese population even though the level is below the national average planning investment in promoting healthy lifestyles especially to cope with a sedentary life-style.

The pandemic situation has also highlighted the need to increase the integration between public health and primary care. Better coordination is crucial in times of epidemiological emergency for surveillance, the early recognition of infections and fast tracing. Moreover, the integration of prevention and primary care remain highly relevant to ensure the shared goal of population health

[2] http://www.ministroperilsud.gov.it/media/2003/pianosud2030_documento.pdf

improvement. Improvements in triage and referral management systems for prevention are needed to support earlier diagnoses.

2) **Primary and community care.** From the analysis carried out using the performance data and regional strategic documents, the investments needed should focus on: a) reinforcing the role of primary care; b) effectively implementing chronic care management; c) supporting the enhancement of community care; d) increase home care assistance.
   - **a)** The fragmentation of primary care services and low integration with the rest of the healthcare services has been a clear weakness in the pandemic response. Reinforcing the role of primary care through the identification of aggregative and multi-disciplinary working models specific for each RHS considering the specific local health needs and infrastructures already in place or planned. For example, **Campania** should focus on the conversion of existing facilities into facilities offering multi-specialist health and social care (*Strutture Polifunzionali della Salute*). Also, the gatekeeping role of primary care should be reinforced as a mean to optimise the efficiency of use (both over use and under use) of specialised services (**Calabria** and **Campania**). In this light, investments can include improvements in triage and referral management systems and an increased number of GPs and primary care nurses for prevention and follow-ups. Early diagnosis by GPs can also benefit from investments in medical equipment and diagnostic technologies for prevention and diagnosis.
     From the data available, **Sicilia** should pay attention to the efficiency of the pediatric area where it registered a higher mortality rate and one of the highest hospitalization rates for asthma and gastroenteritis.
   - **b)** The **management of chronic care conditions** showed **room for improvement in all RHSs**, some are lagging behind and need to expedite the development and implementation (see **Calabria**). Often investment should target improvement in workflows with the development and introduction of clinical governance tools such as standardized Diagnostic, Therapeutic and Care Pathways (**Basilicata, Piemonte** and **Sardegna**), update of ICT systems for sharing of care plans and other health information between providers to enable collaboration (**Campania** and **Umbria**), equipment as well as ehealth systems (ie. telemedicine) (**Basilicata** and **Sardegna**). All RHSs should strengthen investment for multidimensional performance evaluation of care pathways as already planned in Liguria.
   - **c)** **Strengthening of community care** with investments for reconverting healthcare facilities for community care and/or activation of new community hospitals and introduction of community team / nurses. **Toscana**, **Umbria, Piemonte** and **Sardegna** have made clear in their strategic planning the priority to keep investing (renewal/refurbishing or new building) in *Case della Salute* (or *Community Health Centers*), while **Lombardia** should invest in the activation of the *Presidi ospedalieri territoriali* (POT) *Presidi socio sanitari territoriali* (PreSST) as designed in the last health reform (2015). **Veneto** during the Covid-19 emergency highlighted the importance of care continuity and transitional care also reinforcing the role of the operative central units (*Centrale Operativa Territoriale*) and the USCA (*Unità Speciali di Continuità Assistenziale*) for care continuity. Similarly, **Calabria** amidst the pandemic confirmed the role of *Centrale Operativa Territoriale* as the contact point to activate and orient patients. **Liguria** during the Covid-19 pandemic activated a regional agency (*Centrale regionale*) to ensure

continuity between hospital and community services. Such newly organizational models should be assessed to support their expansion.

d) **Strengthening home care services** in the first place for patients with frailty, disability and chronicity problems. Integrated home care is very limited in all regions, with the exception of Basilicata and Toscana where the support is well above the national average. The introduction of family nurses should contribute towards the increase of home care services and treatments together with the implementation of telemedicine solutions. Boosting home care is a **priority especially in remote areas to ensure proximity and easier access to non-acute /primary care services**.

3) The need to strengthen **long term and intermediate care** seems to be recurrent issues across RHS. The reinforcement of **intermediate care and long term services** requires investment in monitoring the performance of all providers (public, private and not for profit), a common weakness among all the RHS. Furthermore, there are regions requiring efforts to align the number of beds and patients using residential and semi-residential care to the Italian average (**Campania**, **Liguria, Sardegna, Basilicata and Umbria)**. In some cases, like Umbria and Sardegna already recognized the need to increase the number of beds for intermediate and long term care in their strategic documents. **Umbria** planned to increase the number of beds listing as an important unmet need the lack of facilities for the youth problems, which is an area not monitored by the current Italian performance evaluation system. **Sardegna** highlighted the need to invest in intermediate into the new regional health law n.24 of 2020 that emphasized the role of community hospital (*ospedale di comunità)*.
Looking at long term care, **Liguria** should consider it a priority for investment since is the region with the highest share of elderly population.

4) Some regions encounter the need to improve specific aspects of **acute care**, such as the concentration of outcome volumes, which can be achieved from the exploitation of the current performance assessment systems. It seems relevant, in terms of infrastructural investments, the need to **strengthen the governance of the hospital networks of Calabria.** The performance of acute care highlighted that Calabria needs to reinforce the quality of care and the appropriate use of the hospital setting. From one side Calabria has to limit inappropriate access to acute care also investing in primary and community care. From the other side Calabria needs to support the implementation of a number of diagnostic therapeutical protocols (as already identified in the 2019-2021 Plan) as well as to carefully plan and govern some areas of care such as **cancer care, maternal care and other areas that register a high share of patient seeking care outside Calabria region.** Also, sharper governance/regulatory mechanisms for purchasing services from private accredited providers should be implemented.

5) Considering the care pathways, **supportive and palliative care** at end-of-life are a core component even though only recently at national and regional level specific attention has been placed. Since 2017 palliative and end-of-life comes within the Essential Level of Care covered by the NHS. Data included in the analysis reported the need to reinforce the number of hospice beds and in general, the palliative care networks (outpatient care, home care services, as well as the use of opioids and other drugs to control the pain) in **Basilicata** and **Umbria**.

To **exploit further the role of palliative care across all RHSs**, investment should be channelled towards research and training given the newly approved residency in palliative care starting in the academic year 2021/2022 and required to introduce the subject also in paediatrics[3].

6) A common weak point across all the RHS is the need to strengthen **continuity of care across settings**. A **recurrent challenge across Italian RHS** is the fragmentation of services; specifically, a weak hospital - community care (territorial) integration and still unsatisfactory primary - specialist care integration (see above on primary care) above all. This fragmentation is dangerous especially for chronic and frail patients that often require care and assistance by different providers/settings (primary, hospital and community). To this end, services and professionals should be vertically integrated to provide appropriate and responsive services along the care pathway, especially for people with complex care needs (e.g. improving the involvement of community services post-discharge or limiting inappropriate access to acute facilities). Also, horizontal integration, i.e. collaboration between primary care and specialists, is essential. In this way, strengthening multi-professional and multi-disciplinary groups of practice is a priority.

7) **Waiting times and waiting list management** is another strategic area that needs to be improved in some RHS to increase efficiency, effectiveness (early diagnosis), and satisfaction with health services. Indeed, waiting times are one of the main concerns for citizens and long times can be a reason for delay or forgone care, mobility to other regions or, private providers, creating inequity in access. From the data analysed, **Calabria** is the region that needs the heaviest investment to strengthen system capacity to cope with delays in outpatient services and provide citizens with better and easier access to these services, for instance through the implementation of the regional-based booking centre (*Centro Unico Prenotazioni – CUP*). All RHS are currently revising their offer of outpatient/diagnostic services, interventions and therapies to cope with the delays / postponement accumulated during the first (spring 2020) and second wave (autumn 2020) of thee Covid-19 pandemic due to the reduced offer. Therefore, this can become a **strategic area to monitor for future investments across many RHSs**.

7. Concluding remarks

In this final section, we provide some concluding remarks highlighting strengths, limitations, and future advancements of this work.

The three thematic and regional-level analyses on unmet healthcare infrastructure needs in Italy were carried out between October 2020 and March 2021. They provide a detailed and informative picture of the priorities for investment and type of long-term investments expected at the regional level to strengthen access and provision of healthcare services and the resilience and sustainability of the RHSs. Such advice is based on RHS performance before the Covid-19 pandemic, the actions taken at the national and regional level during the pandemic, and informative interviews with regional policymakers. In addition, the analysis puts forward some possible investments needed at the national level.

[3] Article 5 of Decree Law 32/2020 “Decreto Rilancio”.

Overall, our advices on health infrastructure needs are in line with the investment areas identified at national level in the Recovery Plan. The main benefit of this work is the regional breakdown of the priority areas identified for each of the 12 RHSs.

One of the main strength of the analysis performed is the collection and selection of evidence-based and official statistics that are common among all the RHSs thus ensuring i) a valid and robust representation of the context and the performance achieved by each region, ii) benchmarking, iii) replicability and the possibility of routine updates. With regard to this last point, the update of the evidence using the same dataset and indicators, could be important during the EU 2021-27 programming phase to address future European investments in a coherent way over time, also in relation to the possible effects of the initial allocations and the changes that will occur during the next years.

Another strength of the work is the use of the information gathered from both official documents and those received from the regional contacts in a qualitative way to review the statistics. Moreover, this kind of information filled the gaps of the evidence publicly available and/or provided more recent snapshot of the regional situation.

The analysis is not far from limitations. One limitation refers to the fact that often there are limited or no documents available on planned capital investment. Information concerning capital investment were gathered from assets and liability statements and framework agreements. The dialogue with the regional informants has been relevant in some cases for collecting information about the perspectives of the regional strategies put in place during the pandemic even though the availability of the regional contacts was not homogeneous.

Another limitation lies on the time lags in data availability. Some sources come from national datasets routinely updated, others come from *ad hoc* analyses carried out from documental analyses and interview. The limitation for the routinely based information is that sometimes the releases refer to data of 1-2 year ago, while the limitation for the *ad hoc* information is that this information cannot be used to monitor the implementation or the benefit of the investments. For instance, in the ICT and eHealth case, indicators used (eg: for FSE - Electronic Health Record and for some parameters of telemedicine services) come from a survey conducted from AGID and additional information on digital solutions and information systems come from official documents as well as information available through the national and regional websites. The degree of detail can therefore vary significantly from region to region. Furthermore, since the ICT topic is highly innovative and particularly stressed during the pandemic, it can undergo extremely rapid transformations in terms of new services and investments, including local and national ones, to support the management of the health emergency. This area would require more frequent updating than others. To overcome this issue we made interviews and validity checks of the reports carried out with regional contact persons but we cannot say that they are comprehensive and free from information gaps.

Another limitation concerns the scope of the analysis. In particular, in accordance with the DG Regio we do not performed any analysis on the personnel staffing either on research investments.

Finally, it is worth to be noticed that we do not ranked the investments' needs. Indeed, they are often interrelated so that it was not possible to put them in a priority list.

In conclusion, we conducted a sort of "diagnosis" highlighting possible investment trends based on regional needs identified in the period 2020 - early 2021. The object was not to define planning or investment strategies or proposals for the allocation of resources, but it should also be useful to develop such analysis in perspective for the benefit of the upcoming programming phase also related to the European Union opportunities for public investment.