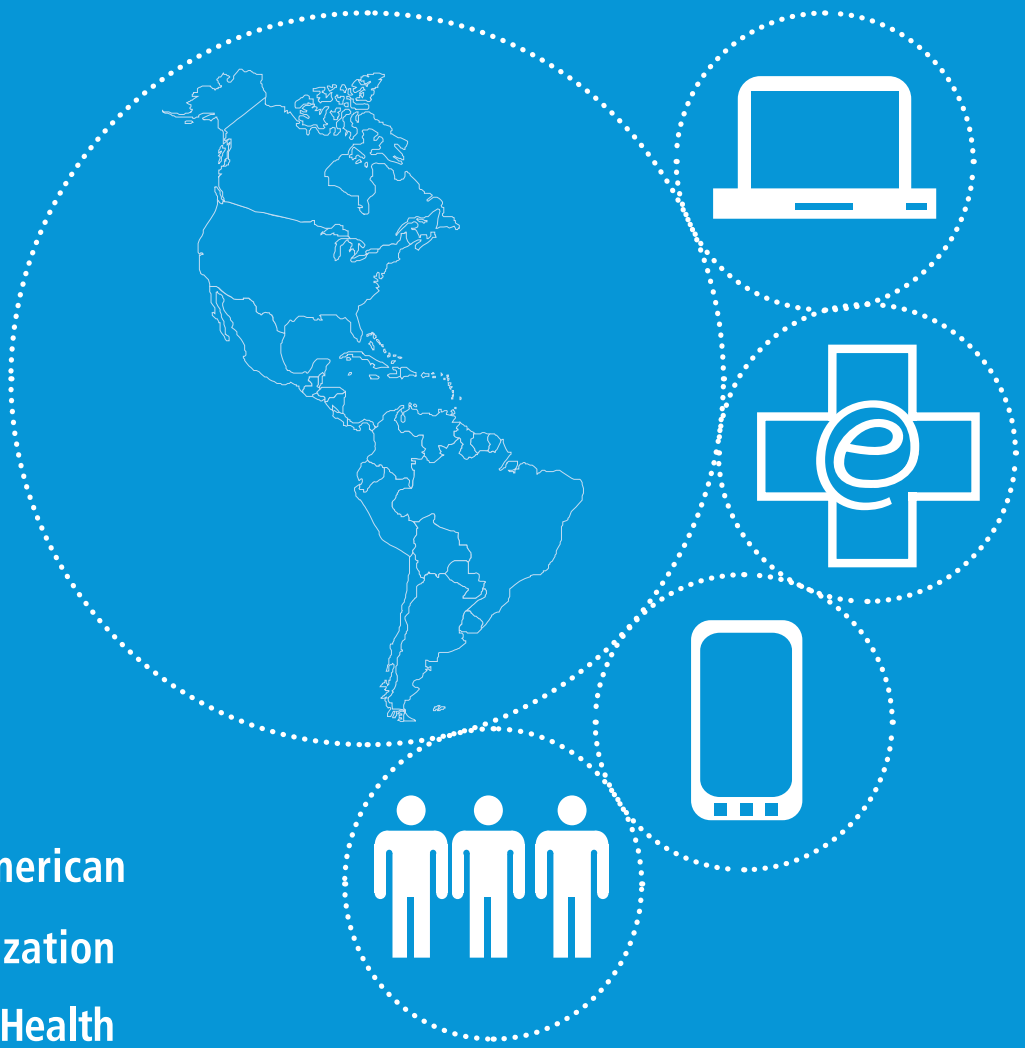
# eHealth in the Region of the Americas: breaking down the barriers to implementation

## Results of the World Health Organization's Third Global Survey on eHealth



Pan American Health Organization
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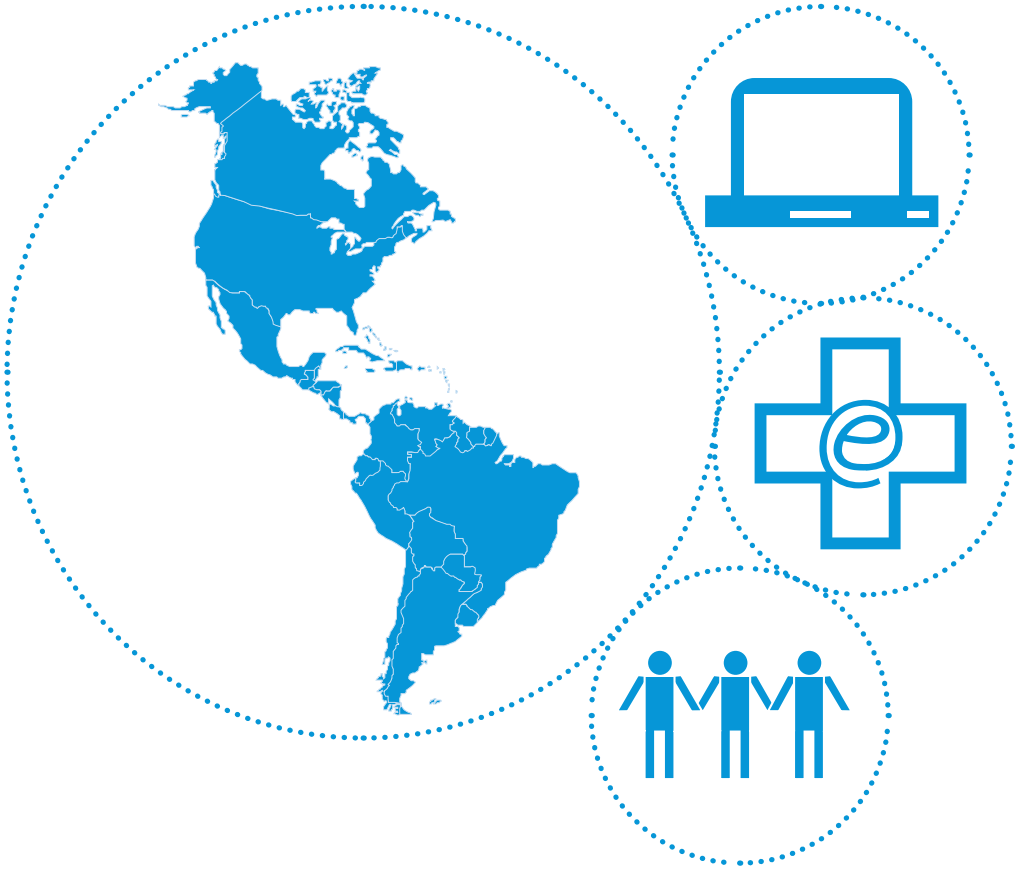

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# Abbreviations and acronyms

| | |
|---|---|
| **AMIA** | American Medical Informatics Association |
| **CAMSAT** | Mutual Aid Center and Health for All (of Bañado Sur, Asunción) |
| **CCSS** | Costa Rican Social Security Fund |
| **CDC** | Centers for Disease Control and Prevention |
| **CdP** | Comunidades de práctica |
| **CIDITIC** | Center for Research, Development and Information and Communication Technology |
| **CNEURO** | Cuban Neuroscience Center |
| **CoP** | Communities of Practice |
| **DCMI** | Dublin Core Metadata Initiative |
| **DDI** | Data Documentation Initiative |
| **DGDS** | General Directorate of Health Surveillance of the Paraguayan Ministry of Health |
| **DICOM** | Digital Imaging and Communications in Medicine |
| **ECH** | Electronic Clinical History |
| **EHR** | Electronic Health Records |
| **EMR** | Electronic Medical Records |
| **FMWCB** | Mobile World Capital Barcelona Foundation |
| **GOe** | WHO Global Observatory for eHealth |
| **IAFA** | Institute on Alcoholism and Drug Dependence |
| **ICD** | International Classification of Diseases |
| **ICT** | Information and Communications Technology |
| **IMF** | International Monetary Fund |
| **ISIC** | International Standard Industrial Classification of all Economic Activities |
| **ISO** | International Organization for Standardization |
| **ITU** | International Telecommunications Union |
| **IVR** | Sistema de respuesta de voz interactiva |
| **IXF Messages** | UN format for transmission indicators |
| **LOINC** | Logical Observation Identifiers Names and Codes |
| **MOOC** | Massive Open Online Course |

| | |
|---|---|
| **MSF** | Doctors without Borders |
| **OAE** | Otoacoustic Emission |
| **OAT** | Office for the Advancement of Teleheath |
| **PAHO/WHO** | Pan American Health Organization/World Health Organization |
| **PDA** | Personal Digital Assistant |
| **PHR** | Personal Health Registries |
| **PSA** | Privacy and Safety Architecture |
| **RITMOS Network** | Ibero-American Network of Mobile Technologies in Health (Network CYTED-515RT0498) |
| **RTMG** | *Rede de Teleassistência de Minas Gerais* |
| **SDMX** | Statistical Data and Metadata exchange |
| **SESEQ** | Secretary of Health for the state of Querétaro |
| **SIS** | National Health Information System |
| **SMS** | Short Message Service |
| **SNOMED CT** | Systematized Nomenclature of Medicine – Clinical Terms |
| **UHC** | Universal Health Coverage |
| **UOC** | Universitat Oberta de Catalunya |
| **UPMC** | University of Pittsburgh Medical Center |
| **US$** | United States dollars |
| **USF** | Family Health Unit of Paraguay |
| **VPN** | Virtual Private Network |

# Introduction

In 2005, all WHO Member States committed to working to achieve universal health coverage (UHC) (1), in a collective expression of the belief that all people in need should have access to health services without risk of financial ruin or impoverishment. Working for universal health coverage is a powerful mechanism for achieving improved health and well-being, as well as for promoting human development.

This, the Third Global Survey on eHealth, conducted by the WHO Global Observatory for eHealth (GOe), reflects a special perspective: the use of eHealth to support universal health coverage. eHealth – referring to the cost-effective and safe use of information and communication technologies (ICTs) to support health and health-related areas, including health care, health surveillance, health literature and education, and health-related knowledge and research (2) – plays a vital role in the promotion of universal health coverage, including using telehealth or mobile health devices (mHealth) to provide services to remote populations and marginalized communities.

eHealth facilitates the training of health personnel through virtual learning; makes education more accessible, especially for those who are isolated; and improves diagnosis and treatment by providing accurate and timely information on patients using digital health records. The strategic use of ICTs improves the operations and financial efficiency of health systems.

The survey is divided into eight thematic sections, each offering a different perspective on the contributions of eHealth to UHC.

- Box 1. Bases for eHealth
- Box 2. Electronic health records (EHR)
- Box 3. Telehealth
- Box 4. Mobile health (mHealth)
- Box 5. Virtual learning in the health sciences
- Box 6. Legal frameworks for eHealth
- Box 7. Social media
- Box 8. "Big data"

## Key data from the survey responses

### Bases for eHealth

- 77.8% of PAHO Member States in the Region of the Americas indicate that they have a national policy or strategy for universal health coverage.
- 61.1% of PAHO/WHO Member States in the Region have a national eHealth policy or strategy.
- Of the Member States that have a national policy or strategy for universal health coverage, only 52.6% have a national eHealth policy or strategy.
- 84.2% of Member States reported that they have a policy or strategy for a national health information system (HIS).
- 84.2% of Member States offer education or training on the use of ICTs and online health.

## Electronic Health Records (EHR)

- 52.6% of PAHO Member States in the Region of the Americas have a national DHR system.
- 26.3% of Member States have legislation that supports the use of their national DHR systems.
- The lack of funding to develop and support DHR programs and the lack of evidence regarding the effectiveness of DHR programs appear to be the most common obstacles, with 73.7% of Member States reporting such problems as "very important" or "extremely important" barriers to the implementation DHR.

## Telehealth

- 36.8% of Member States have policies or strategies directly related to telehealth.
- 89.5% of Member States use teleradiology.
- 57.9% of Member States use remote monitoring of patients.
- 42.1% of Member States use telepathology services.

## Mobile health (mHealth)

- 57.9% of the countries have government-sponsored mobile health programs.
- 73.7% of Member States have no entity responsible for regulatory supervision of mobile health to ensure the quality, safety, and reliability of applications.
- 92.8% of mobile health programs are more frequently present at the local and intermediate levels, while only one program is most frequently present at the international level, namely, the mobile health program of telephone care centers.
- All of the countries report having the 14 programs (telephone health care centers/telephone health assistance line; free emergency telephone services; compliance with treatment; appointment reminders; community mobilization campaigns/health promotion; mobile telehealth; emergency services; health surveys; surveillance; patient monitoring; access to information, resources, databases, and tools; support systems for clinical decision-making; digital information on patients; and mobile learning, or mLearning), except for one case, in which there are no support systems for clinical decision-making.
- more than 50% of the countries have fully established 57% of the programs; the program with the least stable implementation is the support for decision-making program, which is implemented and stable in only 26% of the countries.
- Few Member States (10.5%) have government-sponsored programs for the evaluation of mobile health.

## Virtual learning in the health sciences

- 89.5% of Member States use virtual learning in training health sciences students.
- 94.7 6% of Member States use virtual learning for on-the-job training of health professionals.
- 78.9% of the Member States reported that their main reason for using eLearning with students is that it improves access to content and to experts, while 52.6% cited as the main reason that it provides access to education where learning facilities are limited.

## Legal frameworks for eHealth

- 63.7% of Member States have legislation protecting the privacy of health-related data on individuals that is stored electronically in DHR.
- 57.9% of Member States lack legislation facilitating people's electronic access to their own health data in DHR.

- 36.8% of Member States reported that their legislation gives people the right to specify what health-related data in DHR can be shared with health professionals whom they designate.
- 47.4% of Member States have policies or legislation defining medical jurisdiction, responsibility, and reimbursement for online health services.

## Social media

- 73.7% of Member States reported that individuals and communities are using social media to learn about health problems.
- 100% of Member States reported that health care organizations are using social media to promote health messages as part of health promotion campaigns.
- 78.9% of Member States lack a national policy or strategy on the use of social media in the health professions.

## "Big data"

- 31.6% of Member States have a national policy or strategy regulating the use of big data in the health sector.
- 10.5% of Member States have a national policy or strategy regulating the use of big data by private enterprises.

# Key recommendations

## Bases for eHealth

- New eHealth guidance is needed, going beyond establishing national policies and strategies for universal coverage and moving from policy to implementation. eHealth should be seen not as a set of specific isolated practices, but rather as a system composed of a broad set of dimensions (a holistic model) that transcends traditional temporal sequences. This requires constructing an aggregate model (a framework for implementation) that includes both the set of systemic practices in eHealth and the different explanatory dimensions of eHealth beyond technological considerations (personal, educational, economic, organizational, social, cultural, and institutional factors), and that do not follow a uniform or sequential pattern.
- The Member States are urged to move forward in supporting (particularly through funding) new strategies in eHealth that go beyond establishing national policies and strategies. Public-private collaboration is essential to overcome funding barriers. The creation of national partnerships involving different sectors (civil society, civil service, and private organizations), through establishing national eHealth commissions or committees, could become an effective strategy for mobilizing the resources needed to adopt and implement eHealth strategies.
- National policies and strategies must be accompanied by rigorous evaluation mechanisms and economic and financial procedures (of a legislative nature) that incorporate analysis of the cost-effectiveness (for design, as well as for implementation and evaluation) of eHealth practices.
- More emphasis must be placed on professional learning, the organizational dimension, and the new role of the individual as an empowered patient, or e-Patient). eHealth only increases results if combined with specific training and with new practices for organizing work and managing human resources.

## Electronic health records (EHR)

- Promoting the sustainable, scalable, and interoperable development of EHR-centered programs and initiatives requires that the development of national EHR systems be approached in the framework of a patient-oriented national online health strategy, one that includes a system for unique identification.
- This requires national legislation to appropriately govern EHR systems and their use, and to improve organizational and technological infrastructure, as well as access to information.
- Patient input should be considered in developing the EHR system.

## Telehealth

- National strategies and policies must be developed to highlight potential modes of intersectoral collaboration involving the health and social spheres.
- Uniform interoperability of health systems continues to be a challenge for the Region, due to a lack of integration among existing information systems.

- The construction of an aggregate model (a framework for implementation) is needed that includes both the set of systemic telehealth practices and the different explanatory dimensions of telehealth beyond strictly technological issues (3).
- Greater attention to cost-effectiveness analysis in the design, implementation, and evaluation phases of telehealth projects, as well as greater consideration of the particular economic characteristics of these services (high fixed costs and marginal low costs, experiential goods, and network externalities), could greatly increase effectiveness in establishing networks for public-private collaboration.

## Mobile health (mHealth)

- The Member States should address the issues of responsibility, licensing, and informed consent through policies and laws relating to mHealth.
- Each Member State should have an official agency responsible for overseeing mobile health regulation; establishing guidelines on data ownership, safety, and privacy; regulating the quality, safety, and reliability of mobile devices and software used in delivering medical care; and promoting the training of health professionals, as well as informing patients and citizens on the benefits of using mobile health solutions.
- All principal stakeholders should follow the lead of international cooperation schemes in developing regulations, policies, and best practices for the use of mobile health solutions.
- Each intervention carried out in a local, national, regional, or global context should be evaluated, so as to generate findings.

## Virtual learning in the health sciences

- Training plans that provide adequately for eHealth innovations should be created, reflecting the inevitable changes in the roles of health professionals, and providing training in new disciplines through the academic curricula of health sciences educational institutions.
- Member States are urged to create incentives for online learning as a part of health sciences education and continuing education for health professionals.
- Educational authorities should conduct a systematic evaluation of online learning programs in order to ensure that they are appropriately adapted and developed.

## Legal frameworks for eHealth

- Member States are urged to have national legislation on regulatory issues involving health as related to digital formats, such as: data protection; privacy and confidentiality of data and individual patient rights; and matters concerning responsibility for data.
- Training programs are needed that ensure that professionals are fully aware of what is required to comply with regulations on health-related activities and digital data.
- Awareness among patients of their rights and responsibilities should be facilitated.

## Social media

- Member States are encouraged to create clear guidelines on the use of social media, in order to promote a positive impact on the medical profession as a whole and on public confidence in the health system.
- National policies or strategies on the use of social media in the evidence-based health professions should be developed. Also needed are educational programs designed to help health professionals understand the potential of social media and virtual communities in supporting such policies and strategies, as well as in the acquisition and management of new knowledge and the development of computer skills. Incentives could be created for health personnel to incorporate social media in health promotion efforts.
- Programs should be in place to promote societal knowledge regarding the use of social network-based health programs. A culture of self-care, supported by the use of social media, can become a means of generating broader and better coverage for health promotion programs, and of inculcating in users a sense of responsibility regarding health information, circulated through social media.
- Existing regulations in the Member States should also be updated to coordinate the use of technology health programs' preventive approaches; to encourage open dialogue between patients and information providers with regard to health information acquired through social media and via the Internet; and to ensure that technological infrastructure in the developing countries is capable of providing greater access to information for the population (especially in vulnerable areas).

## Big data

- In collaboration with ministries of health, ministries of justice, and data privacy regulators, the Member States should take the lead in addressing governance issues as they relate to data at the national level, specifically with regard to data privacy and protection.
- The Member States need to create and implement policies regulating the use of large volumes of health-related data, both in the health sector and in the private sector, while promoting funding options for scientific research.

# The report

In May 2005, the Ministers of Health of the 192 member countries of the United Nations, convening in Geneva at the 58th World Health Assembly of the World Health Organization (WHO), adopted an "eHealth" resolution (4) in which WHO, for the first time, recognized the contribution of ICTs to health and health-system management, construing this as a unique opportunity for developing public health. The document defines eHealth as "the cost-effective and safe use of information and communication technologies in support of health and health-related areas," and states that strengthening health systems through eHealth "reinforces fundamental human rights by improving equity, solidarity, quality of life, and quality of care" (2). This resolution gave WHO an overall eHealth strategy in which it urges the Member States to establish long-term strategic plans for developing and implementing eHealth services. The following were established as specific objectives: strengthening the countries' health systems through the use of eHealth; creating public-private partnerships for the development of ICTs and their deployment for health purposes; supporting the creation of capacities for the use of eHealth in the Member States; and developing and adopting eHealth regulations. The interest in encouraging and promoting the incorporation of ICTs in the health field is shared by other supranational, national, and regional organizations (5).

In September 2011, the 51st Directing Council of the Pan American Health Organization (PAHO) (6) implemented the **Strategy and Plan of Action on eHealth** as a contribution to the sustainable development of health systems in the Member States (6). Its adoption represents a desire to improve access to and quality of health services, training in digital literacy and ICTs, access to evidence-based scientific information, continuing education, and the implementation of various methods for adopting these measures. Meanwhile, in response to the need to facilitate the processing and transmission of digital information related to health services delivery on a global scale, WHO, in May 2013, adopted a resolution on the standardization and interoperability of data in the eHealth field (7). The 65th Session (2014) of the PAHO/WHO Regional Committee launched the **Strategic Plan of the Pan American Health Organization (2014-2019)**: *"Championing Health: Sustainable Development and Equity"* (8). This plan establishes the Organization's strategic orientation, which is based on the collective priorities of the Member States and on country-focused care, and defines outcomes to be achieved in 2014-2019. It considers information on health to be a basic right, and thus endorses and urges the development and use of ICTs, the expansion of digital literacy, and increased access to scientific knowledge and training. It makes special reference to the development and use of mobile devices (mHealth) and eHealth applications as a means of changing the way health services are provided.

In the current environment of severe budget constraints for health, eHealth has solidified its position as a highly useful tool for improving public health by accelerating universal health coverage, to cite just one of its benefits (9). The use of the technology to capture, understand, and disseminate knowledge is essential in order to cope with disease over the coming decade. Recent research advances on matters such as decision-making, image processing, clinical guidelines and protocols, biomedical ontologies, and integration of databases, provide new opportunities for improved dissemination of findings, medical advice, and the development of reliable, personalized intelligent systems. Advances in the reliability and accuracy of medical devices, along with the boom in monitoring technology, represent improvements for personalized care, self-management, and empowerment. Data infrastructure, bandwidth, connectivity, cloud computing, and mobile devices provide the setting needed to create and share resources when and where necessary. At the same time, genomics and biosensors offer the opportunity to deal with the essential medical issues of individual human beings.

Planning and assessing any technology to be introduced in any health system needs to be consistent with public policy, with consideration given to its impact on the quality of care for citizens and its cost. eHealth systems and services, and care in the home with the introduction of mobile devices (mHealth), make it possible to provide differentiated care for citizens in the most varied temporal and spatial circumstances, something that would be impossible without these technologies. If a public good is involved here, it should be promoted within the governmental sphere as a fundamental value.

It is in this context, and in accordance with the principles that inspire the **Strategy and Plan of Action on eHealth**, that PAHO/WHO presents this report, whose ultimate objective is to provide recommendations that promote universal health coverage, and to do so by removing barriers to innovation and by promoting changes in health organizations.

# Methodology

## Design of the survey

The Global Survey on eHealth 2015 is an instrument developed by the WHO's Global Health Observatory (10), based on consultation with and information from various WHO strategic partners, including: governments, national and regional PAHO/WHO offices, collaborating centers, professional associations, and international organizations. The survey has been modified and updated through exhaustive analysis of the information provided by the responses of the Member States.

The purpose of the global studies conducted by WHO regarding digital health is to observe and identify points of reference in advancing and implementing online health processes at the national, regional, and global levels. The first survey, conducted in 2005, focused on collecting national information in order to assess the existing situation. The second survey, conducted in 2009, was based on the preceding study but incorporated new questions and included a new approach to the subject of digital health. The 2015 survey examines digital health in terms of its role in supporting universal health coverage. The objectives of this third survey are:

1. to measure the progress of online health at the global level; and
2. to compare the findings with those of previous studies, in order to understand current barriers to online health and examine potential future trends in online health.

The online health issues explored by the Third Global Survey on eHealth 2015 are reflected in the eight-part structure of this report.

## How the survey was conducted

The World Health Organization's Third Global Survey on eHealth concerning online health was implemented in March 2015 and concluded in August 2015. It was primarily conducted digitally, but was also made available to members in hardcopy. The survey instructions and questions were available in all official PAHO languages, and all Member States of the Region of the Americas were formally invited to participate. The Ministries and Secretariats of Health of each Member State were specifically invited to designate a person to coordinate the survey, so as to identify experts in national health organizations and incorporate their contributions in the survey. The notes that PAHO provided for the guidance of those coordinating the survey requested that they convene all of the experts identified, in order to ensure mutual comprehension and the coherence and integrity of survey responses. The person who coordinated the survey was in turn responsible for fielding the contributions of the national experts, reviewing the contents, and presenting the results to WHO.

## Data processing

This report analyzes and discusses only the data provided by the Member States of the Region of the Americas. Responses to this Third Global Survey on eHealth 2015 were provided by 19 of the 38 PAHO Member States,[1] constituting a response rate of 50%.

1 - Antigua and Barbuda, Argentina, Bahamas, Barbados, Belize, (Plurinational State of) Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Cuba, Dominica, Ecuador, El Salvador, Granada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Dominican Republic, Saint Kitts and Nevis, United States, Saint Vincent and the Grenadines, Saint Lucia, Suriname, Trinidad and Tobago, Uruguay, (Bolivarian Republic of) Venezuela.

Because of the linguistic diversity of the area surveyed, the questionnaire allowed for responses in different languages. It should be pointed out that not all countries answered all of the questions; thus, the sample size for analyzing certain issues was reduced substantially. The data from the Third Global Survey on eHealth 2015 were analyzed between March and June of 2016.

The survey's inclusion of multiple open-ended questions, along with the availability of previous reports prepared by WHO, such as the *Atlas* of eHealth *country* profiles report (11), made it possible to analyze a significant portion of the information with qualitative techniques such as discourse analysis and comparative analysis of responses from different time periods. The quantitative data were analyzed using the statistical programs Microsoft Excel and SPSS.

The principal statistical techniques used were univariate analysis and bivariate analysis. Thus, the findings are for the most part presented as percentages of the total number of Member States that answered a question and/or in absolute numbers of countries that responded to the question. For the purpose of determining correlations between the various dichotomous variables, a number of techniques of bivariate analysis, such as Cramer's V, were used.[2] Finally, three different classifications of countries belonging to the Region of the Americas were established.

The first classification reflects geographical position within the continent, dividing the countries into three subregions: North America, Central America and the Caribbean, and South America. The second classification reflects per capita income according to information from the International Monetary Fund (IMF), based on countries participating in the 2014 survey. The third classification reflects per capita health expenditure findings by the World Bank for the year 2015 (12). This made it possible to define different groups for analysis in relation to the last two indicators, thus enriching the conclusions. The income classification defined three major groups: high-income countries (per capita annual income above US$11,000), middle-high income countries (per capita annual income between US$11,000 and US$3,000), and middle-low income countries (with average per capita annual income below US$3,000) (see Table 1).

**Table 1.** Income classification of countries

| | |
|---|---|
| **High income** | Argentina, Canada, Chile, Trinidad and Tobago, Uruguay, USA |
| **Middle-high income** | Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Jamaica, Mexico, Panama, Paraguay, Peru, Dominican Republic |
| **Middle-low income** | Hondura, Cuba |

Source: PAHO, the authors

Per capita health expenditure was also classified in three major groups: high expenditure (above US$1,100 annually), medium expenditure (between US$1,100 and US$600 annually), and low expenditure (under US$600 annually) (Table 2).

**Table 2.** Classification of countries by per capita health expenditure

| | |
|---|---|
| **High expenditure** | Canada, Chile, Trinidad and Tobago, Uruguay, USA |
| **Medium expenditure** | Costa Rica, Cuba, Mexico, Panama |
| **Low Expenditure** | Argentina, Colombia, Ecuador, El Salvador, Guatemala, Honduras, Jamaica, Paraguay, Peru, Dominican Republic |

Source: PAHO, the authors

guay, Peru, Dominican Republic, Saint Kitts and Nevis, United States, Saint Vincent and the Grenadines, Saint Lucia, Suriname, Trinidad and Tobago, Uruguay, (Bolivarian Republic of) Venezuela.

2 - Cramer's V is a correction that can be applied to the chi-square coefficient to give the maximum value of 1 to the index (indicating the greatest correlation between variables; the minimum value being 0, which indicates no correlation).

## Limitations

The Third Global Survey on eHealth 2015 was sent to the Member States under uniform conditions, in order to ensure consistency. Nevertheless, analysis of the results received revealed, in more than one case, inconsistencies and variations in the responses offered by a single country. It should also be noted with regard to the qualitative evaluation of data that in some cases information is incomplete or nonexistent, given the lack of particular data in reports prior to the one presented here.

WHO accepts at face value the responses provided by the Member States, which inherently reflect differences in interpretation of the questions and in the answers. As the Member States were limited to one response per country, consensus was required in order to best represent the overall situation in the country, even where online health activities varied within a country or when they did not meet the survey's criteria.

Finally, the data presented here do not include the responses of other stakeholders, such as patients, communities, suppliers, health professionals, and the digital health industry. As a consequence, the report may show a certain bias toward the supply side of health services.

Section 1

# Bases for eHealth

Electronic health services (eHealth) can also be understood as the use of the Internet and other related technologies in the health industry in order to improve access, efficiency, effectiveness, and the quality of the clinical and business processes used by health organizations, physicians, patients, and consumers, with the ultimate goal of improving the health status of patients (13).

## Key data from the survey responses

- 77.8% of PAHO/WHO Member States in the Region reported that they have a national policy or strategy for universal health coverage.
- 61.1% of PAHO/WHO Member States in the Region have a national eHealth policy or strategy.
- Of Member States that carry out a national policy or strategy for universal health coverage, only 52.6% have a national eHealth policy or strategy. 84.2% of Member States reported having a national policy or strategy for a health information system (SIS).
- 84.2% of the Member States offer education or training on the use of ICTs and digital health.

## Introduction

In recent years, eHealth has undergone intense development. With new developments in wireless technologies, Web 2.0, and communications media 3.0, eHealth is profoundly changing health care, which is evolving from an individual approach (care for acute health problems) toward a population-based approach (management and prevention of disease through online communities) (14). The integration of traditional surveillance systems with new geolocalized real-time data sources, systems of participation and communication in context-sensitive social media, and the modeling of infectious diseases have made it possible to strengthen surveillance, early warning systems, and preparedness and response to global health problems (15). At the same time, access to a broad range of health information that was previously difficult for the general public to access (16, 17), including the societal dissemination and publication of content and individuals' observations via blogs and videos (18), has fostered empowerment and self-managed patient care (19). The emergence of eHealth has been accompanied by a broad range of new opportunities to improve the health status of people through the intensive us of ICTs, especially the Internet (13, 20, 21, 22).

Nevertheless, difficulties in obtaining the scientific evidence required, from both public and private management agencies, to implement the strategies and investments required to move forward in expanding eHealth continue to call for further discussion. Despite the considerable volume of data presently available, data remain segmented, centered largely on specific applications rather than on comprehensive health care systems, and inconclusive. This is a barrier to obtaining the political and economic backing needed to consolidate and expand eHealth initiatives (23). Those projects that are being implemented and evaluated are mostly designed as short-term or pilot projects (24).

The implementation of technology that encompasses eHealth occurs with dynamic processes involving a variety of decision-makers, with varying incentives and criteria which, though they go

beyond the strictly technical, must be taken into account. The lack of standardized work protocols, the still limited availability of, and access to, telecommunications infrastructure, ethical and legal issues, training of health personnel in the new technologies, and, especially, acceptance by health professionals, are additional impediments to the implementation of eHealth.

With the **"Cyberhealth"** resolution of 2005, WHO adopted an overall eHealth strategy, under which the Member States were urged to invest in ICT infrastructure. With the **PAHO Strategy and plan of action on eHealth**, the countries of the Region were urged to establish long-term strategic plans to develop and implement eHealth services (25). Already in the 2013 mandate, WHO focused on more specific aspects, such as interoperability (26).

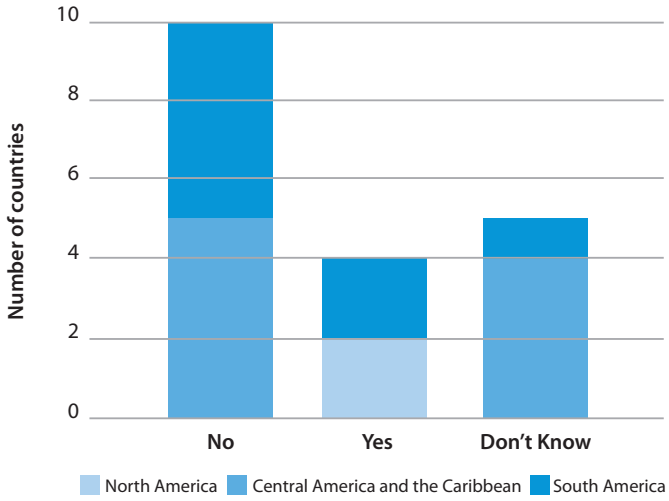
The penetration of Internet access in the Region stands at around 21%, with 50% of this population already connected to the Internet. Nevertheless, its use in the health field remains limited, despite the high penetration of mobile telephony, which is at 108% (27).

It is important to advance our knowledge of the processes, critical factors, and strategies for integrating ICTs in health systems, by identifying what specific changes are generated by interactions between organizations and the technology being introduced.

## Findings of the survey: National policies or strategies

The Third Global Survey on eHealth 2015 showed that 77.8% of respondents (14 countries) have a national policy or strategy for universal health coverage. Of these, 52.6% (10 countries) indicated that their national policy or strategy on universal health coverage specifically referred to the use of ICTs or eHealth as a support for universal health coverage. Figure 1 shows the number of countries, by geographical classification, in which health coverage is specifically related to the use of ICTs.

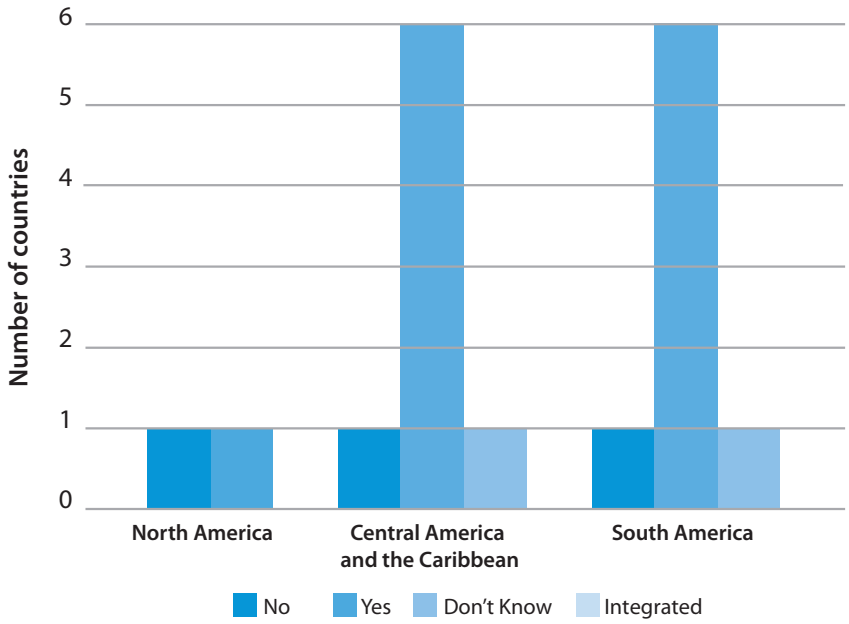
**Figure 1.** Number of countries, by geographical location, where health coverage is specifically related to the use of ICTs




Only 61.1% of respondents (11 countries) have a national eHealth policy or strategy. For the purpose of this survey, the terms policy and strategy are used interchangeably, although this is not strictly accurate. A national eHealth policy or strategy sets forth the vision and objectives needed to promote the specific use of ICTs in the health sector. Of the countries surveyed, 52.6% (10 countries) indicated that national eHealth policy or strategy refers explicitly to the objectives or key elements of universal health coverage (such as access, quality of care, and cost of care).

A national policy or strategy regarding a health information system (HIS) sets forth the approach and objectives needed to ensure that a national system meets the country's needs for health information. It may include elements such as the civil registry, reportable diseases, private sector data such as insurance information, and guidelines on the confidentiality of patient information. Some 84.2% of Member States (16 countries) reported having a national policy or strategy regarding a health information system. Of these 16 countries, however, 73.7% (14 countries) indicated that the strategy has been adopted autonomously, while 10.5% of respondents (two countries) stated that there is no dedicated policy or HIS strategy, but, rather, that this is included in the national eHealth policy or strategy. Figure 2 shows the different countries, by geographical classification, that have a health information system.

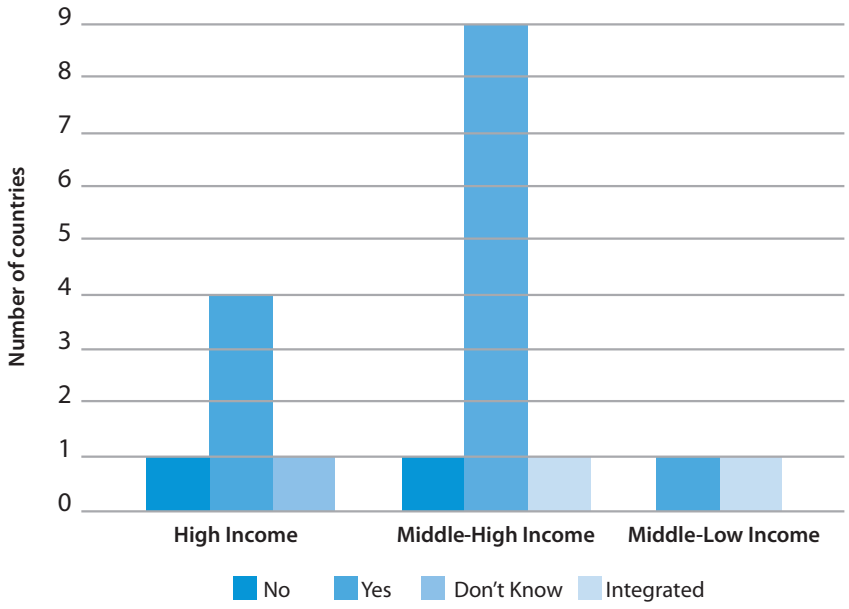
**Figure 2:** Countries with a health information system, by geographical location




Only 15.8% of respondents (three countries) reported that they had no national policy or strategy to guide the development of their HIS. In-depth analysis of the development of Member States' national policies or strategies regarding a health information system, in relation to per capita income, shows that, of the six high-income countries, 66.6% (four countries) reported having a national policy or strategy regarding a health information system. It should be noted, however, that of these countries, three indicated that the strategy has been adopted autonomously, while one country explained that there is no dedicated HIS policy or strategy, but, rather, that this is included in the national eHealth policy or strategy.

A similar situation can be seen in the medium-income countries. Of the 11 medium-income countries, nine reported having a national policy or strategy regarding a health information system, while one of these indicated that such policy is included in the national eHealth policy or strategy. Lastly, the two low-income countries reported that they have a separate national policy or strategy regarding a health information system. Figure 3 shows, by income level, the distribution of countries that have a national health information system.

**Figure 3:** Distribution of countries that have a national health information system, by income level




Of countries with an eHealth strategy, 85.7% (12 of the 14 that report having such a strategy) report having an HIS, thus demonstrating that countries that have eHealth policies regard a health information system as an integral component of eHealth.

An examination of the countries' health expenditures reveals that of the five countries that reported high levels of expenditure, 60% (three countries) reported having a national strategy or health information system. Notably, while 100% of the four countries with medium-level health expenditures (between US$600 and US$1,100 annually per capita) reported having such a system, 90% of the 10 countries in the lowest income group (under US$600 dollars annually per capita) indicated that they have such a system. Of this latter group, 20% reported that the system is not integrated (Table 3).

**Table 3.** Strategy or HIS, grouped by health expenditure level

| | | | Strategy or SIS | | | | Total |
|---|---|---|---|---|---|---|---|
| | | | No | Si | Does not know | Integrated | |
| Health expenditure class | high | Count | 1 | 3 | 1 | 0 | 5 |
| | | % within health expenditure class | 20% | 60% | 20% | 0% | 100% |
| | Medium | Count | 0 | 4 | 0 | 0 | 4 |
| | | % within health expenditure class | 0% | 100% | 0% | 0% | 100% |
| | Low | Count | 1 | 7 | 0 | 2 | 9 |
| | | % within health expenditure class | 10% | 70% | 0% | 20% | 100% |
| | Total | Count | 2 | 14 | 1 | 2 | 19 |
| | | % within health expenditure class | 10.5% | 73.7% | 5.3% | 10.5% | 100% |

Source: PAHO, the authors

## Success stories

### State assistance programs in the United States (28)

The United States has a mixed health system. Despite the importance of private health care in the country – nearly 49% of the population has private health insurance through their employers, and 5% have independent health insurance – approximately 16% of the population lacks health insurance.

Various public programs have been created in order to promote public health care in the United States, including:

- **Medicare:** This is a federal program covering people over 65 years of age. The majority of the older adult population in the USA is a beneficiary of this program, run by the government, who acts as the insurer.
- **Medicaid:** This program is for low-income individuals and families. Federal law protects pregnant women, children, older adults, persons with disabilities, and qualified parents under the country's poverty standards. The program is administered by the individual states; thus, there are 51 different Medicaid programs.
- **CHIP (formerly known as S-CHIP):** This is a public program that offers financial assistance for families that earn too much to qualify for **Medicaid** but not enough to purchase private health insurance.
- **Veteran's Benefits Administration:** This is a program run by the federal government that offers medical benefits to veterans of the armed forces.

Despite the benefits of these public safety-net programs (and their low administrative cost), they still have many problematic aspects. For example, **Medicare** does not cover preventive medicine or services such as dentistry or ophthalmology, and those seeking care under **Medicaid** can be rejected by the health care provider because of the very low reimbursement levels the program offers providers.

## Discussion

The majority of the PAHO/WHO Member States in the Region recognizes the role of electronic health in achieving universal health coverage, and is taking concrete measures through policies and strategies. Thus, 14 of the 19 countries of the Region have policies or national strategies for universal health coverage. Of these 14, five (83.3%) are high-income countries, eight are middle-high income countries (72.7% of that group), and one is a middle-low income country (50% of the group). Of these, 10 countries use ICTs or eHealth as an approach to universal coverage and their own national health objectives. Of the five high-income countries cited that have health systems designed to provide universal coverage, only Argentina and Chile use ICTs.

Argentina has traditionally been a pioneer in several initiatives of its own relating to eHealth—initiatives that have served as a basis for other related developments in the region. This was already clear in 2011, when the report Atlas of eHealth country profiles (11) listed Argentina as having had, from the beginning of the current decade, an environment that encouraged the use of ICTs in the health field. In recent years, such use has been strengthened by implementation of the **Strategy and Plan of Action on eHealth in the Republic of Argentina 2011–2013** (29). Similarly, Chile has made major efforts to improve coverage through the use of ICTs, and has a similar type of system (30), though this was not reported as a known fact in the survey that was conducted. Canada has a system of universal coverage, but does not use ICTs, and Trinidad and Tobago, although having a system, indicated that it does not know whether it uses ICTs. According to the report Atlas of eHealth country profiles (11), the latter country in fact does not use ICTs. Of the eight middle-high income countries,

only five use ICTs, and in the one country in the lowest income group that responded to this question, there was no indication that the universal coverage system used ICTs.

Similarly, 11 countries promote the specific use of ICTs in the health sector. Of these, 10 indicated that their national eHealth policy or strategy relates explicitly to the objectives or key elements of universal health coverage (such as access, quality of care, and cost of care).

At the same time, the majority of responding countries have a national policy or strategy regarding a health information system that is clearly different from online health, while a small group of countries views eHealth in terms of its application at the national level. This is important in the context of creating legislation to facilitate the development of electronic health solutions such as electronic medical records, mobile health services and solutions, electronic prescriptions, and follow-up monitoring and evaluation. This should make it possible to improve the continuity of care, achieve trust and security in eHealth, and guarantee safe access to high-quality health care. Sixteen of the Member States reported having a national policy or strategy regarding a health information system. Of these, 14 indicated that the strategy had been established autonomously, while two countries stated that they had no separate policy or strategy, but rather, that it was included in the national eHealth policy or strategy.

Thus, 83% of the high-income countries, 63.6% of the middle-high income countries, and 100% of the middle-low income countries have universal health coverage systems, while 50% of the high-income countries, 54.5% of the middle-high income countries, and 50% of the middle-low income countries report using ICTs in eHealth. Some 83% of the high-income countries, 36.4% of the middle-high income countries, and 100% of the middle-low income countries have an eHealth strategy. Lastly, 66.7% of the high-income countries, 91.9% of the middle-high income countries, and 50% of the middle-low income countries have a health information system.

## Funding

Funding for eHealth programs can come from any combination of sources, including public and private financing, donor/non-public funds, and public-private partnerships. In order to determine which sectors are providing financial support for online health programs, the survey asked about the availability of funds for online health. Table 4 shows the types of funds available for online health programs in 2015.

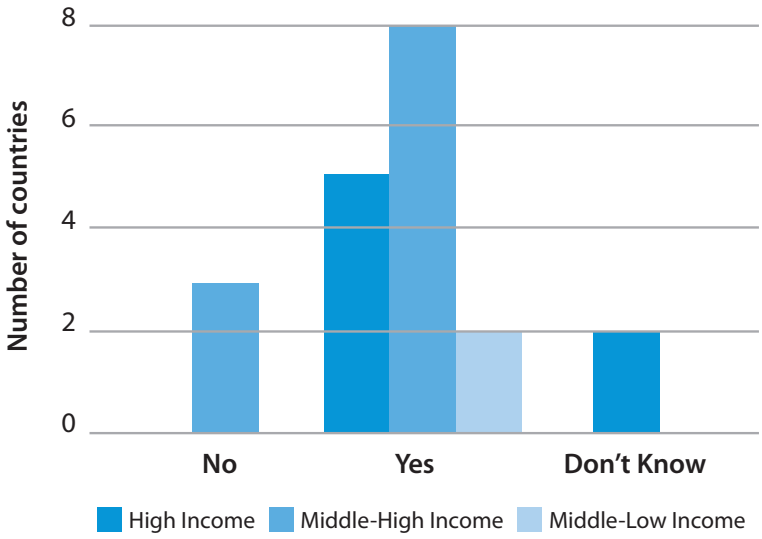
**Table 4.** Funding of eHealth programs, 2015

| Type of source | Member States that use the source | Member States that do not use the source | Member States that use the source for at least half of financing | Member States that use the source for more than half of financing |
|---|---|---|---|---|
| Public | 78.9% (15 Member States) | 15.8% (3 Member States) | 26.3% (5 Member States)* | 36.8 % (7 Member States)* |
| Private or commercial | 36.9% (7 Estados Miembros) | 47.4% (9 Estados Miembros) | 26.4% (5 Member States)* | 0% * |
| Donors | 73.7% (14 Member States) | 15.8% (3 Member States) | 52.6 % (10 Member States)* | 10.6% (2 Member States)* |
| Public/private partnership | 31.6% (6 Member States) | 47.7% (9 Member States) | 10.6% (2 Member States)* | 0% * |

Public funding is the type of financing most commonly available in the Region of the Americas, with 78.9% of Member States (15 countries) citing this as the source of funds available for online health programs. Of these countries, 33.3% (five countries) are high-income countries, 56.3% (eight countries) are middle-high income, and 13.3% (two countries) are middle-low income. Public funding here refers to financial support provided by government, whether at the district, regional, or national level. Only 15.8% of the Member States (three countries, all in the middle-low income category)

stated that they do not use this source, while one high-income country reported that it did not have the information needed to answer the question. Figure 4 shows public funding in the countries, noting the countries' respective income levels.

**Figure 4.** Public funding in the countries, noting their respective income levels




An examination of the distribution of public financing fails to confirm the above information, in that 36.9% (seven countries) stated that they had high levels of this type of funding (between 50% and 75% of funding coming from this source) or very high levels (over 75%), and 26.31% (five countries) cited medium (between 25% and 50%) or low (under 25%) levels of public funding

The second most common type of funding available is donor/non-public funding for development, with 73.7% of Member States (14 countries) citing its use. Again, the distribution of funding fails to confirm this information, in that 10.6% (two countries) cite high levels (between 50% and 75% of funding) or very high levels (over 75%), while 52.6% (10 countries) cite medium (between 25% and 50%) or low (less than 25%) levels. Notably, 21.4% of the Member States (three countries) that reported the use of donor and non-public funding for development are high-income countries, while 52.6% (10 countries) are middle-high income and 7.1% (one country) is in the middle-low income group. 10.5% of respondents (two countries), however, reported that this type of funding is not available (Table 5). Donor/non-public funding for development in this context refers to monetary and in-kind aid provided by development agencies and banks, foundations, or other non-public funding agencies for development, whether international, regional, or national.

**Table 5.** Contingency table. Wealth by per capita income, based on IMF data* concerning donor/non-public funding for development

| | | | Donor/non-public funding for development | | | Total |
|---|---|---|---|---|---|---|
| | | | No | Si | Does not know | |
| Wealth by per capita income based on IMF data | high | Count | 1 | 3 | 2 | 6 |
| | | % within donor/ non-public funding for development | 33.3% | 21.4% | 100% | 31.6% |
| | Medium | Count | 1 | 10 | 0 | 11 |
| | | % within donor/ non-public funding for development | 33.3% | 71.4% | 0% | 57.9% |
| | Low | Count | 1 | 1 | 0 | 2 |
| | | % within donor/ non-public funding for development | 33.3% | 7.1% | 0% | 10.5% |
| | Total | Count | 3 | 14 | 2 | 19 |
| | | % within donor/ non-public funding for development | 100% | 100% | 100% | 100% |

Private or commercial funding is available in 36.8% of the Member States (seven countries), while 63.2% (12 countries) either reported the absence of such funding or did not know whether it was present (three countries). Only one country (14.3%) that reported having this type of funding is a high-income country. As the following table shows, the countries that fund their health systems partially with private or commercial funding have middle-high income levels (71.4%, or five countries), whereas only 14.3% of the countries that have this type of funding are middle-low income countries (Table 6). Once again, the distribution of funding fails to confirm this information: in 73.7% of the cases, private financing is nil or very low. The survey defined this type of financing as financial or in-kind support provided by the private or business sector.

**Table 6.** Contingency table. Wealth by per capita income, based on IMF data* concerning private or commercial funding

| | | | Private or commercial funding | | | Total |
|---|---|---|---|---|---|---|
| | | | No | Si | Does not know | |
| Wealth by per capita income based on IMF data | High income | Count | 3 | 1 | 2 | 6 |
| | | % within private or commercial funding | 33.3% | 14.3% | 66.7% | 31.6% |
| | Middle-high income | Count | 5 | 5 | 1 | 11 |
| | | % within private or commercial funding | 55.6% | 71.4% | 33.3% | 57.9% |
| | Middle-low income | Count | 1 | 1 | 0 | 2 |
| | | % within private or commercial funding | 11.1% | 14.3% | 0% | 10.5% |
| | Total | Count | 9 | 7 | 3 | 19 |
| | | % within private or commercial funding | 100% | 100% | 100% | 100% |

Analysis of the relationship between public and private funding shows that only 40% of the Member States (six countries) that enjoy public funding also receive some type of private funding. Nonetheless, the correlation between the two variables is not significant, with Cramer's V being insignificant. It is nevertheless interesting to note that 80% of institutions receive both public funding and donations for developing eHealth policies. This relation is significant, considering that the value of Cramer's V is 0.717, with a 95% confidence level.

With regard to public/private partnerships, 55.6% of respondents stated that they received no funding of this type, while 44.4% of those that do receive such funding receive amounts that in no case exceed 50% of the funds.

Funding for policy or strategy implementation is available in 31.5% of the Member States (six countries), while 68.4% (eight countries) reported that it is not available and five countries do not know. The majority of the countries that reported funding for policy or strategy implementation are high-income countries (44.4% of the countries that cited funding for support policies or strategies, or four countries), versus 33.3% (three countries) with middle-high income levels, and 22.2% (two countries) with middle-low income levels. Funding for policy or strategy implementation in this context refers to funding provided specifically to help implement a national eHealth policy or strategy.

Finally, public-private partnerships can also be involved in funding digital health, and in fact do provide such funds in 31.5% of the Member States (six countries), although 68.5% (nine countries) reported that such funding is not available or that they do not know whether it is (four countries).

Again, the distribution of funding fails to confirm the foregoing information, given that 63.2% of the Member States (12 countries) reported receiving no funding of this type. The majority of the countries that reported funding for policy or strategy implementation are the middle-high income countries (five countries, or 8.33%), while there is only one such high-income country (16.7%) and no middle-low income country (Table 7). Public-private partnerships in this context are defined as joint ventures between public agencies and private sector companies working together for a common objective.

**Table 7.** Contingency table. Wealth by per capita income, based on IMF data* concerning public-private partnerships

| | | | Public-private partnerships | | | Total |
|---|---|---|---|---|---|---|
| | | | No | Si | Does not know | |
| Wealth by per capita income based on IMF data | High income | Count | 3 | 1 | 2 | 6 |
| | | % within public-private partnerships | 33.3% | 16.7% | 50% | 31.6% |
| | Middle-high income | Count | 4 | 5 | 2 | 11 |
| | | % within public-private partnerships | 44.4% | 83.3% | 50% | 57.9% |
| | Middle-low income | Count | 2 | 0 | 0 | 2 |
| | | % within public-private partnerships | 22.2% | 0% | 0% | 10.5% |
| | Total | Count | 9 | 6 | 4 | 19 |
| | | % within public-private partnerships | 100% | 100% | 100% | 100% |

## Success stories

### The case of Cuba (31)

Cuba has a public health system that provides free universal care. Moreover, the country has one of the best health indicators in the world, in addition to which the development of both service infrastructure and human capital is on the increase. With 24 medical schools across the country, Cuba has a tradition of education for health professionals that dates back almost three centuries, although the last 50 years have seen particular growth, with the graduation of over 140,000 physicians, including students from over 120 foreign countries, as well as Cubans. This is despite the fact that Cuba is considered a middle-low income country, which, according to World Bank data, allocates less than US$817 annually per patient.

The merits of Cuba's health system have made it highly attractive for foreign investment. At the end of 2015, three investment projects designed to foster the exportation of health tourism services were being considered, representing over US$40 million in aggregate. Health tourism refers not to people who are patients, but rather to people who wish to have a medical checkup and can combine it with tourism. The Cuban investment portfolio includes a project for hemodialysis services during vacations, with two facilities being considered (one in Havana and one at the Varadero beach resort). Valued at US$1.5 million, they are designed to serve patients with chronic renal insufficiency, who wish to enjoy vacations on the island.

Cuban authorities calculate that these facilities, at half occupancy, can serve 2,400 patients a year, with revenues on the order of US$480,000. Canada, which constitutes Cuba's main source of tourism, accounts for one million vacationers every year on the island, including some 90,000 hemodialysis patients.

There is also a sports-related health services project. This involves the creation of an International Sports Medicine and Applied Sciences Clinic, valued at US$11 million. The proposed facility will offer medical services to foreign athletes and employees of sports industries, both active and retired, and can be extended to serve others engaging in systematic physical activities.

The clinic will also have the capacity to conduct medical monitoring of sports training, evaluate the medical and psychological effects of training and physical exercise, conduct physioprophylaxis, provide sports rehabilitation and community rehabilitation to address the physiology of exercise, and carry out specific on-site tests for the various disciplines.

Finally, a third project consists of constructing an Exclusive Quality of Life Center in a tourist area on the island, on which a decision is pending, involving an investment of US$30 million. This center is designed to serve some 1,300 people, generating a yearly income of US$8.5 million, returning its initial investment within approximately 3.5 years

## Discussion

The incorporation of ICT in health services holds great promise as an instrument for addressing the 21st-century challenges to health care systems brought on by socioeconomic change. Nonetheless, the ongoing incorporation of ICT involves significant problems. The difficulty of providing the necessary scientific evidence to demonstrate the clinical and economic benefits of ICT constitutes a barrier to funding (23). New health care legislation could help pave the way for funding the development of online health.

The survey findings indicate that much remains to be done if eHealth policies are to be adequately funded. Beyond merely establishing national policies and strategies, countries must move toward funding them. This is particularly challenging for middle- and low-income countries, which clearly lack

the resources needed to address the situation. The findings suggest that the creation of public-private partnerships could be an effective way to raise the funds needed to adopt and implement eHealth strategies. Indeed, this is already evident with the creation of national partnerships – involving civil society, the civil service sector, and the private sector – that are working to create national eHealth commissions or committees (32). The **Toolkit for a national eHealth strategy** (33), prepared by the WHO and the International Telecommunications Union (ITU), points in this direction. Notwithstanding, public-private collaboration faces significant barriers that the countries must work to overcome. The following three elements are of special importance in this connection:

- First, **economic and financial forecasting regarding eHealth practices poses challenges**. The development of national policies and strategies needs to be accompanied by economic and financing processes that include analyzing the cost-effectiveness of each proposed project.
- Second, countries need to provide for economic and financial monitoring of eHealth projects they wish to develop. Initial planning should be accompanied by detailed monitoring of the proposed projects.
- Finally, along with the planning and monitoring, there should be a final evaluation that covers a broad time period extending beyond the duration of the project, to aid in evaluating the economic costs and benefits of eHealth projects.

At the same time as all of these factors are addressed, the special economic characteristics of online delivery of health services must be taken into account. This involves, in the first place, the particular nature of the cost structure, which features high fixed costs and very low incremental costs. Like other knowledge products and services (34), eHealth involves major initial investment, although its reproduction and replication costs tend to be very low. If countries address eHealth as a system of joint practices reaching beyond specific developments, the initial investments in projects can have spillover benefits for other projects, with very low incremental costs. For example, technological investments for telecommunications equipment can be useful in a broad range of specific eHealth applications. This is an obvious area for public-private collaboration (35, 36, 37, 38).

Second, the above-described characteristics imply a major constraint with regard to **determining the value of an eHealth practice**. The clearly diminishing trend of marginal costs make it impossible to define the value (or price) of a digital health practice by the traditional mechanisms under which price equals marginal cost. Moreover, services of this type involve an experiential good. In other words, the usefulness for a patient or user cannot be determined until the service has been provided. Thus, it is important to incorporate patient or user satisfaction in measuring utility (or demand). Only in this way can the value of an eHealth practice be determined.

A final element to be considered is the nature of the associated network externalities. The functioning of eHealth services involves network externalities, in the sense that their value for users or patients is determined in part by the number of people using the services. It is important for the economic and financial evaluation of eHealth projects to take account of the types of networks that are to be constructed. A network with direct externalities is created when user participation takes place on a large scale. This would be the case, for example, for social networks in the health area. A network with indirect externalities is created by simplifying or improving the usability of its technological applications. Examples of this are the improvements in usability that many mHealth applications have implemented in recent years. Finally, learning networks are networks that function not so much as a result of the numbers of users, but rather as a result of the expert knowledge that is generated within them, as exemplified by typical networks of health professionals. Determining the type of network to be built for eHealth practices plays a major role in its subsequent evaluation, as it does for the expansive new field of public-private collaboration.

## Multilingualism in eHealth

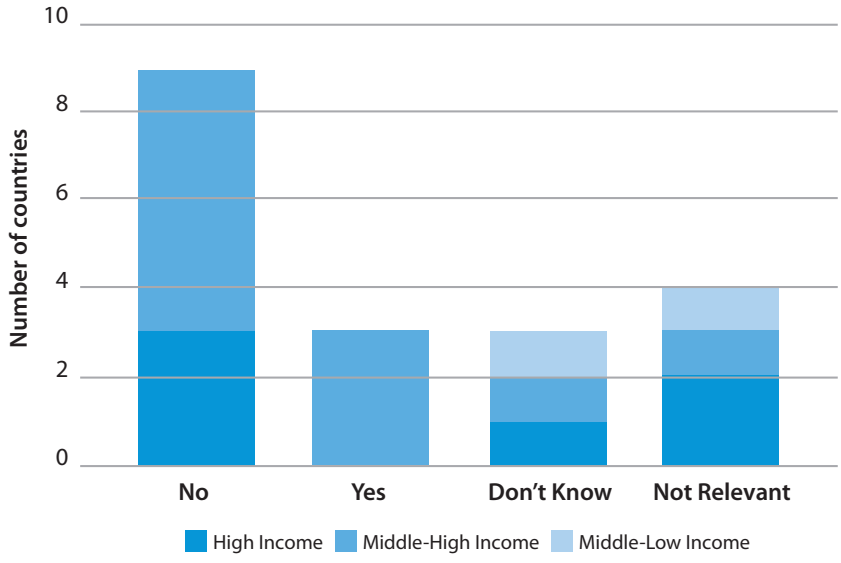
Delivering health services and health information to all requires linguistic support. A policy or national strategy to foster multilingualism promotes linguistic diversity and cultural identity. It should include access to health information that respects the relevant cultures and languages of the country's communities, and should offer eHealth products, services, and applications in several languages in support of the various linguistic groups.

Providing universal health coverage requires having a multilingualism policy or strategy providing for online access to both health information and health services in a way that is culturally sensitive and is available in the languages of each community. This ensures that medical professionals and patients understand each other when dealing with medical causes and treatments in the context of health interventions.

Of respondents, only 15.8% (three countries) of the Member States of the Region reported that they have a multilingualism policy or strategy. An equal percentage reported being unaware of the existence of such a policy or strategy, while 47.4% (nine countries) indicated that they have no multilingualism policy or strategy.

On another front, as shown in Figure 5, data indicate that a country's income level does not determine the development of multilingualism policy. Thus, of the six countries with high income levels, 50% (three countries) lack such a policy, while 16% of respondents (one country) did not know whether this type of policy was present, and 33.3% (two countries) indicated that such a policy was not relevant. Similarly, of the 11 middle-high income countries, three (27.2%) cited having this type of policy, six (54.5%) indicated that they do not have one, one country (9%) did not know, and one other (9%) indicated that such policy was not relevant. Finally, of the middle-low income countries, 50% (one country) did not know whether such a policy was present, and another 50% cited lack of relevance.

**Figure 5.** Distribution of countries with multilingualism policy, by income level




The data show that 73.7% of respondents (14 countries) stated that their government-supported websites do not offer information in multiple languages, while only 10.5% (two countries) responded in the affirmative.

## Discussion

It is clear that, for most of the countries of the Region, linguistic support continues to be a major challenge. New eHealth services should address this issue in order to prevent communication inequalities due to linguistic differences and cultural diversity (39). As empirical evidence confirms, when linguistic barriers are overcome, financial benefits can accrue (40). In view of these facts, it is indispensable that countries have a national policy or strategy to promote the availability of information in their local languages, in a way that respects cultural diversity.

## Capacity building – human resources, knowledge and skills

The work of health professionals involves intense activity in information management and knowledge generation. Collaboration and communication with colleagues are fundamental aspects of their work and are increasingly dependent on ICT. Given the current state of globalization, there is a correlation between competitiveness and the adoption and efficient use of ICT by health professionals in health organizations (41).

eHealth services affect many aspects of care delivery, as they are ever more important tools for decision-making in the health care arena. As one of the pillars of universal health coverage, well-trained health workers are essential to high-quality care. In addition to educational curricula, it is important that students be taught how online health services can be used to foster universal health coverage, improve care quality, support their own work activities, and provide care to patients.

Empirical evidence already points to a general lack of eHealth skills, even though most health professionals have used eHealth solutions, such as electronic medical records, in clinical settings (41). This underlines the fact that learning in this area needs to be incorporated in medical education and be an integral part of continuing professional education (42).

### Pre-service training – health sciences students

In the section entitled "Training prior to service – health sciences students," the survey asked about the teaching of health sciences students on the use of ICT in the field of health (eHealth). Training health sciences students in the use of technology in the health field is widespread. Among respondents, 84.2% (16 countries) indicated that their universities offer such training.

Of the countries that train health sciences students to use ICT in the health field (eHealth) and that provided a more detailed breakdown of how such training is delivered, 68.4% (13 countries) reported that up to 50% of their academic institutions (public and private) offer such training, while 10.6% (two countries) stated that ICT and online health training is provided for the students in more than half of their public and private institutions. One of these two countries is a middle-high income country, while the other is a high-income country. Notably, in the larger group cited above, along with the two middle-low income countries, one high-income country reported that fewer than 25% of its public and private academic institutions offer this type of training.

The training that does exist seems to be of a general nature, with little focus on the use of 2.0 technologies; when questioned on whether countries provide training on the use of social media for health purposes, the above percentage drops to 47.4%.

### Discussion

In various areas of health, the creation of platforms and strategies, based on free access to information as a form of research and as a means of promoting technological advances in the health field, has been essential in developing and advancing new knowledge to provide innovative forms of care (43). The use of mass media, new technologies, applications, and health-related services emerging

on the Internet all herald advances in creativity, apomediation, aggregation, information sharing (not only among scientists), and collaboration, using social networks, wikis, and blogs, among other media. Internet users, geographically scattered as they are, organize around communities of interest on any subject, even when the numbers of participants is small, leading to non-regulated or informal learning. Some of these communities, based on common interests, over time become true communities of practice (CoP) according to Brusilovsky and collaborators (44), Brown and Duguid (45), and Lave and Wenger (46), with users building knowledge collectively, sharing experiences, and interacting through the tools provided by the community. Of countries responding, 26.3% indicated that at most 25% of their public and private institutions of higher education offer this type of training for students. In only one middle-high income country do more than 75% of the public and private higher education institutions offer this type of training.

## On-the-job training – health professionals

With regard to continuing education for health professionals, 84.2% of Member States (16 countries) that responded indicated the existence of this type of training.

Of the countries that provide on-the-job training for the use of ICT in the health field as part of continuing education for health professionals––and that provided a more detailed breakdown of the delivery of such training––57.9% (11 countries) report less than 25% of professionals receive such training, while 15.8% (three countries) report 25-50%, with only 5.3% (one country) reporting 50-75%.

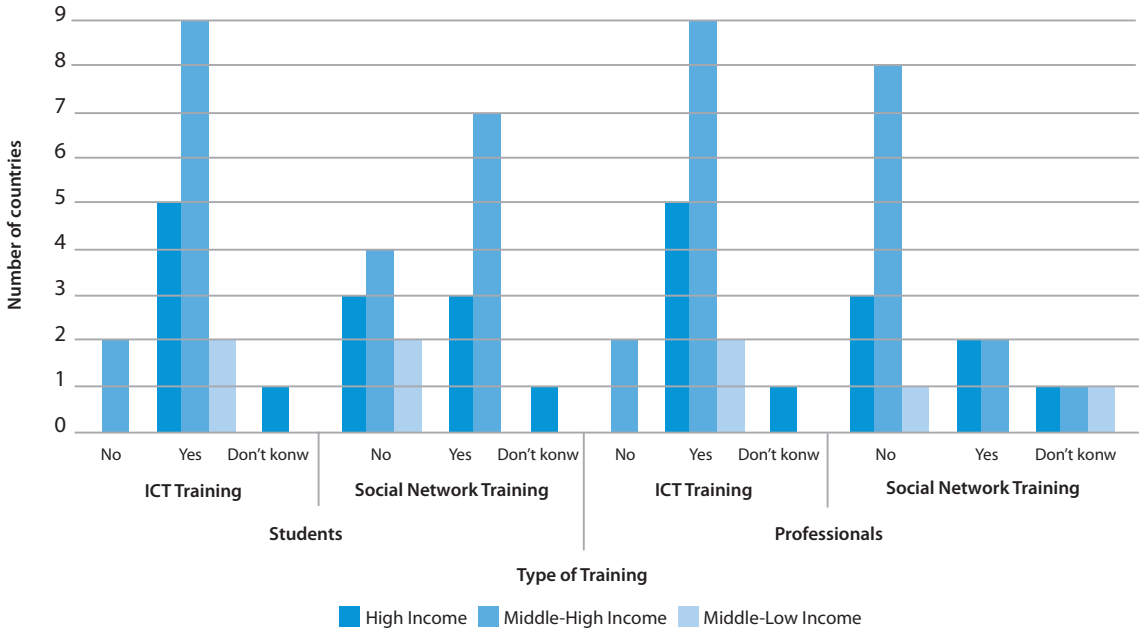
As in the case of university education, few countries provide continuing training on the use of social media in health. Specifically, only 21.1% (four countries) indicated the existence of this type of training for health professionals. Although training on the use and benefits of social media in health remains limited, such training is improving in the case of newly trained graduates in the health field.

When queried about different professional groups within the health field, responses indicated that on-the-job training on the use of ICT in health is available for physicians in 78.9% of the Member States (15 countries); to nursing and birthing personnel in 63.2% (12 countries); to dentists in 47.4% (nine countries); to pharmacy personnel in 52.6% (10 countries); to public health personnel and researchers in 57.9% (11 countries); and to medical IT personnel in 52.6% (10 countries). Continuing training on the use of social media in health is available to physicians in only 15.8% of the Member States (three countries). This proportion is even lower for the other groups. Thus, in only 5.3% of cases (one country) is this type of training provided for nursing and birthing personnel, dentists, pharmacy personnel and researchers, while twice the number of public health personnel (10.5%) receive such training.

One possible reason for this situation is the lack of national policy governing the use of social media in health-related professions. The survey findings show that 94.7% of respondents (18 countries) indicated they have no policy in this regard.

Figure 6 shows training in ICT and social media for health sciences students and professionals, by income level.

**Figure 6.** Training in ICT and social media for health sciences students and professionals, by income level




## Discussion

On-the-job training of health professionals continues to be indispensable for the development of new abilities and skills in the use of ACT, if national digital health strategies are to advance and outcomes, efficiency, and effectiveness are to improve (41). eHealth has the potential for expanding health services to a broader population, and for making service more personalized. Knowledge and skills in ICT are key to developments in eHealth. A body of well trained and committed health workers is essential to the availability of accessible and high-quality services, and thus constitutes a pillar of universal health coverage.

Distance learning is not a panacea for the problems of continuing medical education (CME) in electronic health, but does offer a series of advantages over traditional training methods. First, it is compatible with the responsibilities of health professionals and with the potential to learn from their own clinical experience. Second, the flexibility associated with distance learning gives participants easy access to the most important aspects of science, research, and management in their specialties, and facilitates the learning of ICT-related abilities and skills. "Training via eLearning does not necessarily have to be located in areas that are geographically remote or unable to access any another type of training. Instead, choosing it is fundamentally based on the potential that ICTs contribute to the training and on the new learning styles associated with the methods used in these environments" (47). Finally, the rapid evolution of ICT makes it mandatory to consider flexible and remote forms of continuing education (48). The Internet is an important tool for continuing medical education and for staying abreast of the latest knowledge.

Given the promise that ICT in health services holds as a tool for addressing the challenges of universal health coverage, health professionals will need new skills to meet the needs of the new society, as will professionals involved in designing electronic health solutions, online health experts, and managers of digital health programs. Knowledge of the processes, critical factors, and strategies needed to integrate ICT in health care systems will be essential. New and more powerful means of transmitting this knowledge to health professionals through continuing medical education (CME) also need to be developed.

## Summary

eHealth brings with it a wide range of new opportunities to improve universal access to health services, through intensive use of ICT and, in particular, the Internet (13, 21, 49). The majority of PAHO/WHO Member States in the Region recognize the important role of eHealth in achieving universal health coverage, and are adopting concrete policy and strategy measures. Thus, 14 of the 19 countries of the Region have national policies or strategies regarding universal health coverage. In 10 of these countries, the approach to universal coverage and national health objectives involves ICT or eHealth.

Funding of eHealth programs in the WHO Region of the Americas is primarily from public sources. A total of 15 countries state that they draw on such funding for the development of their eHealth programs. Although many countries have this type of funding, in seven of the countries it constitutes over half of the total funding. An examination of national income levels shows that, of the countries that have such funding, 33.3% are high-income countries, 53.3% are middle-high income countries, and 13.3% are middle-low income countries. In each of the three (out of six) high-income countries that have this type of funding, over 75% of all funding for this purpose is public. In the case of the remaining country, the figure is between 50% and 75%. Among the eight middle-high income countries with such funding, 50% stated that this type of funding represents less than the 50% of the total investment. Finally, with regard to the two middle-low income countries, one of these reports that public funding represents between 25% and 50% of the total received, while the other states that this information is not available.

Next in importance after public funding is donor/non-public funding for development. A total of 14 countries stated that they receive such funding, and two of these reported that this type of funding represents over half of their eHealth funding. Again, an examination of income levels reveals that of the 14 countries that receive this type of funding, 21.4% (three countries) are high-income countries, 52.6% (10 countries) are middle-high income countries, and 7.1% (one country) is in the middle-low income bracket. As to distribution, the responses show that for the three wealthy countries this type of financing represents less than 25% of total funding, and represents between 25% and 50% for seven of the 10 countries with middle-high income; while one of the two middle-low income countries receives 100% of the funding through this modality.

Private or commercial funding is the third most common type of funding, with seven countries indicating this as a source, while 12 countries report either that this is not a source of funding or that they do not know. Again, just one middle-high income level country stated that this type of funding represents more than half of its eHealth funds. With respect to income levels, the responses show that of the seven countries that have this type of funding, only one (14.3%) is a high-income country, while five (71.4%) are middle-high income countries and one (14.3%) is a middle-low income country. Despite the importance of this source for the middle-high income countries, three of the five that utilize this source indicated that private funding represents less than the 50% of overall funding.

Finally, financing for implementing policies or strategies and financing through public-private partnerships, present in six of the Member States, are the least common types of financing, while 13 countries reported either that such funding is not present or that they do not know. With respect to income classification, the responses show that of the six countries that receive these types of funds, one (16.7%) is a high-income country, while five (83.3%) are middle-high income countries. Given the importance of this kind of funding as a percentage of the total received, it is present in five middle-high income countries. In all cases, the amount received does not represent more than 50% of total funding.

In the countries of the Region in which a significant portion of the population is indigenous and has its own cultural traditions, linguistic challenges in the health sector are common. Only three countries reported having a multilingualism policy or strategy, while nine countries stated that they have no such policy.

Training in technological applications for health among health sciences students is common. Among respondents, 84.2% (16 countries) indicated that their universities offer such training. The training, however, seems to be general in nature, with little focus on the use of 2.0 technologies; only 47.4% indicate using social media for health purposes.

With regard to continuing education for health professionals, 84.2% of the Member States responding indicated the existence of such training.

As in the case of university-level training, few countries have continuing education training on the use of social media in health, with only 21.1% citing this type of training for health professionals.

## Recommendations

- A new orientation to universal eHealth is needed, one that goes beyond establishing national policies and strategies on coverage and moves toward implementation. eHealth must not be solely seen as a set of specific, isolated practices, but rather must be approached as an integrated system in which each practice within the sphere of eHealth, though facing its own barriers and having its own facilitating factors, can be addressed globally. Adopting a comprehensive approach will foster not only important synergies with other branches of eHealth activity, but with other economic and social uses of the Internet as well. Only in this way can eHealth help reduce socially determined health inequalities through universal health coverage (especially in the middle-high and middle-low income countries).
- eHealth should be regarded as a system made up of a broad set of dimensions (a holistic model) going beyond traditional temporal sequencing. This requires constructing an aggregate model (implementation framework) that reflects both systemic eHealth practices as a whole and the various explanatory dimensions beyond the technological (personal, educational, economic, organizational, social, cultural, and institutional), ones that do not take a homogeneous or sequential form. One tool for use in health-related settings is the telemedicine 'Hat' model that PAHO/WHO presented in May 2016 in an effort to provide solutions for the successful implementation of telemedicine and general eHealth services (3).
- Member States are urged to move forward in supporting (and funding) new eHealth strategies that go beyond establishing national policies and strategies. This challenge is especially relevant to the middle- and low-income countries, where resources to address the situation are clearly lacking. Public-private collaboration is essential if funding barriers are to be overcome. The establishment of national partnerships between civil society, the civil service, and private-sector entities, through the creation of national eHealth commissions or committees, could be a useful approach for mobilizing the resources needed to adopt and implement eHealth strategies. **The National eHealth Strategy Toolkit** developed by WHO and the ITU can help in this respect (33).
- National policies and strategies must go hand in hand with rigorous assessment mechanisms and economic and financing (legislative) reports that analyze the cost-effectiveness of eHealth practices – not only in the design phase, but also in implementation and evaluation. **The Methodological recommendations for the measurement of access and use of eHealth** (50), along with the telemedicine 'Hat' model (3), can serve as supporting tools.
- Greater emphasis must be placed on educating health personnel on the organizational dimension and on the role of patients (in the new empowered-patient or e-patient role). eHealth can only improve outcomes when combined with specific training and with new ways of organizing work and managing human resources, in ways that provide health professionals the necessary flexibility to use technology to carry out routine tasks, thereby adding value to their organizations.

Section 2

# Electronic health records (EHR)

A sound electronic health records (EHR) system is essential to achieving universal health coverage; it provides support for diagnosing and treating patients by offering fast, thorough, and specific information on patients at the point of care.

## Key data from the survey responses

- 52.6% of PAHO/WHO Member States in the Region of the Americas have a national EHR system.
- 26.3% of Member States have legislation that supports the use of their national EHR systems.
- Lack of funding to develop and support EHR programs and lack of evidence regarding the effectiveness of EHR programs are the most common barriers, with 73.7% of Member States reporting this as a "very important" or "extremely important" barrier to their implementation of EHR.

## Introduction

Electronic health records (EHR) are patient-centered real-time files that provide immediate and secure information to authorized users. EHRs typically detail clinical histories, patient diagnoses and treatments, as well as information on drugs, allergies, vaccines, radiological imaging, and laboratory findings.

National EHR systems are usually overseen by a country's national health authority, and provide access to patients' clinical records for professionals in health care institutions, as well as furnishing links to related services such as pharmacies, laboratories, specialists, emergency facilities, and medical imaging. With EHR, primary care physicians have electronic access to specialists on clinical issues which, by reviewing a patient's history in real time, can be addressed without the patient actually visiting the specialist (51, 52, 53, 54, 55, 56). Similarly, EHRs make it possible to monitor acute and chronic health conditions (57, 58, 59). This is particularly important in light of the current challenges posed by an aging population and the growing number of sufferers from chronic illnesses who receive care from more than one health care facility (60). The use of EHR also provides a unique opportunity to prevent medical errors, particularly those related to allergic reactions and drug interactions (61).

The secondary use of EHR data provides a competitive advantage for clinical and epidemiological research.

## Survey findings: Electronic health records

For the purpose of this survey and for purposes of general comparison, the terms "electronic health records" (EHR) and "electronic medical records" (EMR) are used interchangeably here, though they are not strictly synonymous. When a country's EHR system is overseen by a national health au-

thority, patients' medical records are available to health professionals in different health institutions, and the system provides links to national health services.

The Third Global Survey on eHealth 2015 shows that 52.6% of the countries surveyed (10 countries) stated that they have a national EHR system under the above definition. More specifically, 30% (three countries) are high-income countries and 60% are middle-high income countries, with only one country (10%) being in the middle-low income category. When classified according to per capita health expenditure, analysis shows that 20% of the high-expenditure countries have an EHR system, as opposed to 30% and 50%, respectively, of middle-high and middle-low income countries. Only five countries (26.3%), though, have specific legislation governing the use of a national EHR system, while eight countries (42.1%) stated that they do not have the information to answer this question. Again, it should be emphasized that specific EHR practices would gain consistency if linked with national health strategies/policies.

Member States were asked to indicate the types of health facilities they have that use the national EHR system, and the extent to which the system has been adopted, so as to enable better understanding of the types of health facilities that use EHR. Of the respondents, nine (47.4%) reported that they use the national EHR system in primary care facilities (such as clinics and health centers), with the same percentage stating this in regard to secondary care facilities (such as hospitals and emergency facilities). The same percentage applies to tertiary health care facilities (for example, specialized care and referral from primary/secondary facilities). Eight countries (42.1%) stated that they did not know which health facilities use the national EHR system.

With regard to levels of adoption among the countries that cited use of the national EHR system in primary health care centers, 8 countries stated that the extent to which the system is used is "medium" (between 25% and 50%), while 8 countries (42.1%) reported that they did not know. In terms of secondary care facilities, six countries (31.6%) indicated a "medium" (between 25% and 50%) and "high" (between 50% and 75%) level of use of the system. Lastly, with regard to tertiary care facilities, six countries (31.6%) stated that use of the system at these facilities is "low" (slightly less than 25%), while two countries (10.5%) indicated a "medium" level of use. In the two latter types of facilities (secondary and tertiary care), 10 countries (52.6%) reported that they did not have figures on the extent of use.

In seeking to achieve universal health coverage, efforts should be made to link primary care EHR data, hospital data, and data from other health institutions (pharmacies, laboratories, etc.) (62). Moreover, linking the EHR system with electronic prescriptions would improve care quality and coordination, leading to better health outcomes (63, 64). The countries were asked what other systems were connected with their EHR, i.e., whether their national EHR system is linked to related clinical systems. Of the 10 countries with national EHR systems, nine (47.4%) reported links with laboratory information systems, two (10.5%) with pathology information systems, nine (47.4%) with pharmaceutical information systems (e.g., a national electronic prescription system), eight (42.1%) with image filing and transmission systems, and two (10.5%) with automatic vaccination warning systems. Lastly, 10 countries (52.6%) reported that their EHR system was not connected with any other system, while nine countries (47.4%) indicated that they did not know.

The use of international standards to support national EHR systems was also explored. Ten countries reported using such standards, selected from a list of recognized standards, while nine countries (47.4%) reported having no knowledge of this. The International Classification of Diseases (ICD), in use in 10 countries (52.6%), and digital imaging and communications in medicine (DICOM), in use in eight countries (42.1%), are the most common international standards applied in the Region. HL7 (Health Level 7) messaging is the third most widely used standard in the implementation of EHR systems and is used in seven countries (36.8%). Following close in ranking are the Systematized Nomenclature of Medicine – Clinical Terms (SNOMED CT) and the Logical Observations Identifiers, Names, Codes (LOINC) standard, in use in five countries (26.3%). Finally, there is the CEN/CT 251 standard, the Dublin Core Metadata Initiative (DCMI), the International Organization for Standardization (ISO) technical specifi-

cations for EHR systems (ISO/TC 215), and, in one country (5.3%), the ISO specifications for the design of EHR systems (ISO 18308). The survey found that no country uses any of the following: the ASTM continuity of care record (CCR) standard, the data documentation initiative (DDI), the UN format for the transmission of indicators (Messaging IXF), or the Statistical Data and Metadata eXchange (SDMX).

## Discussion

Hillestad *et al.* (65) have estimated the potential improvement in efficiency and savings in expenditure that would accompany the extensive implementation of ICT in health settings. In the United States, large-scale adoption of an interoperable form of EHR could translate into average annual savings of US$77 billion, with the main sources of reduction being in hospital stays, time that professionals devote to administrative tasks, consumption of drugs, and use of diagnostic tests. Moreover, increased use of electronic prescriptions could, according to these researchers' estimates, prevent some 2 million adverse reaction events, or two thirds of the predictable events of this type (i.e., nearly half of such events that occur each year), which result mostly from the misuse of drugs. This would generate annual savings of US$3.5 billion. Lastly, they state that integrating EHR with available scientific evidence could improve preventive actions, with major mid- and long-term benefits at a low incremental cost. The authors cite an estimate of 13,000 years of life gained, with an increase in cervical cancer screening that would involve an additional expenditure of only US$100,000 to US$400,000 per year.

On yet another front, the incorporation of geographic information systems would open the door to providing geographical context for EHR data (66). This would make it possible to analyze the environmental and social determinants of health, identify health trends in local communities, and provide help in planning interventions for populations in increased need of services (67). Analyzing the correlation between health outcomes and social determinants of health could provide specific interventions and facilitate optimal allocation of available resources. Integrating data from different clinical systems, with information on the social and environmental determinants of health, could provide a more complete picture of the health status of different communities (67). By identifying high-risk localities, public health efforts can define and prioritize community-based strategies. The prospect of linking EHR with auxiliary health information systems holds promise for using electronic health to enhance integrated care.

## Barriers to implementing electronic health records

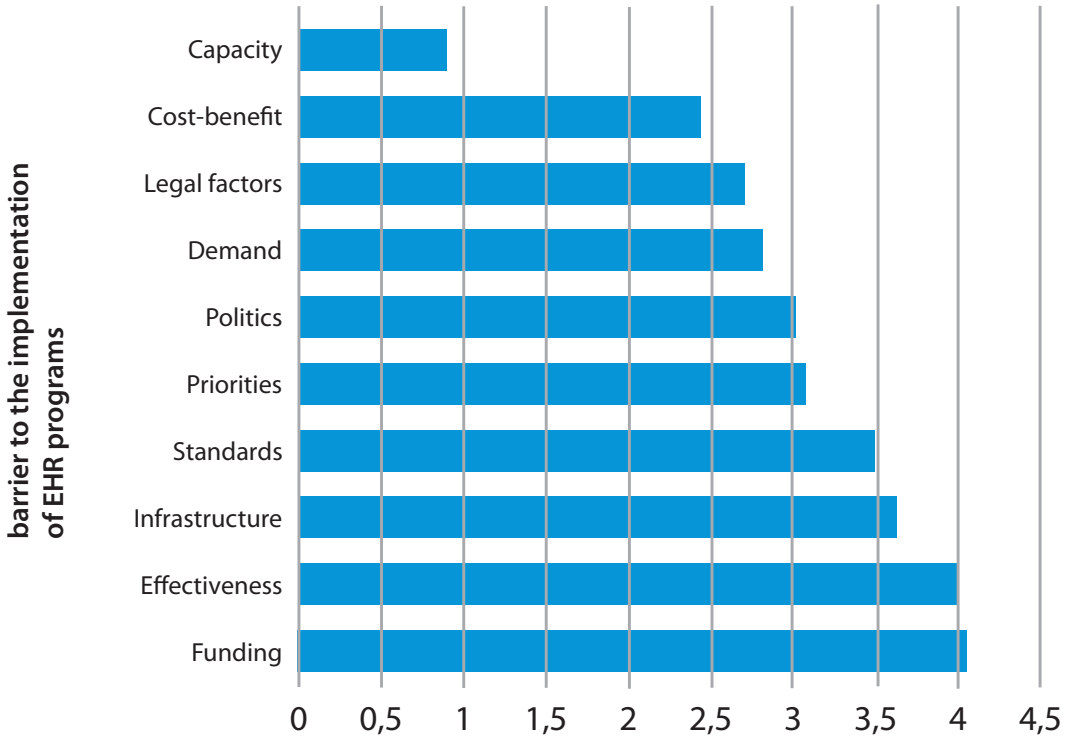
Many factors impede the successful implementation of electronic health records in the Region's countries. Various studies on the use of EHR show that it is difficult to determine their added value (68, 69, 70, 71, 72, 73), and indicate that resistance on the part of users (74, 75, 76, 77, 78, 79),, along with other barriers (80, 81, 82, 83), can block the potential benefits (84). For this reason, the survey urged Member States to evaluate a list of barriers according to their importance in the national context.

The 2015 survey listed a total of 10 specific barriers to the implementation of EHR systems; these were assessed by respondents on a Likert scale of 1 to 5, with 1 signifying "it is not a barrier" and 5 indicating an "extremely important barrier." Thus, each country was able to indicate which barriers had relevance and to specify the importance of each.

The lack of funding to develop and support EHR programs, and the lack of evidence on the effectiveness of EHR programs, are the most common barriers cited. Fourteen countries (73.7%) reported these as "very important" or "extremely important" for EHR implementation. Of these, eight (57.6%) are middle-high income countries. The lack of equipment and/or connectivity (infrastructure) and the lack of national or international information standards for interoperability were the factors cited with next-greatest frequency as "very important" or "extremely important" barriers – by 13 countries (68.4%) and 11 countries (57.9%), respectively. (Of the 13 that cited these as "important,"

eight, or 80%, are middle-high income countries, and of the 11 countries, 54.1% are middle-high income countries.) The average values of the variables range between 4.11 and 4.05 for the former two, and between 3.68 and 3.53 for the latter two. Figure 7 shows the respondents' average scores for the different barriers to the establishment of EHR systems.

**Figure 7.** Average scores for different barriers to the establishment of EHR systems




Five countries cited a series of additional barriers, including lack of evidence on the profitability of EHR programs (cost-effectiveness), lack of demand for EHR programs by health professionals and patients, and lack of legislation or regulations that address EHR – all of which were ranked as very important barriers.

## Discussion

The barriers associated with EHR concern its applications and use (85), as well as the technology's interactions within the health care system (86, 87, 88, 89, 90, 91, 92, 93). The two most common barriers appear to be closely related. The lack of available evidence regarding the effectiveness of EHR programs suggests that these are not being used extensively in clinical care. The sluggishness and difficulty in implementation is attributable to the lack of definitive scientific evidence to accurately identify their positive effects, both on care practice itself (in the form of increased quality and efficacy) and with regard to economic factors involved in their development (cost-benefit improvement). A thorough understanding of the effectiveness of EHR systems requires examining the determinants of EHR use – i.e., focusing on what actually motivates physicians to use EHRs and on the care context in which EHRs are used. It is this lack of evidence that accounts for the lack of funding to develop and support EHR programs. A strategic focus on widespread adoption of EHRs (incorporating evaluation of results), will help identify the benefits of EHRs, better enabling health systems to address their role in achieving universal health coverage. In this context, physicians should be encouraged to input data, so that the task does not become an extra daily work burden. The participation of patients in the data collection process is also an important factor, as discussed below.

The organization and management of human resources in health organizations clearly plays a key role. In addition to making greater efforts to analyze the impact of EHR practices, countries need to move toward more flexible, advanced, and high-performance organizational systems that provide health professionals with greater autonomy and decision-making capacity. As international evidence shows (94), the incorporation of digital technologies in professional activities magnifies their effects on organizational outcomes when accompanied by personnel training and new ways of organizing work. For EHR practices to magnify the organizational effects of technology, organizational schemes and human resources management must be reoriented. With better use of technology, medical professionals can contribute more value to their organizations. Specifically, ERH practices can allow for technology to replace routine manual and cognitive tasks in order for health professionals to focus on non-routine cognitive tasks. A failure to incorporate organizational and human resources dimensions in developing EHR practices can ultimately have a saturation effect and increase the barriers to their use by health professionals.

The most important obstacles – lack of equipment and/or connectivity (infrastructure) and the absence of national or international information interoperability standards – are connected with the lack of a national eHealth strategy. Given the potential benefits, there needs to be a political awareness to promote the importance of data access and ownership, as well as consideration of issues concerning data security, privacy, quality, and comprehensiveness. Moreover, addressing the lack of legislation or regulations regarding EHR programs remains a prerequisite to successful implementation (95, 96).

Ultimately, a long-term policy approach must be adopted in order to address the issues of interoperability that accompany the crossborder use of national electronic health services, in the form of applications, information, ICT infrastructure, care procedures, and legal and regulatory issues. Additional evaluation is needed to ensure that existing barriers are addressed and that adequate interoperability frameworks are in place. In the survey, 14 countries cited funding and lack of evidence of efficacy as very important or extremely important barriers to the implementation of their national EHR systems. Following these, in order of importance, were a lack of equipment and/or connectivity (infrastructure) and the absence of national or international information interoperability standards.

## Other applications

ICT are increasingly being used to support complex processes and functions in the health sector, thereby improving the efficiency and security of the sector's systems. Applications vary widely, ranging from methods for paying service providers to managing hospital supply chains. Questions regarding the use of such applications in the countries remain to be addressed.

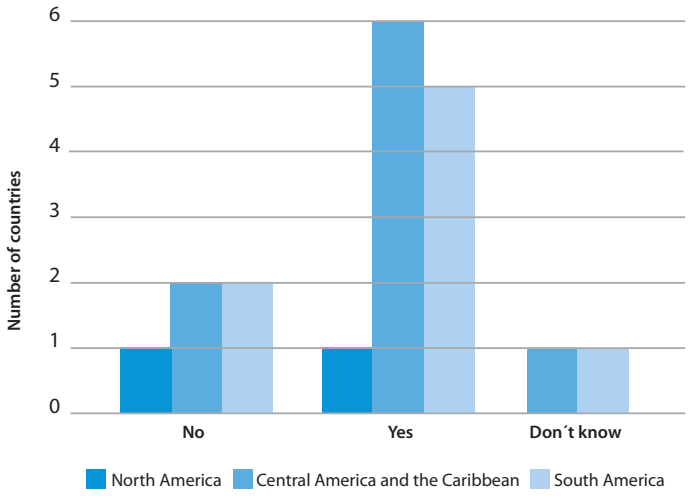
The survey also examined various applications that are used to support services in the health sector. Electronic medical billing is the process by which a health care provider sends an electronic invoice to a health insurance company (or other payer) for services provided. Of those responding, 68.4% (13 countries) stated that their country's health sector has electronic medical billing systems, while six countries reported the absence of such systems.

Information systems for managing health-related supply chains consist of software solutions to deal with complex procedures for monitoring and submitting reports on materials, information, and finances, as these move from provider to manufacturer, to wholesaler, to health services, and to the consumer. Of those responding, 68.4% (a total of 13 countries) reported the use of such systems in their health sector, while 26.3% (five countries) reported that they did not use such systems.

Lastly, health-related human resources information systems provide up-to-date information on a country's health personnel, so that human resources can be monitored, managed, and deployed, allowing for problems to be assessed and evidence-based interventions designed. Of those responding, 63.2% (12 countries) reported the use of such systems in their health sectors, while 26.3% (five countries) replied in the negative. As shown in Figure 8, of the five countries that answered "no," one

is in North America, two are in the Central American and Caribbean subregion, and two are in South America. Of the 12 countries that indicated having such systems, one is in North America, six are in the Central American and Caribbean subregion, and five are in South America.

**Figure 8.** Distribution of countries with respect to human resources information systems




## Success stories

### Integration of electronic records systems: The Electronic Health Record (EHR) Blueprint in Canada (97)

In 2000, the federal, provincial, and territorial governments of Canada agreed to work together to create EHR systems with compatible standards. Accordingly, they supported the creation in 2001 of an independent organization called Canada Health Infoway. Funded by the Canadian government, its mission is to accelerate implementation of electronic health information systems, developing a network of computer solutions that make a patient's electronic records available throughout the country, so that access is assured for clinics, hospitals, pharmacies, and other care facilities. This is designed not only to improve access to health services for patients, but also to improve care and enhance the efficiency of the health care system.

In support of this mission, Infoway has developed an application known as the Electronic Health Record (EHR) Blueprint, a technological framework that not only facilitates the interoperability of electronic files between various systems, but also provides secure, high-quality information. The system was launched in 2004 and revised in 2006. The second version, Blueprint version 2, in addition to correcting some defects that became apparent in version 1, also integrates new elements of privacy and security architecture (PSA).

This is essential, since a patient's digital file contains a great deal of information, such as the results of laboratory tests, medication profile, results of diagnostic imaging, clinical/immunization reports, etc. – information that is used by multiple agents. Accordingly, the new version not only improves the care, security, and diagnostic accuracy provided by health professionals, but also, from the patient's perspective, streamlines the process and reduces some of the costs of repeat visits and tests.

## Discussion

Electronic Health Records (EHR) have the potential to become a profitable, viable, and sustainable source of data for the ongoing management of a population's health, by fostering the effective circulation of timely medical information in unprinted form for all stakeholders (61). With EHR it becomes possible to improve the efficiency and overall quality of care by providing the patient with direct care, improving the management of support, administrative, and financial processes, and, most importantly, supporting patients' capacity for self-monitoring.

One of the most promising trends in the EHR area is the increasing use of Personal Health Records (PHR) (98), and in particular their integration with other health information systems such as those of laboratories, pharmacies, and hospitals. The successful development of PHR that can be accessed by patients and health care teams can aid in moving toward a more citizen-focused approach to care (99, 100). The catalyzing synergies of this transition can give health system users an increasingly active role in decisions that affect their health (101, 102). The evolution of PHR and their use by citizens create new opportunities as well as new dilemmas. As with other social systems, health systems are subject to numerous challenges brought on by economic, technological, social, and cultural change (103). Given that information and communication are basic elements of these systems, the interrelationship of the new technological paradigm and the new social paradigm should facilitate changes in the way health services are accessed and consumed (104, 105); emphasizing the value of the patient will be vital in promoting the development of PHR as a facet of universal health coverage (106). The American Medical Informatics Association (AMIA) has already stated that citizens should have control over their own PHR (specifically, that secondary uses of PHR data be controlled by the citizen except when otherwise required by law) (106). Thus, in addition to promoting greater integration with different EHR providers, patients' access to portions of their medical records can be facilitated, and new options can be provided for interaction with providers. Thus, patients dealing with multiple EHR, generated in different settings, can gain a comprehensive view of their records.

Transferring local initiatives to larger communities is often slow and complex, and national strategies should confine themselves to laying the groundwork for EHR interoperability and encouraging connectivity between suppliers. In this way, increasing connectivity can make patient information more accessible throughout a state or region and provide a greater critical mass of data.

Nevertheless, proper implementation of EHR practices requires that countries take account of two key factors, which are considered indispensable to optimizing the organizational benefits of eHealth. These concern the training of professionals and the establishment of new approaches to organizing and managing human resources. The EHR-training-organization triangle is essential for successfully incorporating eHealth into health systems. Among professionals, many of the barriers to eHealth come from a failure to consider their training-related and organizational origins. Lack of evidence on effectiveness, problems with technological equipment, and interoperability constraints could be addressed through increased training for health professionals regarding EHR developments, and by introducing methods of organizing work that place greater emphasis on non-routine cognitive tasks, while using technology to replace routine cognitive and non-cognitive tasks.

Lastly, the advent of mobile technology is making it possible to integrate different applications for managing well-being and health, while at the same time making health services more personalized.

## Comments and lessons learned by the Member States

All of the countries emphasize the importance of adopting national standards that allow for inter-institutional interoperability between different information systems. They also stress the need to enlist a range of working teams and experts in the process.

The ways in which each country manages its health system, however, remains a problem. In

countries such as Chile and Uruguay, the implementation of electronic health records brings to bear various information technology solutions, coordinated centrally by the Ministry of Health, which determines what processes will be implemented and what standards will apply. In countries such as Mexico, on the other hand, interoperability is hindered by the system's fragmentation, with multiple institutions having their own EHR systems. Similarly, in Canada, health-related responsibilities are handled primarily at the provincial and territorial levels, with the development and adoption of EHR systems falling under those jurisdictions. Serious efforts are nevertheless being made to integrate existing systems in both of these countries, in an effort to facilitate interoperability. This is especially true in Canada, where, as early as 2001, the federal, provincial, and territorial governments agreed to create the independent organization **Canada Health Infoway** to advance the effort. Funded by the national government, it functions as a strategic investor in projects to develop competencies, while promoting collaboration and guiding the development of a common architecture.

Another impediment relates to the public versus private status of the organizations called upon to integrate their systems. As the **Atlas of eHealth country profiles** (11) report has pointed out, funding in countries such as Canada and the United States is entirely public, while in others, such as Trinidad and Tobago, it is private.

## Summary

An effective national EHR system must help ensure complete and timely documentation of patient diagnoses and treatments and be a tangible resource for furthering universal health coverage. EHR systems must be a key element of national online strategies. Of Member States in the Region of the Americas, 52.6% stated that they have national EHR systems, and half of these have specific laws that regulate the use of such systems.

The survey findings indicate that, in six countries, national EHR systems are used in most secondary care facilities. In primary and tertiary care facilities, however, their use is relatively low.

In order to achieve universal health coverage as envisioned, there need to be ways of linking EHR data from primary care facilities, hospitals, and other health institutions such as pharmacies and laboratories. In more than half of the Member States, National EHR systems are frequently linked with laboratory information systems (9 countries), pharmaceutical systems (9 countries), and image filing and communications systems ( 8 countries), signaling that these national EHR systems are expanding as they mature.

The use of international standards in national EHR systems promotes interoperability with other national ICT/health systems, paving the way for new crossborder health services. The International Classification of Diseases (ICD) standard, in use in 10 countries, and the Digital Imaging and Communications in Medicine (DICOM) standard, in use in 8 countries, are the most common international standards in the Region. The next most common standards in the Region are HL7 (Health Level 7) messaging (7 countries), Systematized Nomenclature of Medical and Clinical Terms (SNOMED CT) (5 countries), and Logical Observation Identifiers Names and Codes (LOINC) (5 countries). Although standards and interoperability continue to be important obstacles to EHR implementation, funding is cited as the most important barrier by 14 of the Member States that responded to the 2015 survey.

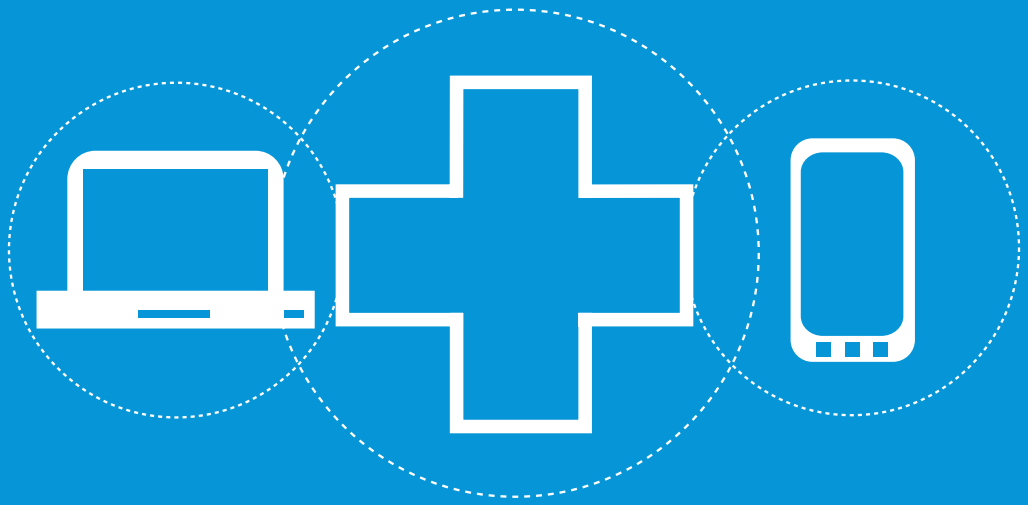
## Recommendations

- In order to promote sustainable, extendible, and interoperable development of EHR-based programs and initiatives, the development of national EHR systems should occur in the framework of a national patient-centered online health strategy, based on a unique identification system.

- To this end, appropriate national legislation must be enacted to govern EHR systems and their use, and organizational and technological infrastructure and access to information must be improved.
- Patients should participate in developing the EHR system, in efforts to expand the sharing of health information beyond the traditional health and social services borders. This will also support change toward a more citizen-focused approach to care, which is recognized today as the key to improved outcomes and care quality, while reducing costs and consuming fewer resources.

Section 3

# Telehealth



Telehealth is regarded as one of the greatest innovations in health services, not only from the technological standpoint, but also culturally and socially, since it improves access to health care, as well as care quality and organizational efficiency.

## Key data from the survey responses

- 36.8% of Member States have policies or strategies directly concerned with telehealth.
- 89.5% of Member States use teleradiology.
- 57.9% of Member States use remote patient monitoring.
- 42.1% of Member States use telepathology services.

## Introduction

According to WHO, telehealth is defined as "the delivery of health care services, where distance is a critical factor, by all health care professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of health care providers, all in the interests of advancing the health of individuals and their communities" (107, 108). In addition, telehealth aids the effort to achieve universal health coverage, and is particularly valuable to the inhabitants of remote areas, vulnerable groups, and older populations.

Telehealth services or programs can be divided into remote care, administrative management of patients, distance education for professionals, and networked collaborative evaluation and research.

Remote care can include follow-up consultations, monitoring, diagnosis, and treatment, as well as telemonitoring of [in many cases chronic] patients that commonly includes the recording of biological parameters. These services also include electronic communication between professionals to coordinate actions. Within remote care services, a distinction is often made between telecare and telemonitoring. Telemonitoring services expand a patient's options and permit continuous care in the home. They are promoted by health professionals and help to empower citizens and patients to take an active role in managing disease. Moreover, they reduce the duration of hospital stays, provide a new role for the physicians as a second line of support in an environment of multidisciplinary services often coordinated by nursing personnel, and enable patients to take responsibility for managing their illnesses.

With regard to the administrative management of patients, services include both orders for analytical tests and processes involved in billing for services.

Distance training is designed to provide guidelines and health-related evidence as part of continuing education for health professionals.

Lastly, networked collaboration for evaluation and research aims to make use of ICT for sharing and disseminating best practices, as well as for generating knowledge through the actions and reactions of those involved.

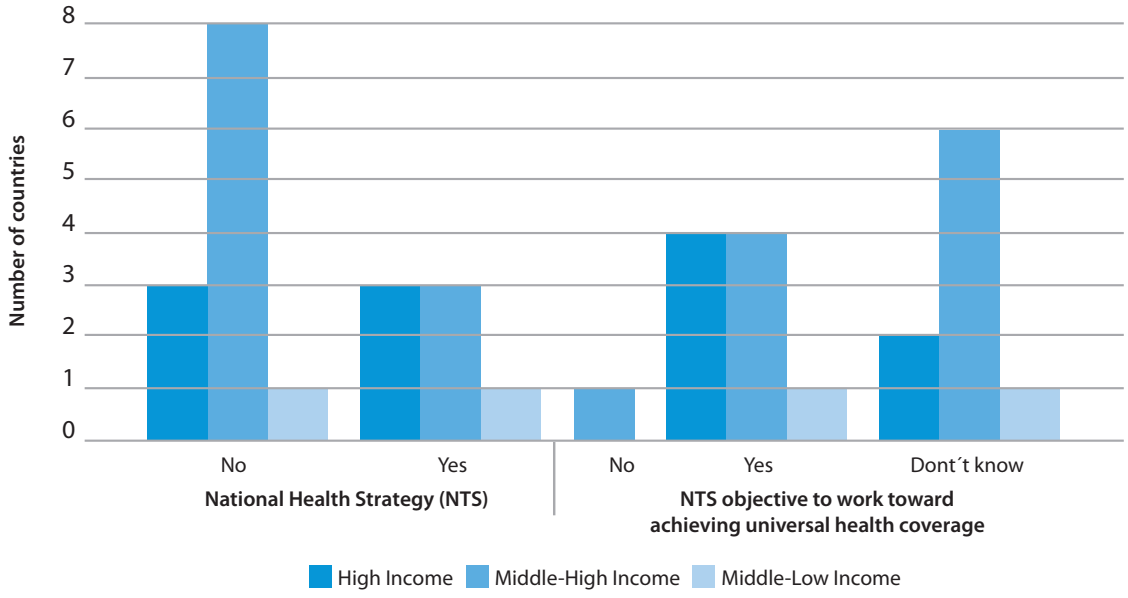
Telehealth was initially developed to bring health services closer to populations in remote locations where health resources are lacking, thus improving access to such resources. Over time it became a means of improving the quality of care by providing training and decision-making support for health professionals in remote areas. Most recently, it has been viewed as a tool to improve the efficiency of health services, making it possible to share and coordinate geographically remote resources and to redesign health services for resource optimization. At present, most specialties make use of telehealth services.

In the WHO Region of the Americas, the interest and expectations associated with telehealth seem highly justified, given that geographical factors and the distribution of health services are key elements for successfully addressing existing challenges. Hence the steady increase in the number of projects implemented, and the ever-growing scientific and research activity they are generating. The *Centro de Telessaúde* [Telehealth Center], of the state of Minas Gerais, (RTMG), in Brazil, which serves 480 municipalities, has already performed over two million electrocardiograms (109).

## Survey findings: National telehealth policy or strategy

In a follow-up question in the 2015 survey, Member States were asked whether they had a national telehealth policy or strategy. A national telehealth policy or strategy is one that sets forth a vision and objectives for the delivery of national and crossborder services using telehealth, and can involve matters such as standards, accreditation, and payment for services. Only 36.8% of respondents (7 countries) indicated the existence of a national telehealth strategy, while 63.2% (12 countries) replied in the negative. Of the latter, 42.9% are high-income countries, 42.9% are middle-high income countries, and 14.3% are middle-low income countries. Of the seven Member States that have national telehealth policies or strategies, all stated that their policy or strategy specifies how telehealth can contribute to universal health coverage (for example, by facilitating second medical opinions and improving access to medical care). By way of summary, Figure 9 shows the number of countries, by income level, that have national telehealth strategies whose objective is to work toward achieving universal health coverage.

**Figure 9.** Number of countries, by income level, that have national telehealth strategies whose objective is to work toward achieving universal health coverage



## Discussion

These findings indicate that the political will to introduce and expand the use of ICT in health is not only a consequence of an impulse to modernize, but also arises from the needs that health systems are called upon to address. Nearly a third of Member States of the Americas recognize universal health coverage as a challenge to be addressed through the strategic adoption of telehealth.

## National overview of telehealth programs

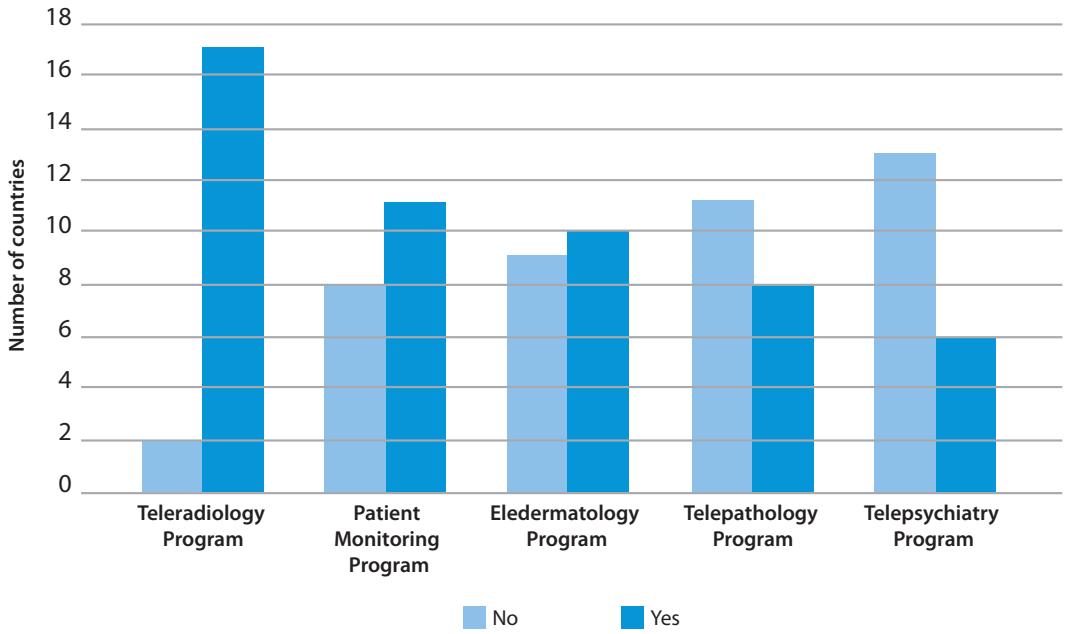
The survey also asked about the status of telehealth programs in the Member States. Such programs involve providing patient care in the home, emergency services, and information services. One aspect of these programs involves remote medical visits, which draw on telehealth resources to obtain second opinions from health professionals through the exchange of clinical information.

In the survey, Member States described their telehealth programs according to level of service and type of program. For the purpose of the survey, telehealth programs are divided into the following categories: informal programs (e.g., early adoption of telehealth in the absence of formal processes and policies), pilot programs (telehealth in the testing or evaluation phase), and established programs (functioning programs that have been using telehealth for a minimum of two years, where provision has been made for ongoing continuity and financing for at least two additional years). In terms of types of institutions in the health system for which the program is being used, the categories consist of: international (including health entities of countries in other parts of the world), regional (including health entities in the countries of the same geographic region), national (referral hospitals, laboratories, and health centers, mostly public, but some private), intermediate (encompassing district or provincial facilities: hospitals and health centers, whether public, private for-profit, or, as in the case of religious institutions, private nonprofit), and local or peripheral (health care facilities that provide basic care).

To analyze telehealth strategy, the survey asked about five fairly common telehealth programs: Teleradiology, which is a telehealth field that uses ICT to transmit digital radiological images for diagnosis or consultation; Teledermatology, which uses ICT to transmit medical information on cutaneous disorders for diagnosis or consultation; Telepathology, which uses ICT to transmit digitized pathology results, such as microscopic images of cells, for diagnosis or consultation; Telepsychiatry, which uses ICT to provide mental health services; and remote patient monitoring, which is an increasingly important telehealth field in which patients, often at home, transmit information concerning their illness, compiled by sensors and monitoring equipment, to external monitoring centers.

As shown in Figure 10, 89.5% of respondents in the Region (17 countries) reported having teleradiology programs – in 57.9% of cases (8 countries) involving remote monitoring of patients, in 52.6% (10 countries) involving teledermatology programs, in 42.1% (8 countries) involving telepathology program, and in 31.6% (6 countries) involving telepsychiatry programs.

**Figure 10.** Distribution of telehealth programs, by countries




Despite these figures, only two countries (10.5%) reported that they have established telehealth programs – specifically, in teleradiology and telepathology. These services require major investments in infrastructure and equipment, as well as personnel training and reorganization. This may explain why programs have not yet been established in the remaining countries. Teleradiology is the most common program in the Region, with 17 countries confirming the use of this type of program, while five countries (26.3%) report having pilot studies. In six countries (31.6%) these programs are national, and in two countries (10.5%) regional. Telepathology is present in two countries (10.5%) at the international level and in one country at the national level, while three countries (15.8%) have pilot programs, and six countries (31.6%) have informal programs.

Patient monitoring is the third type of program that has been established, though in only one country (5.3%) in the Region does this exist at the national level; in most cases (seven countries, 36.8%), it is a local program. Remote patient monitoring has the greatest number of pilot programs in progress (three countries, or 15.8%), indicating that this is an area of growing interest and development.

Teledermatology and telepsychiatry involve less capital costs and training than do the former two types of programs, but the adoption of these services nevertheless requires major organizational changes. Teledermatology is an active program in three countries (15.8%) at the national level, and in four countries (21.1%) at the intermediate level. In three countries (15.8%) it has reached the pilot stage, while in eight countries (42.1%) informal programs are in progress. Telepsychiatry is active in three countries (15.8%) at the national level and in the same number of countries (15.8%) at the intermediate level. Pilot programs exist in only two countries (10.5%).

## Other telehealth services

One of the questionnaire's open-ended questions asked about other telehealth programs not already covered. Since a country may offer additional telehealth services for diagnosis, consultation, or intervention, the survey asked respondents to describe up to five additional services established in their countries. "Established program" was defined as a health-related program that has been functioning for at least two years, where provision has been made for ongoing continuity and financing for at least two additional years.

There are programs other than the ones mentioned above that have been implemented in the Region. They range from relatively widespread programs such as cardiology, teleophthalmology, and telepediatrics, to other highly specialized and pioneering programs in areas such as oncology and genetics (in Canada) and neuroscience (in Cuba).

Among the more widespread programs, cardiology is the most prevalent, found in 4 of the 19 countries (Canada, Colombia, Cuba, and United States). Next most common are teleophthalmology, present in 2 of the 19 countries (Argentina and Cuba), and telepediatrics, found in 2 of the 19 countries (Argentina and Mexico). These programs for the most part function at the regional level – with Argentina's teleophthalmology program, which operates at the international level, being the exception – and in over 95% of cases they are in the pilot phase.

The **Atlas of eHealth country profiles report** (11) does not cite the existence of any of these telehealth programs prior to 2011 in Argentina or Mexico. This suggests that government initiatives have accounted for the radical change that has occurred in the last five years in this regard. Mexico has a federal system, with individual states having a great deal of autonomy on health issues; thus, telehealth developments are uneven from state to state. In Argentina, implementation of the country's **eHealth Strategy and Plan of Action 2011-2013** has encouraged the development of a policy, law, and ethics framework covering online health, in addition to adequate funding from various sources, the development of infrastructure, and the establishment of training programs. This set of circumstances has made Argentina one of the pioneering countries in the implementation of telehealth programs.

It can be seen from the above information that national income levels, and even health expenditure levels, are not a determining factor in the implementation of additional telehealth programs. There are income differences among the above-mentioned countries: some, such as Canada and the United States, are high-income countries; Argentina and Cuba are high and middle-high income countries, respectively, with medium levels of health expenditure; while Cuba has launched some of these programs despite having low levels of income and health expenditure.

A country's willingness to wager on the benefits of telehealth seems to be the most important factor in implementing telehealth programs. Previous reports by the WHO, such as the **Atlas of eHealth country profiles report**, show that Canada, at the beginning of the current decade, opted to develop telehealth programs. As the report describes, a legal framework to establish and provide clear regulations for the programs, along with the relevant infrastructure and a high level of collective interest on the part of health professionals, are additional factors favoring the creation and consolidation of telehealth programs (11).

Cuba's situation merits special mention. As a middle-low income country with a low level of health expenditure, Cuba has launched various telehealth programs, some of which are referenced above. While some are relatively basic and more characteristic of a country whose health system is in development (such as blood banks), others (such as the neuroscience program) can be considered innovative.

## Success stories

### Neuroscience program for the early detection of hearing loss in children (110)

The Neurosciences Center of Cuba (CNEURO) was one of the first groups in the world to use information technology to analyze the brain's electrical activity. Today the Center is devoted to basic and applied research, and to the development of high-level technology for mental health diagnosis and intervention.

The lines of research conducted by CNEURO address a range of areas associated with the neurosciences: cognitive, social and experimental neuroscience; clinical neurophysiology, neurodiagnosis, molecular biology, bioimplants, and neuroinformatics. One of the Center's principal achievements is the introduction of methods for the early detection of hearing loss in children.

Advances in recent years in diagnostic techniques for the objective evaluation of hearing, and in particular development in the areas of auditory evoked potentials (EAP) and oto-acoustic emission (OAE), have made it possible to establish programs for the early screening of auditory disorders. Since 1983, CNEURO has been conducting an early-detection program in Havana. The organizational model adopted evaluates multiple groups of at-risk children and uses brainstem auditory evoked potential (BAER) as a diagnostic test. The rationale for the program lies in its potential for advancing the intellectual, linguistic, emotional, and social development of deaf children. To the extent that an auditory disorder is detected early, and medical and/or prosthetic treatment begins immediately – along with psycho-pedagogical intervention – many of the adverse effects of auditory privation can be reduced and even prevented. The positive effects of early detection on the development of deaf children has two types of benefits: (1) optimal utilization of the critical period for language acquisition, which can occur within the first 3 to 4 years of life; and (2) preventing and/or reducing (during this stage of major neural plasticity) the functional reorganization that would occur in the nervous system under conditions of auditory privation.

## Success stories

### Rural Telemedicine Project in Peru (111)

The objectives of this project, funded by the Ministry of Transportation and Communications of Peru, are: (1) to implement a national telemedicine system, in order to make remote health care possible and reduce care time for diseases in the country's rural areas, reducing the number of clinical cases and emergencies and thereby increasing the response capacity of health care facilities; and (2) to integrate the initiatives, work, and projects being developed in the field of telemedicine, in order to optimize resources, avoid duplication of efforts and expenditures, and foster collaboration, as part of a National Telemedicine Plan.

The project is based on the creation of a comprehensive communication network connecting referral hospitals with health centers and specialized research centers. All of the facilities involved are provided with HD (high definition) video conferencing systems, LCD (liquid crystal display) screens, audio systems, microphones, UPS (uninterrupted power supply), and computer equipment. Facilities in rural areas are also supplied with standard technological equipment used in health care, such as abdominal probes, otoscopes, dermatoscopes, and ophthalmoscopes.

The network allows for real-time video conferences between rural physicians and specialists in various fields, in which experts can answer questions arising in the local setting, thus facilitating and improving diagnostic accuracy.

## Success stories

### Teleradiology programs in the state of Querétaro (Mexico) (112)

In Mexico, in 2012, various state health services implemented initiatives to develop telehealth, targeting the most vulnerable populations. One state that has made extensive advances in this area is Querétaro, which includes geographically remote areas and is divided into four jurisdictions, with five general hospitals: the hospital of the city of Querétaro, the Hospital of Pediatric and Women's Specialties, also in the city of Querétaro, the hospital in Cadereyta, the hospital in Jalpan de Serra, and the general hospital in San Juan del Río. The State of Querétaro's health services, directed by the Secretary of Health of the State of Querétaro (SESEQ), serve a population of 847,455 people who lack social security, as well as 903,510 inhabitants with social security.

One of the programs that has received the greatest impetus is the teleradiology program. Since 2011, work on a teleradiology network offering X-rays, echocardiograms, mastography, tomography, ultrasound, and specialized tests, has been in progress. With the construction of a web platform, all of the state's hospitals are now connected; thus, information on a single patient at any of the network's 50 input points can be analyzed at any of the five existing analysis facilities.

Teleradiological communication between the different sites is web-based, with images forwarded to the general hospital in Querétaro. A virtual private network (VPN) was also created to guarantee secure access, communication, and data integrity. The server on which data is stored at the general hospital in Querétaro was made accessible online so that images can be seen and interpreted externally from any point with Internet access. Within the VPN, data can be interpreted from any site on the teleradiology network. Using various communications tools and protocols, such as TCP/IP, Internet, RF technology, and the different network technologies, all interaction can occur through local or remote access to the EHR.

Moreover, the information is centralized, which means that it can be consulted by different specialists, simultaneously or at different times, thus avoiding unnecessary travel for the patient.

## Success stories

### Telemedicine and the Children's Hospital of Pittsburgh (113)

Pediatric cardiologists are in short supply in some Latin American countries, such as Colombia. The high level of need for the services of these specialists led the Children's Hospital of Pittsburgh (UPMC) to launch its international telemedicine program in 2010.

The first collaborative agreement to provide consultation for local medical personnel was with the Valle del Lili Children's Hospital in Cali. After exploring satellite and cable options, the organization decided to provide these telemedicine services via the Internet. Using a secure encrypted line, pediatric cardiologists at UPMC conduct daily rounds with the physicians in Cali, and also help with specific cases when necessary. High-definition cameras make it possible for medical personnel in Pittsburgh to view monitors, attending physicians, and even patients, allowing them to offer detailed clinical advice.

The levels of satisfaction attained by the medical staff in Cali have increased with the introduction of this system, and although they receive technical assistance from UPMC, they remain in charge of treatment.

At present, UPMC has established agreements with three hospitals in Colombia to provide advisory telemedicine services. It is also attempting to expand the program to a hospital in Mexico City and to one in Italy. Based on the present rate of growth, UPMC is expected to carry out some 800 interventions per year in the near future using this system.

## Evaluation

When telemedicine service is being contemplated for meeting a given care need, a research project to evaluate the service should also be considered, with the evaluation project being conducted in parallel with implementation of the telehealth application. Evaluation should be part of the overall design, development, and implementation plan, and should be fashioned to avoid possible errors or losses of information due to insufficient planning. Furthermore, there should be ongoing re-evaluation, using information from the initial evaluations to assess and adapt the operation of the service, and to make any necessary changes to subsequent evaluations.

When asked whether any government-sponsored telehealth programs were being evaluated, most

of the Member States (72.2%) responded "no," with only four countries (22.2%) answering "yes." Responses relating to the different aspects of evaluating telehealth programs (access, quality, cost-effectiveness, program acceptance, health outcomes, and sustainability) have not been processed, so no data on those aspects are currently available.

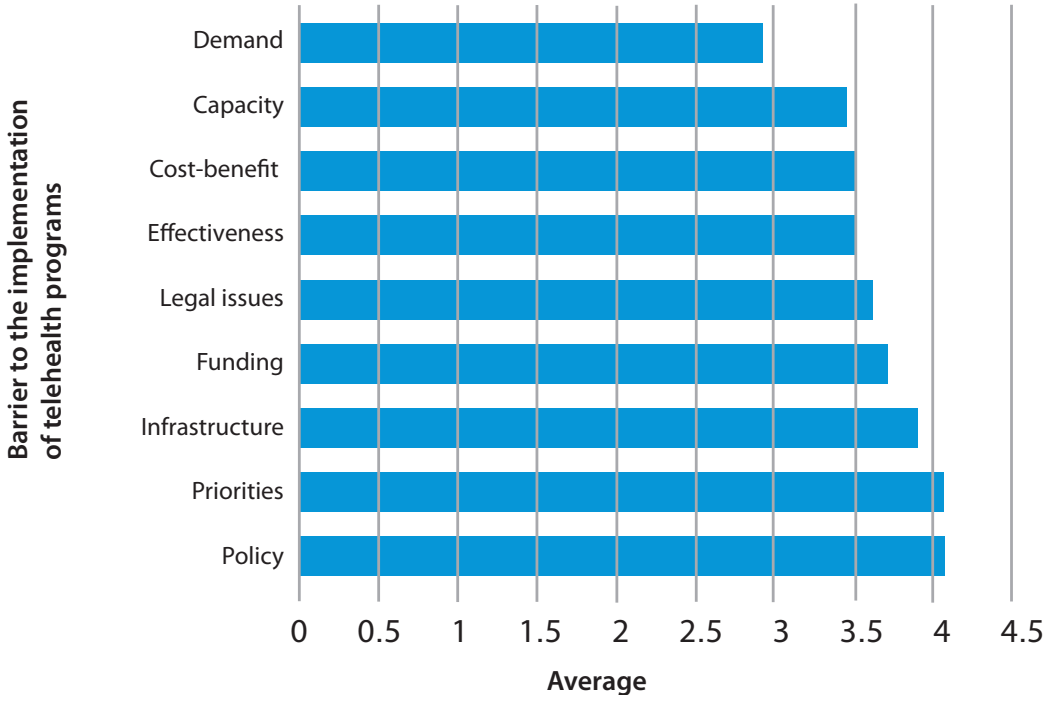
## Barriers to the implementation of telehealth programs

There are many barriers to the successful implementation of telehealth programs in the countries. Although more and more pilot projects and feasibility studies are being carried out, few telehealth applications have been incorporated in clinical practice and in the care process. Rather, they are often relegated to near oblivion once the initial phase has ended (108, 114), hence the question to Member States regarding the ranking of barriers in order of importance.

The 2015 survey examined a total of 10 specific barriers to the implementation of telehealth programs, which respondents ranked on a Likert scale of 1 to 5, with 1 meaning "it is not a barrier" and 5 representing an "extremely important" barrier. Therefore, each country could select the most relevant barriers and specify each one's degree of importance.

Figure 11 shows the average values obtained for the different barriers to implementation of telehealth programs. As the analysis shows, policy is the most important barrier, followed by the issue of priorities, each with an average score of 4.05. Following these in importance are infrastructure and funding, with scores of 3.89 and 3.74, respectively..

**Figure 11.** Average values obtained for the different barriers to the implementation of telehealth programs




Detailed analysis of each barrier confirms these results. Policy (the fact that national policies do not recognize telehealth as part of health services delivery) and priorities (conflicting priorities in the health system) are the most common barriers. Measured on a 5-point scale, the average value of each of the two barriers is 4.05. In responding to the first of these, 73.7% (14 countries) reported that it was "very important" or "extremely important" for the implementation of telehealth programs, while 78.9% (15 countries) had this response with regard to the second of the two barriers. Evidence in the

international literature on the difficulty of introducing technologies such as telehealth (and eHealth in general) in health systems and health organizations (83, 115) cites changes in the work process, as well as organizational change, as sources of internal resistance (116, 117, 118). For this reason it is important to stress the need to implement public telehealth policies and strategies that call for: analyzing the potential advantages and disadvantages of telehealth as a means of meeting health needs, analyzing the needs themselves, and analyzing resources and organizational models (characteristics of health services supply and demand in relation to different health needs in the population, and in the health organizations of specific localities) (119, 120).

In the 2015 survey, lack of equipment and/or connectivity (infrastructure) and lack of funding to develop and support telehealth programs were described as the next most important obstacles by 78.9% and 57.9% of respondents (15 and 11 countries), respectively. Overall, 85.7% of the countries that cited infrastructure as a very important barrier are countries with middle-high income, while 65% of the countries that cited lack of funding as an important or very important barrier are countries with middle-high income. As indicated above, the average values of the variables are 3.89 and 3.74, respectively.

Economic factors have also been described in the international literature as a barrier. Studies in the United States (121, 122) point to the absence of payment models as a fundamental factor. While 78.9% of Member States (15 countries) reported that public funding is available for online health programs, and 73.7% of Member States (14 countries) reported that donor/non-public funding for development is also available for online health programs, in addition to 36.8% of Member States (7 countries) that reported that private or commercial financing is also available for online health programs, 57.9% (11 countries) nevertheless cited financing as a significant barrier. Greater attention to cost-effectiveness in the design, implementation, and evaluation phases of telehealth projects, as well as greater consideration of the particular economic aspects of these services (high fixed costs and low marginal costs, experiential goods, and network externalities) could help speed the creation of collaborative networks involving public and private entities.

Of the countries surveyed, 63.1% (12 countries) cited a series of additional barriers as being "very important" or "extremely important," namely: lack of evidence on the effectiveness of telehealth programs (effectiveness), lack of evidence on cost-effectiveness of the program (cost-effectiveness), and lack of legislation or regulations to address telehealth programs. The current scientific literature reflects a widespread consensus in attributing the sluggishness and difficulty in implementing telehealth services to the lack of definitive scientific evidence on its usefulness, both medically (clinical benefits) and economically (cost-benefit ratio) (23). Bashshur *et al.* (123), in their review of evaluations of this type of project stated that, with few exceptions, research in this field had so far failed to generate an adequate body of empirical data, that no definitive and conclusive evidence on clinical effectiveness had been produced, and that most of the studies' findings lacked statistical significance. A recent meta-analysis of the literature looking specifically at methodologies for evaluating telehealth points once again to a scarcity of high-quality scientific evidence regarding clinical effectiveness, and on the impact of telehealth on patient management, organization, and cost (124). Difficulties in obtaining the data necessary for management organizations to implement strategies and make investments to drive telehealth initiatives have led to opposing views on the matter.

Lastly, regulatory issues are crucial in the telehealth area. It is essential to analyze the state of legal regulation when developing and implementing telehealth services. These regulatory issues involve: (1) data protection; (2) data privacy and confidentiality; and (3) regulatory issues concerning responsibility for data. Given that comprehensive regulatory frameworks for telehealth services are usually lacking, the issues tend to be dealt with through preexisting data protection laws. Guaranteeing the rights and responsibilities of patients requires that strategies for implementing telehealth services include safeguards with strict definitions regarding compliance with medical confidentiality protection provisions (125). Moreover, the obstacles limiting the development of telehealth services, such as lack of legal clarity and the fragmentation of individual legal frameworks, can only be addressed if the different organizations that manage health resources share a coordinated approach.

## Discussion

The incorporation of telehealth in the health services environment brings with it enormous expectations with regard to cost-cutting and improvements in quality of care, which also entail increased access and greater availability of care in rural areas, where services would otherwise be difficult to obtain (68). Moreover, telehealth facilitates equitable access to care independent of geographical location; reduces waiting periods (for both diagnosis and treatment), thus preventing the emergence of additional problems; makes possible remote consultations from primary care sites to referral hospitals, reducing the number of referrals; and has a positive effect on training and competency in primary care facilities and hospitals. Unequal access to health resources is evident even among citizens of a single country who share the same health system. In the United States (126), data from 1999 showed the distribution of primary care physicians and specialists to vary significantly between the southern and northern portions of the country: 39 vs. 113 primary care physicians per 100,000 inhabitants, and 12 vs. 69 specialists per 100,000 inhabitants. One result is that most of the money available to some individuals for health care is consumed in travel and in lodging expenses in the cities where hospitals are located.

Telehealth also promotes viable organizational models, such as care continuity and patient-centered care, applying concepts of globality and interoperability to health organizations (127), and giving rise to networking and new organizational environments. Implementing ICT in social assistance care services would improve comprehensive care and follow-up, not only for chronic patients, but also for low-prevalence illnesses, as well as facilitating education in preventive medicine and public health. With the support of integrated public policies, telehealth should look to change not only the organization of health care, but also, through these changes to: improve planning and funding; design plans that integrate ICT; reduce the cost of ensuring proper conditions in care facilities; and reorient professionals to carry out functions in line with today's society, in which people are viewed as the greatest asset. These changes, which can be expected to accompany the introduction and dissemination of ICT, should take place at the macro level (national government), at the middle level (affecting care facilities, including hospitals and health centers), and at the micro level (with specific applications in clinical units and with impacts on aspects of social health). Nonetheless, this requires a single governance structure to ensure efficient and sustainable implementation; only in that way can the benefits for funding, planning and delivery of health services be assured. Thus, efforts must be made to identify existing evidence on the efficiency of telehealth, so that government can make wise decisions regarding the utilization and allocation of resources and can effectively address the crucial regulatory issues associated with telehealth. As in the cases cited earlier, the importance of personal and organizational barriers should be given special attention, since these can impede the success of telehealth practices. Ensuring positive organizational outcomes from these practices requires that personnel be trained in telehealth and that work processes be reorganized to take greater advantage of the value that health professionals provide.

According to the International Telecommunications Union (ITU) (128), the United Nations agency specializing in ICT issues, thousands of pilot telehealth projects were conducted between 1960 and 2000, but only some of these initiatives survived beyond the initially financed period. The ITU report concluded that less than the 10% of the projects in middle-income countries were successful during the 20th century, with 45% failing after only one year and the remaining 45% after three years; there is little reason to believe that this has changed in the 21st century. Ekeland *et al.* (124) observed that evidence of the value of telehealth ranges from "promising but incomplete" to "limited and inconsistent," with the economic analysis of telehealth being particularly problematic. Similarly, van Eland-de Kok *et al.* (129) identified only slight and moderately positive effects of eHealth on the primary health outcomes of patients with chronic diseases, and pointed out that the evidence was not entirely convincing, given the limited number of studies and the methodological limitations. New telehealth projects must improve their designs and quality of execution in order to generate scientifically valid answers to the persisting questions, some of the most important of which are: Is telehealth

clinically effective and safe in comparison with the existing alternative? Does it achieve its purpose? How cost-effective is it? Is it accepted by patients and health professionals? How does its introduction and adoption affect customary care practices?

In May 2016, PAHO/WHO presented the **Framework for the Implementation of a Telemedicine Service** (3), offering solutions for the successful implementation of telemedicine and telehealth services (and of eHealth in general) in health settings and health systems. Based on an understanding of the broader context of eHealth, and on the existing challenges and opportunities, the work describes the realities of implementing telemedicine services in real health settings, analyzing the interactions that occur in the process of ICT implementation, and examining the changes that take place in organization, management models, culture, and care. Lastly, it reflects on issues that are key to prioritizing, designing, implementing, integrating, and evaluating these services.

## Comments and lessons learned by the Member States

A large proportion of the countries surveyed recognized the benefits of ICT as a tool for achieving universal coverage of health services. Despite the fact that the total number of experiences is relatively low, that they are in the pilot phase, and that in very few cases have they been subject to exhaustive cost-benefit analysis, they nevertheless provide some worthwhile input for reflection and debate.

First, most of the countries pointed out the need for creating policies to improve interinstitutional relations, if the efficiency and effectiveness of telehealth actions are to improve. In the United States the most successful experiences were directed by public institutions such as the **Office for the Advancement of Telehealth (OAT)**, while in Ecuador, for example, the most efficient programs were implemented by two technical universities.

Collaboration involving academia, government, public administration, and health institutions is essential in developing these practices, given that the necessary resources and knowledge are to be found in different types of institutions.

Second, comments by some of the countries reveal the need to provide health professionals and institutions with resources to facilitate and streamline implementation of these practices. Specifically, there is a need for infrastructure, improvement in processes, and development of specialized training for professionals. Although a shortage of resources of this type might be expected in countries with middle-high and middle-low income levels, some other countries, such as Canada, also need improvement in some of these areas.

Third, infrastructure, processes, and training were remarked upon. Thus, it was pointed out that, in some places, the lack of computer equipment (computers, tablets, etc.), the absence of recorded patient data, and/or a lack of connectivity make it difficult to implement initiatives of this type.

Comments by the countries indicate a need to verify that processes are implemented, that documentation is ordered, and that the information needed to execute the processes is in place. The need for licensing or regulatory mechanisms governing these practices, by competent, authorized professionals, was also cited.

Finally, with regard to training, the comments highlighted not only a need to develop training processes to enable health professionals to acquire and maximize competencies on an ongoing basis, but, more importantly, the need to develop training to help health professionals understand the benefits associated with these practices, so that the inclination to reject them will recede. One of the main brakes on innovation is the fact that many professionals lack knowledge about technology, its uses, and its benefits. Basic training to overcome these barriers would not only facilitate and streamline implementation of the practices, but would also make them more efficient.

## Summary

With the advent of the technological revolution, interest in telehealth has gathered new impetus in working to achieve universal health coverage. This is particularly valuable for the inhabitants of remote areas, vulnerable groups, and older populations. The number of telehealth projects in the Region is growing. Still, these are mostly pilots or informal programs at the intermediate and national levels, with some regional initiatives emerging. This means that careful and detailed planning of telehealth strategies is required. Only 36.8% of the countries stated that they had a national telehealth strategy aimed at achieving universal health coverage. The problem is precisely the absence of specific national telehealth strategies or policies. Most or all of the programs function at a relatively low level, are in the implementation phase, or are informal programs. Teleradiology is the most common type of program in the Region, with 89.5% of respondents confirming its presence in their respective countries. Of these, 11.7% use it at the regional level, 35.2% at the national level, 35.2% at the international level, and 17.6% at the local level. Of countries that have implemented such programs, 23.5% have informal programs, 29.4% have pilot programs, and 11.7% have formal programs.

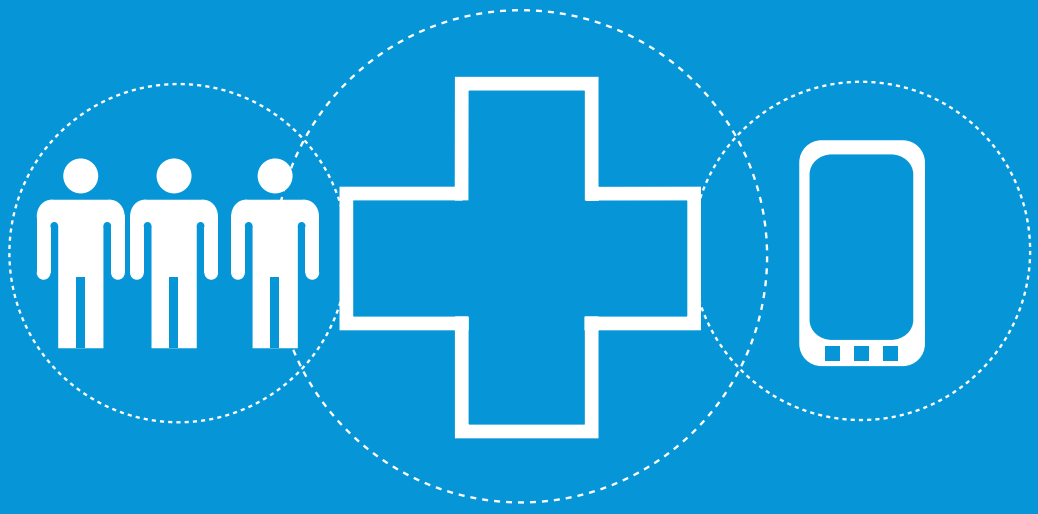
The definitive extension of telehealth in the Region faces considerable challenges for four main reasons. The fact that national policies do not recognize telehealth as a part of health services delivery, along with conflicting priorities in the health system, are the most prevalent barriers for 73.7% and 78.9% of the countries surveyed, respectively. Lack of equipment and/or connectivity, and lack of funding to develop and support telehealth programs, were described as the next most important obstacles by 78.9% and 57.9% of the countries, respectively. Some 63.1% of countries pointed out a series of additional barriers including lack of evidence on the effectiveness of telehealth programs, lack of evidence on their cost-effectiveness, and the absence of legislation or regulations to address telehealth programs. Thus, there need to be public telehealth policies and strategies to analyze the advantages and disadvantages of telehealth as a way of meeting health needs, to determine actual needs and resources, and to analyze organizational models. Determining precise evidence on the efficiency of telehealth services is crucial if public administrations are to be persuaded and helped in making optimal decisions regarding the use and allocation of resources associated with the new telehealth services, as well as in making optimal decisions on crucial regulatory issues involving telehealth.

## Recommendations

- National strategies and policies must be developed, detailing possible modes of collaboration among different sectors within the health and social spheres.
- Unique interoperability of health systems continues to be a challenge for the Region, due to the lack of integration of existing information systems.
- Possible telehealth approaches and solutions should be aligned with the specific needs of the countries' health systems and with their culture; should be technologically appropriate and consistent with the social, cultural, environmental, and economic constraints in the settings where they are to be used; should foster self-sufficiency; and should include medium-term objectives. This requires the construction of an aggregate model (implementation framework) that comprises both the set of systemic telehealth practices and various explanatory dimensions beyond the technological realm.
- Greater attention to cost/effectiveness analysis in the design, implementation, and evaluation phases of telehealth projects, along with more thorough consideration of the particular economic properties of these services (high fixed costs and low marginal costs, experiential goods, and network externalities), could significantly strengthen efforts to create collaborative networks linking public and private entities.

Section 4

# Mobile health (mHealth)



Mobile health (also known as mHealth) refers to the use of mobile devices such as mobile telephones, patient monitoring devices, personal digital assistants (PDAs), and wireless equipment in medical practice and public health. Mobile health applications address issues such as treatment compliance, community mobilization, clinical and community health data collection, personal well-being and care, chronic disease management, and remote patient monitoring. Mobile health can contribute to universal health coverage by facilitating access to services for remote populations and marginalized communities, and by providing mechanisms for the exchange of patient data.

## Key data from survey responses

- 57.9% of countries have government-sponsored mobile health programs.
- 73.7% of Member States do not have an entity responsible for regulating mobile health with regard to the quality, safety, and reliability of applications.
- 92.8% of mobile health programs are at the local and intermediate levels, with only one program (mobile health via telephone care centers) being present at the international level.
- All countries report having the 14 programs, except for one case where systems are not available to support clinical decision-making.
- In 50% of the countries, 57% of the programs are fully established; the program whose implementation is most often unstable is the one designed to provide support for decision-making, which has been firmly implemented in only 26% of the countries.
- Few Member States (10.5%) have a government-sponsored program to evaluate mobile health.

## Introduction

With more than 4.55 billion people around the world having mobile devices as of 2014, health applications and interventions through mHealth are empowering users in the developed world and accelerating access to the best evidence and to health services in low- and middle-income settings (130). Moreover, mobile health offers technologies capable of providing personalized care, redesigns the health care approach through which patient and health professionals interact, reaches remote groups, complements traditional therapies, and has an enormous potential for effectively managing and using health data and information.

mHealth is spurring the rapid development of decision-making tools that are not time- and place-dependent and that are accessible to both professionals and consumers, whether patients, family members, or healthy citizens. An increasing number of patients are better equipped (possess knowledge for decision-making) for  and better informed about a broad range of health care issues (131, 132), and desirous of using ICT (especially the Internet) to communicate and share personal health information (133, 134). Once a user inserts information into a health application or uses a portable

(or wearable) technological device, health care providers can gain a monitored, quantified, and more holistic description of the patient's habits and treatment outcomes, and of the interventions employed.

Patient participation can be a major contributor to the collection of data, which, in addition to enhancing their own health, contributes to the common welfare, since public health management benefits from the mass collection of data, serving to detect potential health problems and aiding in the design of effective interventions.

In this way, an environment is created in which health care delivery models move toward empowering patients in making health care decisions (14). mHealth facilitates the integrated care of patients and citizens, while empowering them and fostering self-management of health, placing the patient at the center of health care for the first time. As a result of these interventions, it is easier to foster healthy habits and conduct health promotion interventions.

In recent years, the use of health-related applications has brought on a revolution in medicine, since these tools are fast, versatile, manageable, and illustrative, and allow people to take charge of their own health (135). According to the **IMS Institute for Healthcare Informatics**, there are currently more than 165,000 health-related applications, constituting a large and volatile market for computer applications that is not yet being properly regulated (136). The applications most frequently downloaded are those relating to physical exercise and weight control, considered to be ways of maintaining healthier life habits. Applications can be found for any aspect of health, including malaria, HIV, tobacco and alcohol control, vaccines, diabetes, pregnancy, and maternity. It is estimated that, by 2017, some two-thirds of existing health applications will focus on monitoring patients with chronic diseases, on active aging, and on services for post-acute health conditions (137). mHealth is experiencing a huge boom throughout the world, and has revolutionized health care in terms of the role of health professionals and in meeting the needs of patients using these applications. This boom is also occurring in middle- and low-income countries, where the proliferation of mobile telephones has made it possible to redesign communications, replacing landline-dependent services with solutions that use mobile technology infrastructure.

Two United Nations agencies have joined forces to form a new global program focused on the use of mobile technology to optimize treatment, control and monitoring of noncommunicable diseases. This initiative, by WHO and ITU, using mHealth to monitor noncommunicable diseases, aims to mobilize the countries' governments to incorporate programs using mHealth interventions in their health services (138). The program is a response to the 2011 Moscow Declaration on noncommunicable diseases (A/RES/66/2) (139, 140), and identifies existing mHealth services that have been proven effective and efficacious and that can be scaled up to serve larger populations.

Nevertheless, to optimize mHealth interventions, facilitate patient empowerment, and improve the management of individual health and health systems in the various countries, barriers and obstacles must be overcome. Accordingly, mHealth developments should address the needs and resources of each region. It is therefore essential to determine needs and priorities based on sociocultural and socio-health realities and resources.

It has been calculated that 83% of applications are "zombie" applications – ones that do not provide any value – while 60% of health-related applications are downloaded less than 5,000 times each. A mere 36 of the 165,000 health applications that have been developed internationally represent 50% of total worldwide downloads, according to an **IMS Health** study. It has been estimated that only 16 of every 100 new applications are actually useful to patients or physicians, and that these usually fail to fulfill minimum quality requirements. The WHO Global Observatory for eHealth report of 2011 (142) concluded that, despite the fact that at least some type of mHealth-based intervention was present in 83% of WHO member countries, only 12% of the countries conducted any type of evaluation of these interventions. There therefore needs to be a strategic approach to planning, developing and evaluating mHealth interventions in efforts to increase their impact.

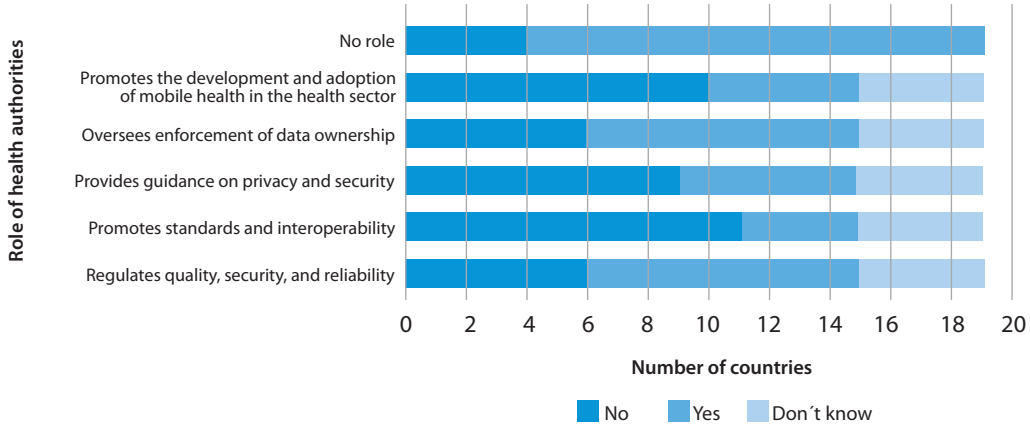
Development of this technological ecosystem is a reality; optimizing it, however, depends on involving developers, health professionals, patients, users, and politicians in the process of designing, implementing and testing interventions.

## Results of the survey: mobile health (mHealth)

Mobile health appears to be gaining ground in the Region's countries. Some 57.9% of respondents (11 countries) indicated that there are government-sponsored programs of this type in their countries. In 15.8% of responding countries (three countries), these mobile health programs are guided by a national mobile health policy or strategy, in 10.5% (two countries) by a national telehealth policy or strategy, and in 14% (three countries) by other strategies or policies (e.g., a digital welfare policy, a strategic plan of the Ministry of Health, or a national digital strategy). Only 26.3% of the surveyed Member States (five countries) reported that their mobile health programs have no policy to serve as a guide. Consequently, policies that guide mHealth interventions are relatively widespread. Nevertheless, a large number of countries (57.9%) stated that they did not know the answer to this question.

Member States were asked about the role or function of their health authorities in developing and adopting mobile health. More than half of the countries (57.9%, or 11 countries) reported that their health authorities promote interoperability standards, while 52.6% (10 countries) reported promoting the development and adoption of mobile health. A total of nine countries (47.4%) stated that their health authorities provide guidelines on privacy and safety, while 31.6% (six countries) stated that their health authorities regulate the quality, safety and reliability of mobile devices and oversee the supervision and enforcement of data ownership. Only 15.8% (three countries) stated that they did not have knowledge of such functions being carried out by their health authorities, while 26.3% (five countries) stated that their health authorities provide guidance of a type not mentioned by the survey, such as: (a) promoting implementation of a referral and response system, as is the case in Honduras; or (b) promoting effective universal access, as occurs in Jamaica. Figure 12 provides an overview of the role of health authorities in developing and adopting mobile health policies.

**Figure 12.** Role of health authorities in developing and adopting mobile health policies




## Mobile applications

The number and scope of health-related applications (apps) for smartphones have grown exponentially in recent years. Many of these apps are free, and others are relatively inexpensive. The growing popularity of such applications, however, also increases the risk that consumers will be exposed to

products whose accuracy, reliability and quality are untested. Health applications comprise a highly heterogeneous group, with very different objectives (diagnosis, monitoring, information, communication, best practices, treatment, prevention, health promotion), and target different types of users (including health professionals, decision-makers, the chronically ill, those with acute illnesses, and specific healthy populations).

When asked about the existence of a specific national entity responsible for regulating the quality, safety, and reliability of mobile health applications, 73.7% of respondents (14 countries) reported that they do not have such an entity, while 26.3% (5 countries) answered affirmatively. On the other hand, when asked about the existence of an entity that offers incentives and guidance for innovation, research, and evaluation related to health applications, 63.2% (12 countries) stated that they do have such an entity, while 31.6% (6 countries) reported that they do not, while one country indicated that it did not know.

Only two countries (40%) out of the five with an entity of this type also reported having government-sponsored mobile health programs. This suggests that governments are more inclined to offer incentives and guidance for innovation and evaluation, and provide regulation, when they are sponsoring mobile health programs. Nonetheless, a breakdown of the data also shows that guidance on health applications is not being provided consistently at the national level. Given the main issues at stake, such as security and privacy, legal challenges and questions of responsibility, interoperability, and international cooperation, stronger leadership is needed to drive mobile health development.

## Overview of mobile health programs in the countries

The 2015 survey asked about the status of mobile health programs in the Member States. Respondents provided a view of their mobile health programs according to the level of service and type of program. For the purpose of the survey, mobile health programs were categorized as informal (when early adoption of mobile ICT for health purposes takes place without the benefit of formal processes and policies), pilot projects (use of mobile health under conditions of testing and evaluation), and established programs (programs that use mobile health and that have been functioning for at least two years, where provision has been made for ongoing continuity and financial support for at least two additional years). The term "mobile ICT" here refers to mobile devices and hand-held devices such as mobile telephones, portable computers, tablets, or personal digital assistants (PDAs) that can be used for written communication, oral communication or transmission of images, and that can compile, process and transmit data.

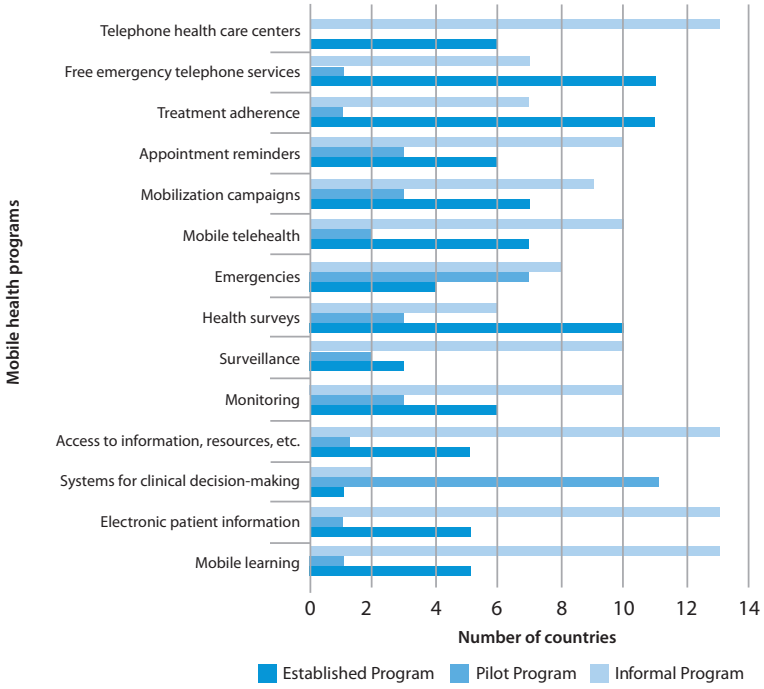
With regard to the geographical level(s) at which the program functions within the health system, the categories are: international (involving health entities of countries in other parts of the world), regional (involving the health entities of countries in the same geographical region), national (involving referral hospitals, laboratories, and health centers, predominantly public, but also private), intermediate (involving district or provincial facilities such as public hospitals and health centers, private for-profit facilities, and private nonprofit facilities such as those of religious institutions), and local or outlying (health posts, and health centers that provide basic care).

In order to analyze mobile health strategy, the survey asked about 14 categories of mobile health programs, classified according to their functions. Thus, in terms of communication from individuals to health services, there are telephone centers/phone lines for health care, and free emergency telephone services. For communication from health services to individuals, the categories are: determining adherence to treatment, appointment reminders, and community mobilization or health promotion campaigns. For consultation among health professionals, there is mobile telehealth. Intersectoral communication for emergency situations is defined as the "emergency" category. The area of health surveillance and oversight includes health surveys, surveillance, and patient monitoring. Finally, the

categories for access to information and education for health professionals are: access to information, resources, databases and tools, systems to support clinical decision-making, electronic patient information, and mobile learning (mLearning).

The prevalence of established mobile health programs far exceeds that of informal and pilot programs for most types of programs (see Figure 13). The most common mobile health programs are telephone centers/phone lines for health care, access to information, resources, databases, tools (e.g., electronic devices, as in mobile/cellular telephones and computers that implement some of the services offered), electronic patient information, and mobile learning (mLearning). Some countries operate all of these internationally.

**Figure 13.** Scope of mobile health programs




In general, mobile health programs are more common at the local and intermediate levels, with a total of 13 such programs, and only one program is most frequently implemented at the international level, namely, telephone centers/phone lines for health care, and free emergency telephone services. The 2011 survey of the Region's countries showed that mHealth projects were focused primarily on medical emergencies and natural disasters (142). The present findings indicate that mobile health applications are increasingly being incorporated throughout the Region and are becoming an established form of electronic health.

## Telephone centers/phone lines for health care

The findings from the Region indicate that 47.4% of respondents (nine countries) provide health advice and triage services by trained staff and through prerecorded messages accessible from mobile telephones or landlines, which function at the international level, and 68.4% of these are established programs.

## Free telephone emergency services

Some 63.2% of respondents (12 countries) reported having free telephone lines for health emergencies operated by trained staff, offering prerecorded messages and linked to response systems that

are accessible from mobile telephones or landlines, that are functioning at the intermediate level, while 15.8% (three countries) have such programs that operate at the international level, with 36.8% of these constituting established programs. It is encouraging that in 57.9% of cases, these are informal programs.

## Adherence to treatment

A total of 15 countries (78.9%) reported that their health services offer reminder messages via mobile ICT at the local level to ensure that patients are adhering to medication regimes. The messages can be text, voice, or multimedia messages. In 36.8% of cases, these are established programs, while in 57.9% of cases informal programs are being initiated, thus representing ongoing development in this area.

## Appointment reminders

Seven countries (36.8%) stated that they have implemented mobile ICT messaging services to remind patients to arrange or attend appointments, and that these function at the intermediate level, while 31.6% have such programs in operation at the local level. The messages can be text, voice, or multimedia. In 52.6% of cases, these are established programs. Failure to attend appointments tends to be a recurrent problem for various health services, and reminders via mobile telephones have proven beneficial in this regard (143).

## Community mobilization/health promotion campaigns

These are health promotion campaigns conducted via mobile ICT to increase awareness among target groups. The messages can be text, voice, or multimedia. In 2015, 47.4% of respondents (nine countries) reported having such service at the local level. The use of mobile health ICT in the mobilization and promotion category is somewhat more mature: in 47.4% of cases these are established programs.

## Mobile telehealth

Some 52.6% of respondents (10 countries) reported having services at the local level that allow for consultations among health professionals or between professionals and patients, while 21.1% (four countries) have such services at the intermediate level, and 15.8% (three countries) have them at the international level. In 52.6% of cases, these are established programs, while 36.8% (seven countries) have informal programs, and 10.5% (two countries) have pilot programs.

## Emergencies

The use of ICT for intersectoral mobile communications in emergencies can help health systems respond to and manage emergency and disaster situations. In the 2015 survey, 47.4% of respondents (nine countries) stated that they have mobile health programs for emergency response and management at the intermediate level, and 36.8% (seven countries) cited such programs at the local level. In 42.1% of cases, these are established programs, while 36.8% are pilot programs.

## Health surveys

Some 73.7% of respondents (14 countries) stated that they have local-level services for data collection and management, and for presenting reports on health surveys through mobile ICT. These services can include any combination of mobile Internet-connected devices. In 31.6% of cases these are established programs, while 52.6% of respondents reported already having informal programs, thus indicating ongoing development in this area.

## Surveillance

68.4% of respondents (13 countries) stated that they have local-level services for routine, spe-

cific, and emergency data collection, as well as for the management and presentation of reports on public health surveillance using mobile ICT. These services can also include any combination of mobile devices connected to the network. In 73.6% of cases these are already established programs, thus signaling that this is a key growth area in the Region.

### Patient monitoring

Of countries responding, 73.7% (14 countries) stated that they have local-level services to capture and transmit data for monitoring a range of conditions in a variety of environments using mobile ICT, and in 52.6% of cases these are already established programs, while 31.6% are informal and 3% are in the pilot phase.

### Access to information, resources, databases, and tools

With regard to services for health professionals that provide access to literature, resources, and health sciences databases via mobile ICT, 42.1% (eight countries) stated that they offer this at the intermediate level, and 26.3% (five countries) reported that these operate at the international level. In 68.4% of cases these are established programs.

### Systems to support clinical decision-making

Of responding countries, 63.2% (12 countries) stated that they have services that provide access to decision-making support systems using mobile ICT, which function at the local level. In 57.9% of cases, these are informal programs, while 26.3% are established programs. Accessing information through mobile ICT facilitates evidence-based decision-making.

### Electronic patient information

Of responding countries 47.4% (nine countries) stated that they have local-level services that provide access to electronic patient information (such as electronic medical records, laboratory results, X-rays, etc.) through mobile ICT, while 26.3% (five countries) reported that their programs function at the intermediate or international level. In 68.4% of cases these are established programs. Electronic patient information can be used to provide health professionals relevant information from electronic clinical records.

### Mobile learning (mLearning)

Programs providing online access to educational resources for professionals through mLearning function at the intermediate level in eight countries (42.1%), at the local level in seven (63.8%), and at the international level in only one. These programs are firmly established in 68.4% of cases, while they are informal in 26.3% of cases.

## Success stories

### Texting-based (SMS) program to help smokers quit smoking (144)

To date there is little scientific evidence on the benefits of health applications (145), and many people in the Region do not have smartphones. Regardless, interventions based on text messaging (short message service, or SMS) have proven a useful option to help patients quit smoking (146), monitor risk factors in patients with cardiovascular diseases (147), monitor adherence to antiviral treatment in HIV patients (148), and even treat diseases such as diabetes (149) and tuberculosis (150).

In 2014, Costa Rica's Ministry of Health launched its SMS-based **Healthy Messages System Program** to help people quit smoking. The program's protocol has been endorsed by WHO. It consists of an automated messaging system to help smokers quit. Its basic approach is to accompany the smoker "virtually" with a series of messages designed to explore behavior and provide corresponding recommendations on how to change the habit.

Registration in the program is free and simply requires sending a message to 4321 with the phrase "I want to quit." The program is intelligent and interacts with the person who registers, accompanying him or her in the process of quitting tobacco use.

When the first phase of implementation was complete, the program was deemed a resounding success, with 187 people having managed to quit smoking during the three-month support period. A second phase aimed to strengthen the program through collaborations with entities such as the **Costa Rican Social Security Fund (CCSS)** and the **Institute on Alcoholism and Drug Dependence (IAFA)**, in order to provide pharmacological support in cases of intense addiction. The program's goal is to reach the country's entire population of smokers, numbering 500,000. Currently, the program is estimated to have some 2,000 registered users, 80% of whom have reduced their tobacco use, while 20% of those who have completed the program have quit smoking.

## Success stories

### Use of mobile technology to prevent the progression of pre-hypertension in urban areas of Latin America (151)

The Center of Excellence on Chronic Diseases of the University Cayetano Heredia, in Peru, created an initiative based on using mobile health as a preventive strategy to reduce the risk of cardiovascular disease.

More specifically, an intervention was designed, implemented, and evaluated using mobile health strategies to reduce blood pressure and prevent pre-hypertension from progressing to hypertension in inhabitants of low-income urban neighborhoods in Argentina, Guatemala, and Peru. The initiative began with a randomized clinical trial involving 212 participants per country. Along with telephone advisory services provided by nutritionists trained in motivational interviewing, the intervention involved sending text messages (SMS) to participants. In the course of one year, each participant received monthly calls from a telephone advisor, followed by four SMS messages promoting healthy lifestyles in four areas: physical activity, consumption of fruits and vegetables, consumption of fats and sugars, and intake of salt and high-sodium products.

In 2011, the text messages (SMS), which were designed for different stages of change in each of the targeted behavioral areas, were tested to determine their effectiveness. February 2012 saw the initial recruitment of participants, who were assigned randomly to the intervention group (receiving advice via telephone and four SMS messages) or to the control group (which received its usual health care).

People in the intervention group received a motivational interview via telephone once a month, during which the participant selected the area in which he or she wished to work and then set health goals; progress toward these goals was evaluated in the next month's phone call. At the six- and twelve-month points, evaluations were made in order to identify any changes in blood pressure, weight, eating, physical activity, and attitudes related to the behavioral changes.

## Success stories

### Chile's "Health Responds" program (152)

The 'Health Responds' program (600, 360, 77, 77) is the telephone platform of the Chilean Ministry of Health responsible for providing health information, support, and education to the entire country, 24 hours a day throughout the year.

This service aims to provide continuous support centered on people, families, and communities, with high-quality personalized care for users 24 hours a day, 365 days a year. This service draws on a multidisciplinary team (physicians, nurses, midwives, and psychologists, among others) and focuses on informing users on the rights and benefits of the health network.

The services provided include offering guidance on administrative questions (places and schedules), fielding citizen requests, providing health consultations, offering support for professional health management, assisting in health emergencies, supporting health network management, and providing emergency and natural disaster support.

## Success stories

### The CarePartner Program

The CarePartner program is a United States program that uses interactive voice response (IVR) to change patients' behavior and improve their health. Using expert-developed content, a series of automated calls have patients respond to spoken questions by pressing telephone buttons. Health information is thus recorded, and patients in return receive specific information for self-care. The health care center receives alerts concerning symptoms and potentially troubling signs, so that it is able to anticipate potential acute episodes. Moreover, the program includes participation by relatives of patients, who receive up-to-date information on what they can do to help their loved ones (153). It is precisely this involvement of family members that leads to important improvements in the health outcomes of the most vulnerable patients and of those in the most remote areas, creating a highly beneficial emotional channel for care in the Region's countries, where families play an important role in the lives of chronically ill patients (154).

This program was developed for the treatment of diseases including diabetes, hypertension, depression, cardiac problems, and suprarenal cancer, as well as for patients undergoing chemotherapy, patients in post-hospital phases of care, patients with liver disorders, and victims of stroke. The program has been evaluated in four countries of the Region: Honduras (155), Bolivia (156), the United States, Mexico, and, more recently, in Colombia. A study on the feasibility of using mobile technology with diabetic patients in Honduras (157) found that, for the vast majority of patients (83%): it was easy to answer the automated calls; the service provided useful information (86%); and it reportedly helped patients "a great deal" (70%). Overall, the service improved support for self-care, and significantly reduced blood glucose levels. A randomized test conducted in Honduras and Mexico showed that a similar service could help hypertensive patients to control their blood pressure and improve health outcomes (154).

To determine the risk factors that limit patients' use of this technology, a survey on the use of mobile telephony questioned 1,000 users in La Paz, Bolivia (158). In the 18- to 29-year-old population, 96% had cellular telephones and 32% had smart phones. Among the indigenous population, 82% had cellular telephones, while 72% of the country's non-literate population had such phones. Only 7% of the elderly population had smart phones, but among the non-elderly 50-year-old-plus population this figure was 31%. Despite the economic inequality in the country, 74% of the population between the ages of 30 and 49 were found to use text messaging.

## Success Stories

### BONIS: an epidemiological surveillance system for Paraguay (159)

Paraguay is a developing country that is using the new opportunities provided by health-oriented ICT to conduct community-based epidemiological surveillance. Vector-borne diseases such as dengue have caused several epidemics in Paraguay since 1998, with a total of 11,212 confirmed cases in 2010.

Early 2010 saw the creation of the BONIS system in the area covered by the Center for Mutual Aid and Health Assistance for All (CAMSAT), in Bañado Sur, a section of Asunción. CAMSAT is based on routinely searching for potential cases of fever, through home visits conducted by community agents within the Family Health Unit (USF). Each of the 10 CAMSAT community agents is assigned 150 homes, and the results of their home visits are collected in paper documents that are subsequently sent through traditional means (such as paper, internal mail, fax, etc.) to the Health Ministry's General Directorate of Health Surveillance (DGVS). As a result of this method of collecting and reporting data, efforts to halt transmission often occur too late, with attendant social and financial costs.

The BONIS system is based on introducing mobile telephony as a catalytic element, so that routine case-finding gives way to a proactive approach. The system also uses web technologies and databases to register patients and to allow health personnel to monitor them.

The telephone system that has been developed uses the computer application Asterisk, which, through the design of an interactive voice response module, has the capacity to record, classify, and automatically prioritize fever cases suspected to be caused by certain diseases, such as dengue, yellow fever, Hanta, leptospirosis, and malaria.

The first step in this proactive epidemiological surveillance begins when the system responds to a user's call with a series of nine questions, which are available in both Spanish and Guaraní. The questions were developed by a group of epidemiologists to obtain information on the patient's signs and symptoms.

Once information on the user and the symptoms is recorded, the next step consists of DGVS organizing the information in an appropriate and effective form, and taking the actions needed for early detection of possible fever cases, as well as for quarantining of the household. For this purpose, the BONIS system has developed an information management module accessible via the web in PHP format.

The application offers three types of services, accessible together through different tabs in a web browser: (1.) patient calls/follow-up, (2.) reporting service, and (3.) information and mana-gement service. This set of processes generates an electronic file on acute febrile syndrome for physician follow-up.

## Evaluation

The 2015 online health survey asked Member States to evaluate mobile health programs spon-sored by the government. Only two countries (10.5%) reported that they have a government-sponsored program to evaluate mobile health; 16 countries (84.2%) stated that no such evaluation had ever been conducted; and one country (5.3%) reported that it did not know whether its government-sponsored mobile health programs had been evaluated. Given the survey's findings regarding established national programs, a higher level of program evaluation could be expected. Responses related to different aspects of evaluating mobile health programs (access, quality, cost-effectiveness, acceptance, health outcomes, and sustainability) have not been processed; thus, no data are available on these aspects.

## Barriers to the implementation of mobile health programs

A number of factors may be acting as barriers to the implementation of mobile health programs, hindering their ability to contribute to the goal of universal health coverage in the Region's countries. For this reason, the survey urged Member States to provide a list of barriers in order of importance, in efforts to make mobile health a tool for furthering universal health coverage efforts.

The 2015 survey listed 10 specific barriers to the implementation of mobile health programs. Each was scored by the respondents on a Likert scale of 1 to 5, 1 meaning "it is not a barrier" and 5 indicating an "extremely important" barrier. Thus, each country could select the barriers relevant to it and specify their respective degrees of importance.

A comparison of these responses (based on the average for each barrier) points to conflicting priorities in the health system as the most important barrier, with an average score of 4.06, followed by national policies that fail to address mobile health in health services delivery, with an average score of 3.89. Specifically, 35.3% of respondents (12 countries) identified conflicting priorities as a "very important" or "extremely important" barrier to the implementation of mobile health programs, while 22.2% and 50% (4 countries and 13 countries), respectively, identified non-recognition by national policies as "very important" or "extremely important" barriers to the implementation of such programs.

In the 2015 survey, lack of funding to develop and support mobile health programs (funding), and lack of trained human resources and/or technical support for such programs (capacity), were ranked as the next most important obstacles by 77.7% and 61.1% of respondents (14 and 11 countries), respectively. Average values of the corresponding variables were 3.83 and 3.72.

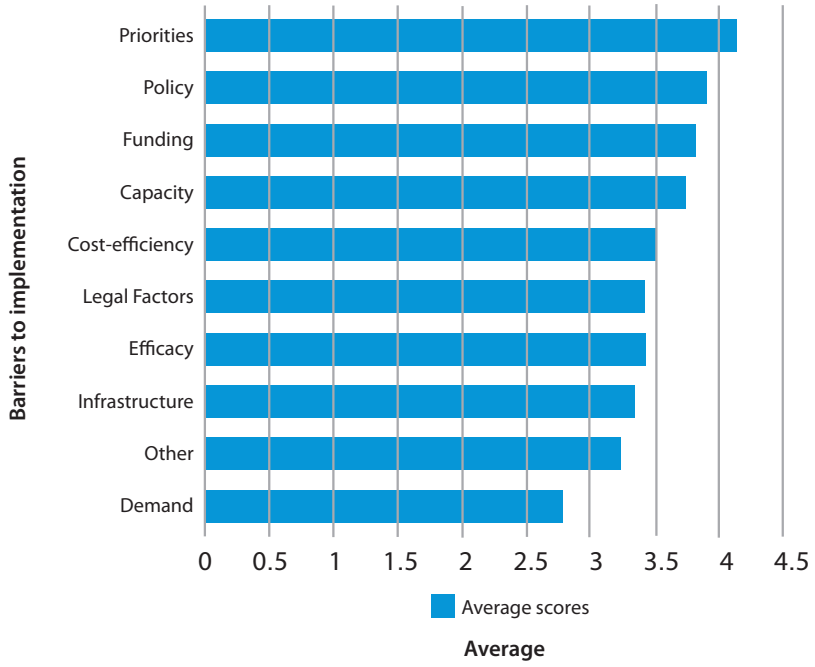
A WHO survey asked the governments of eight countries of the Region what barriers they had identified when dealing with mHealth (and eHealth) in their countries. The lack of skilled personnel was deemed most important, ranking above lack of infrastructure, which was second. The absence of a business model, lack of political commitment, and lack of economic sustainability were other barriers identified as hindering the spread of these services (160). The findings suggest that there is a need to persuade governments to engage in long-term projects and to create new training policies when implementing mHealth solutions, as well as to involve political bodies in managing change effectively.

Lack of evidence regarding the cost-effectiveness of mobile health programs, the absence of legislation and regulation to cover these programs, and lack of evidence on the effectiveness of the programs rank as the next most important obstacles. On a scale of 1 to 5, the average for these variables ranges from 3.50 to 3.41.

The 2011 survey also pointed to a lack of clear priorities, and indicated that projects were created without appropriate legislative backing (142). Legal barriers prevent greater technical cooperation between countries when exchanging health data. Moreover, there is a need for governance models and for ways of ensuring sustainability over 10- to 15-year periods.

While all of these variables score high (above 3.4 on a scale of 1 to 5), one variable scores low: the lack of demand for mobile health programs by health professionals and target groups scores an average of 2.67, and no country described this as extremely important. Figure 14 shows all of the barriers in the Region covered by the 2015 survey, with their average scores. As can be seen in the chart, priority issues, followed by policy, are the most important barriers, with average scores of 4.06 and 3.89, respectively.

**Figure 14.** All barriers in the Region, with their average scores




Others barriers identified by the different countries relate, on one hand, to health professionals and the health system, and, on the other, to patients and the general public. In the case of health professionals, a vision of potential usefulness is lacking; there are concerns about a possible lack of security; and health professionals, decision-makers, and clinic administrators lack training. Furthermore, the existing supply is an unknown, as is the cost-effectiveness of implementation. With regard to the patients and general public, there is a lack of knowledge regarding the possibilities that mobile health offers, along with concerns about confidentiality and associated costs.

## Comments and lessons learned by the Member States

Program evaluations generated numerous lessons learned for the various countries; these will be important to take into account in both the short and medium term. Notable among these are the following:

- Mobile applications must be part of an interoperable digital ecosystem and be able to interact with health systems if they are to be fully functional.
- There is a clear need for an interinstitutional and integrated approach to mobile health at the national level, or at least at the regional level.
- It is important to adequately evaluate the projects that have been executed to date.
- Political will at all levels is needed for mobile health to become a priority.
- There must be a regulatory framework, sufficient funding, and trained human resources to ensure sustainable implementation of the different programs.
- Some of the comments cited above concerning telehealth programs are applicable here. For example:
  - The need to create collaborative programs involving universities, public administration, and health institutions; and
  - The need for ongoing training of health professionals that not only teaches them how to use the technology, but also helps them understand the benefits associated with the use of ICT, thus facilitating adoption of the technology.

## Discussion

mHealth is experiencing a worldwide boom and is being implemented across wide geographical areas, creating enormous expectations. It is seen as a means of transforming health services and data delivery and alleviating problems in the delivery of medical services and management of public health activities related to a lack of resources and the limited number of specialists (161). These technologies could significantly assist health professionals in their care activities. At the same time, they could facilitate active and responsible public participation in self-care and disease prevention (162).

Mobile health is gradually being incorporated into health care services. Programs aimed at organizing health or emergency services depended, until recently, on the existing infrastructure for telephone communication. Other, more ambitious, programs, however, now address issues such as lifestyle changes in the population, health promotion, and even portable medical devices or sensors that facilitate the management and monitoring of the chronically and acutely ill.

The evolution of mHealth must be consistent with the needs and resources available in each region (163). Thus, a basic requirement for ensuring successful implementation of mHealth services is to determine priorities and needs, taking into account sociocultural and socio-health factors and the resources available in the area (164). Holistic analysis, in the sense of comprehensive or integral analysis of the realities, is essential in order to properly understand the needs, conditions, and most relevant resources for integrating mHealth services in the particular environment (infrastructure, funding, human and organizational resources, standards and legal issues, ethics, and privacy of information). The survey findings indicate that many countries are beginning the process of implementing specific programs. Still, it is important that mobile solutions not be treated as isolated programs, but rather as efforts that require broad change in the overall approach to health and health systems.

The potentialities of mobile health are numerous and extremely diverse. While new applications and mobile solutions continually appear and may be adopted by different groups of users, there is no clear culture for testing and evaluating these solutions. Although there are specific regulations on the use of medical devices (165, 166), they do not apply to mobile applications; this often creates confusion, and even legal vacuums, around the use of these technologies. A framework to evaluate mobile health interventions, in order to identify those applications that generate value added in the form of cost-effectiveness, efficacy, adherence to treatment, usability, etc., needs to be established as rapidly as possible. Some recent initiatives attempt to shed light on these issues (167, 168) and foster consensus around quality criteria, in efforts to identify best practices in mobile health. Nevertheless, there continues to be a lack of scientific evidence to corroborate findings. Political entities must also be encouraged to participate in creating a plan to motivate mHealth, targeting all stakeholders in the system, with patients playing a major role.

The numerous possibilities that mobile technologies offer when applied to health issues, along with their ease of use, have inspired interest among governments and within academia, as illustrated by the case of the CYTED-RITMOS-515RT0498 network (the Ibero-American Network of Mobile Technologies and Health). This is an international network led by the Universitat Oberta de Catalunya (UOC), composed of 17 research groups from six countries (Argentina, Bolivia, Colombia, Chile, Ecuador, and Spain), along with PAHO/WHO, Doctors without Borders (MSF), Telefónica, and the Mobile World Capital Barcelona Foundation (FMWCB), with the University of Michigan (UM) also being an active participant. The aim is to promote research and development on mHealth in Latin America (153).

## Summary

Mobile health has great potential to improve health in the world and to improve health systems. Of the 19 countries participating in the survey, a total of 11 Member States pointed out that national

mobile health programs in their countries enjoy government sponsorship, guided in three cases by national health strategy. Among the Member States there is a notable lack of regulation to ensure that applications offer quality, security, and reliability. Mobile health can be a key element in public health, and countries would be wise to encourage implementation of comprehensive programs that have been tested by an official agency. Most countries have specific programs already established or in progress. These include free emergency services, health care centers, appointment reminder systems, and patient monitoring. Nonetheless, programs such as health surveys and support systems for clinical decision-making are still in their early stages, with few Member States having incorporated them to date.

Evaluation of the programs is a crucial element for ensuring the future development of mobile health. Having evidence from high-quality evaluations of different interventions will help eliminate some of the barriers to implementation. There needs to be a general framework for evaluating mobile health, not only in the American hemisphere but also at the global level. Both developers and end users need to be able to distinguish solutions with useful functions from those that contribute no added value.

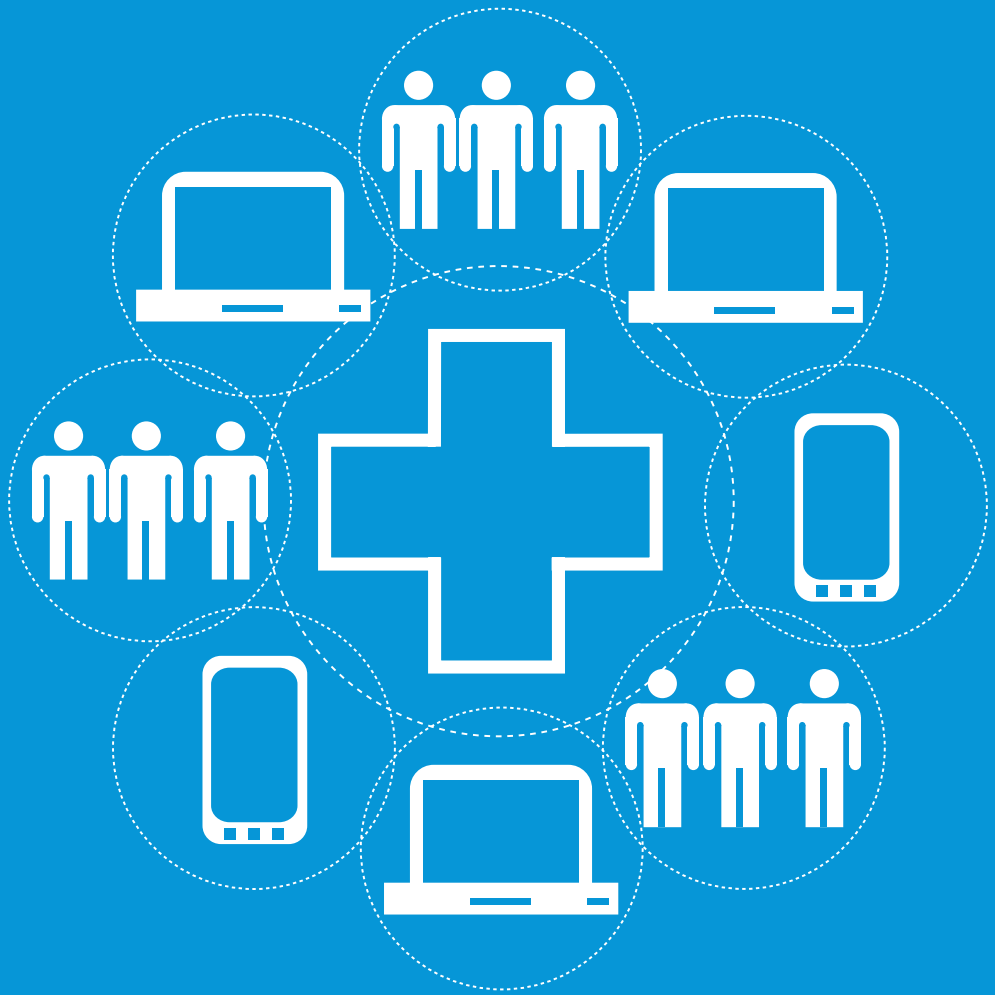
The current challenges to health and health systems – lack of training and limited budgets, as well as lack of political will in some countries – are problems that should be solvable through the use of mobile health.

## Recommendations

- Member States need to address concerns regarding responsibility, licensing, and informed consent, through policies and laws governing mHealth.
- Each Member State needs an official agency to oversee mobile health regulation and to provide guidelines on the ownership, security, and privacy of data, while regulating the quality, security, and reliability of the mobile devices and software used in providing medical care.
- Such an agency could also promote training of health professionals, as well as of patients and citizens, in order to foster the beneficial use of mobile health solutions.
- The principal stakeholders should follow the lead of international cooperation in developing regulations, policies, and best practices for the use of mobile health. This would facilitate continuity in mobile health efforts, and would aid the development of crossborder programs.
- Each intervention carried out in a local, national, regional, or global context must be evaluated, in order to continue generating evidence. National health authorities and the health research community should develop and employ a common methodology to evaluate mHealth programs, particularly government-sponsored initiatives. These evaluations should address aspects such as usability, functionality, and the significance of mHealth solutions for end users. Systematic evaluation of these services will make it possible to clarify national progress toward health-related objectives and demonstrate the benefits for patients. This evidence should be used to support decisions on investment and execution.

Section 5

# Virtual learning in the health sciences



Virtual learning consists of the use of ICT and social media for training and education. It can be used to improve the quality of education and increase access to learning for people who are geographically isolated or whose local training facilities are sub-standard. Thus, it offers a valuable methodology for educating the general public and health service personnel, as well as patients and their families, students, teachers, and other health professionals and administrators. Ultimately, it can make education in the health sciences available to a broader public and improve the use of existing educational resources.

## Key data from the survey responses

- 89.5% of Member States use virtual learning in preparing health sciences students.
- 94.76% of Member States use virtual learning for on-the-job training of health professionals.
- 78.9% of Member States reported that their main reason for using eLearning with students is to improve access to contents and to experts, while 52.6% report that the main reason is that it allows access to education where learning facilities are limited.

## Introduction

Various studies indicate that at the global level there is an estimated need for over four million skilled health workers (169). The shortage of skilled professionals is constraining the development of health systems, and therefore impedes universal health coverage and universal coverage of quality services (170, 171). To cope with these deficiencies, human resources in the health sector must be strengthened through ongoing development and continual updating of the competencies of health professionals. In this regard, ongoing learning is a decisive element for enhancing the technical and scientific knowledge of health professionals in today's society (172). Digital skills have become essential for people in the present information society. This point is emphasized by WHO, which also provides guidelines to encourage the development of technological innovations linked to eHealth (25). Professionals who are well versed in the ways ICT can be used to improve health will be better able to teach and support their patients in using the technology for self-care.

The use of virtual learning can help address existing needs and contribute to achieving universal health coverage by improving the knowledge and capacities of health personnel. Thus, the role of eLearning for health professionals is of great importance as a means of recycling knowledge and providing ongoing learning throughout the lifetimes of health professionals (173).

It is no surprise that the teaching of various disciplines related to virtual learning has been proliferating increasingly in recent years, facilitating the development of digital competencies among health sciences students. Training programs for students of medicine and related sciences increasingly include educational content related to the development of digital competencies, such as computer skills or skills in other technologies targeted to this group. Numerous universities have increased their own use of ICT to facilitate learning, and have introduced content related to ICT and online health in clinical and medical school curricula and training programs.

In recent years, changes in technology and its uses have made virtual learning increasingly accessible, providing it in multiple modalities. The availability of educational resources in different formats (video, audio, etc.), and through mobile devices such as smart phones and tablets, has resulted in so-called mobile learning or mLearning. Virtual learning is also available through social media, and increasingly through open educational resources (OER) that disseminate educational materials without cost for use in teaching and learning. An example of OER is MOOC (Massive Open Online Courses). This has become a model of innovation for providing education online freely accessible via the Internet and is an increasingly popular source of training.

A more novel phenomenon is the creation of communities of practice (CoP) (174). In the health field, the so-called clinical CoP are online platforms that take advantage of Web 2.0 to build knowledge among health professionals at different care levels (175), in efforts to improve the efficiency of quality care (176). Specifically, it becomes possible to conduct remote consultations between primary care sites and referral hospitals, thus reducing the number of referrals and enhancing training and skills at both the primary care and hospital levels (177). These virtual communities have proved capable of increasing the speed at which problems can be solved, and of improving organizational operations by generating tacit knowledge emerging from collegial interaction (178). Along with social media, they provide an environment that permits training and support for decision-making by health professionals in remote areas. Not surprisingly, the PAHO/WHO eHealth portal is being used for developing communities of practice and launching related webinars (179) as a part of training and knowledge management activities.

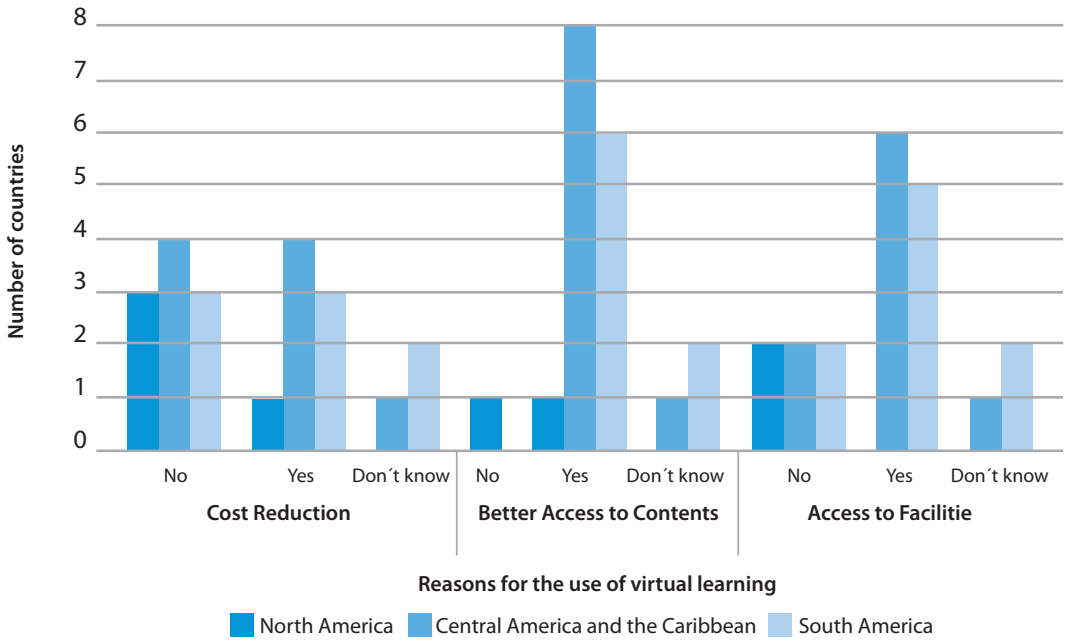
Thus, websites, OER, social media, and CoP make the Internet an inexhaustible supplier of resources for virtual learning in all disciplines, including the health sciences.

## Survey findings. Target group: health science students (before entering professional service)

The 2015 eLearning survey asked Member States to report on the use of virtual learning in their countries for the preparatory training of students and professionals in health-related fields. The findings indicate that 89.5% of respondents (17 countries) use virtual learning in the preparation of health sciences students. Only one country (5.3%) reported that it does not do so. Member States were also asked about their rationale for using virtual learning in preparatory training. To this end they were given a list from which to select three principal motivating factors. The main motivator reported by 78.9% of respondents (15 countries) was improving access to content and experts; 52.6% (10 countries) stated that their main reason for using virtual learning in preparatory training was that it allows access to education where learning facilities are limited; and 42.1% of respondents (eight countries) pointed to the reduced costs associated with providing educational content by this means; while 15.8% (three countries) stated that they did not know.

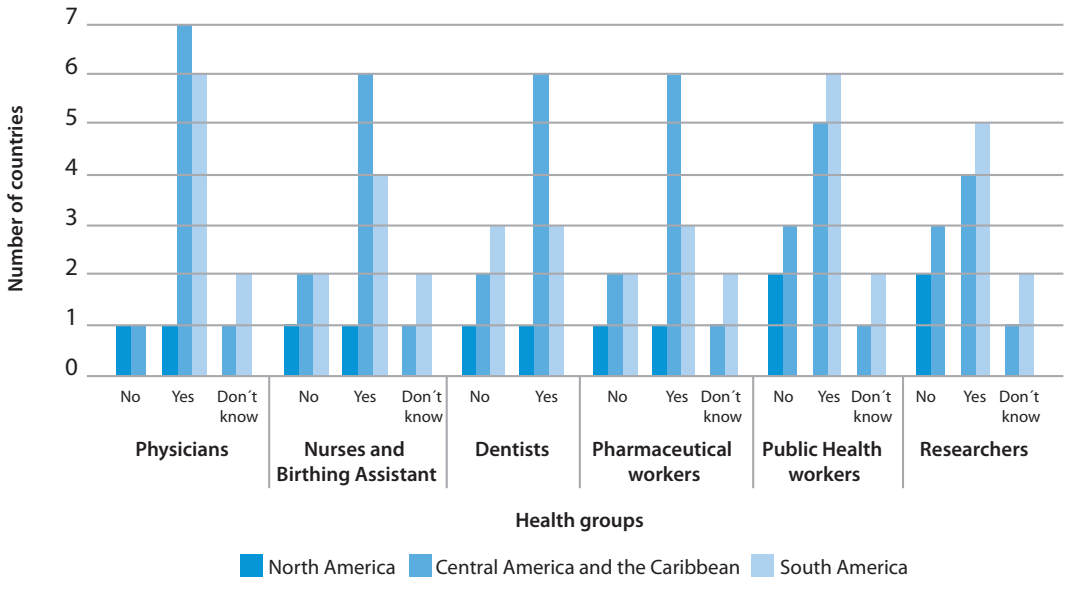
In all, 5 countries (26.3%) cited two reasons, while 31.5% pointed to all three above-listed reasons. The distribution of reasons for the use of virtual learning in preparatory training is shown in Figure 15.

**Figure 15.** Distribution of reasons for the use of the virtual learning in preparatory training




The 2015 eLearning survey also asked Member States about the groups of students to whom virtual learning is provided as part of their preparatory training. The respondents could select from a list of up to six specific health sectors. Of Member States that responded, 73.7% (14 countries) reported that virtual learning is used in the education of medical students; 57.9% of respondents (11 countries) described virtual learning as being part of educational programs in the fields of nursing and birthing care, biomedical research, life sciences, and public health; 52.6% (10 countries) reported the use of virtual learning as part of educational programs in the field of dentistry and 36.8% (seven countries) in the field of pharmaceuticals; while 15.8% (three countries) stated that they did not know. These findings are shown in Figure 16, detailing differences in the adoption of virtual learning as a part of preparatory training.

**Figure 16.** Distribution of preparatory training of different professional groups, by subregion



The study also looked at how the institutions in each country that teach health sciences use virtual learning. The majority of the institutions (78.9%; 15 countries) use virtual learning in courses for their own students. In 68.4% of the institutions (13 countries), virtual learning is used for preclinical subjects, while 52.6% of the institutions (10 countries) use courses developed by other institutions; 47.4% of the institutions (nine countries) use virtual learning for clinical subjects, and 26.3% of the institutions (five countries) use virtual learning to develop courses for use by other institutions. Finally, 21.1% of the institutions use virtual learning in subjects for which in-house specialists are not available; three countries (15.8%) stated that they did not know.

In addition, 15.8% (three countries) reported that they have universities that offer health sciences degrees or certification obtainable entirely online; 63.2% (12 countries) responded negatively to this question, while four countries (21.1%) stated that they did not know the answer; 26.3% (five countries) have universities that offer certification in specific health sciences subjects that can be obtained entirely online.

In the 2015 survey, only two Member States (10.5%) reported that their virtual learning programs for health sciences education have been evaluated, while 57.9% of the countries did not know. Responses related to the different aspects of evaluating virtual learning programs (access, cost-effectiveness in relation to suppliers, cost-effectiveness in relation to students, results of learning, quality, and acceptance of the program by suppliers and by students) have not been processed; thus, no data is available on these aspects.

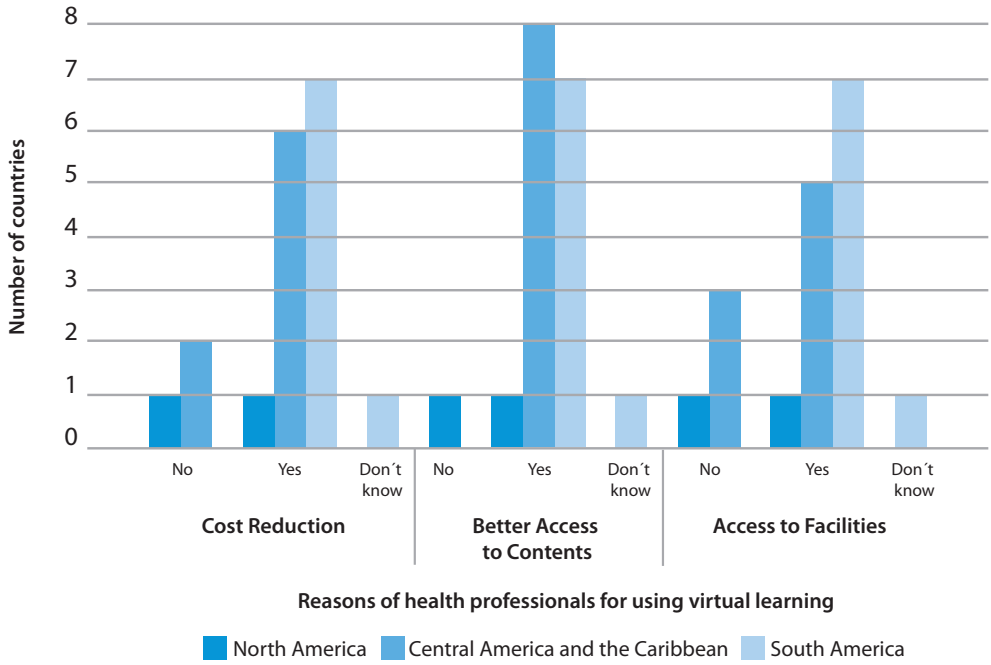
## Target group: health professionals (on-the-job training)

The 2015 eLearning survey asked Member States about the use of virtual learning in on-the-job training of health professionals in their countries. The responses show that almost all Member States (17 countries; 94.7%) use virtual learning in on-the-job training for health professionals.

Member States were also asked about their rationale for using virtual learning in on-the-job training for health professionals in their countries. They could select from a list of up to three principal motivators. The main reason reported by 88.9% (16 countries) was to improve access to contents and experts; 77.8% (14 countries) stated that the main reason for using virtual learning for preparatory training in their country was to reduce the costs associated with providing educational content; while 72.2% of respondents (13 countries) reported that the main reason was to make access to education possible where learning facilities are limited.

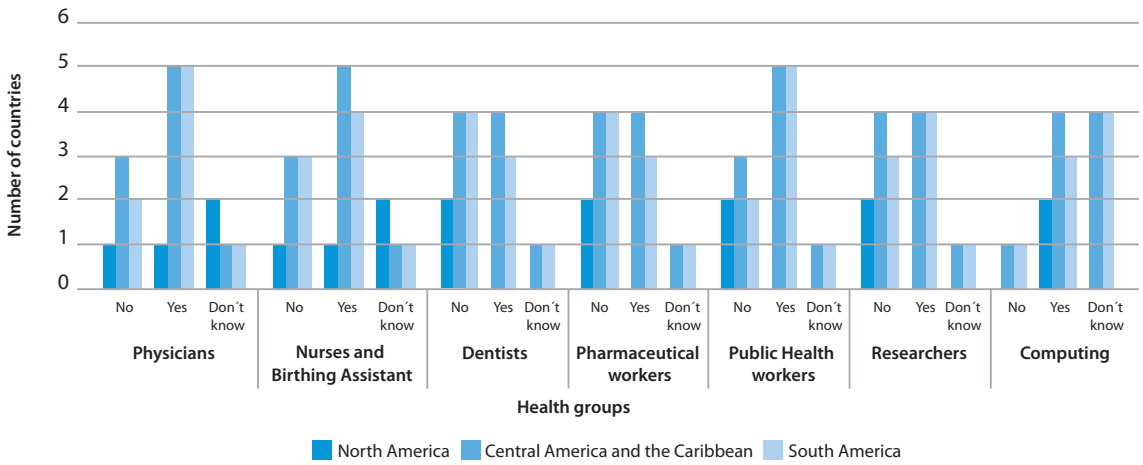
More generally, five countries (26.3%) cited two reasons and 31.5% (six countries) cited the three reasons given. The distribution of reasons for using virtual learning in on-the-job training for health professionals is shown in Figure 17.

**Figure 17.** Distribution of reasons for using virtual learning in on-the-job training for health professionals




Only 36.8% of PAHO/WHO Member States in the Region of the Americas (seven countries) that use virtual learning for continuing education of health professionals have entities accredited to conduct continuing medical education (CME) or professional regulatory bodies in this area. Notably, 42.1% (eight countries) answered that they did not know. The survey also asked what professional groups in the country have adopted virtual learning for the continuing education of health professionals. Respondents could select from a list of up to six specific health sectors. The highest rates of use of virtual learning are in medicine (63.2%; 10 countries) and in nursing and public health (52.6%; 11 countries). Of Member States that responded, 42.1% (eight countries) reported the use of virtual learning as part of educational programs in biomedical research, while 36.8% (seven countries) reported the use of virtual learning as part of educational programs in dentistry, pharmacy, and medical informatics; 10.5% (two countries) stated that they did not know. These findings are shown in Figure 18, comparing the adoption of virtual learning by various health-related groups.

**Figure 18.** Health-related groups that have adopted virtual learning in the various countries



Again, in the 2015 survey, only two Member States (10.5%) reported that their virtual learning programs in health sciences education have been evaluated. No country answered the questions about the specific areas of evaluation.

## Success stories

### AIEPI project, Colombia: Convergence of the public and the private (180)

The AIEPI project (integrated management of childhood illness) is a project based on impar-ting training and skills to health workers, and to the community in general, for preventing illnesses in children from birth to 5 years of age.

This project is an initiative of the telehealth program of the University of Caldas (Colombia), with financing from the Ministry of Health and Social Protection, and support from PAHO/WHO and the CICUT network. It is an attempt to address the problem of high infant mortality present in certain parts of Latin America. In-person training for reference personal is an added problem, given its high cost – approximately US$1,000 per person – as are the serious difficulties of geographical access.

During its first year, the project trained a total of 2,500 physicians and nurses in Colombia. The project is now in its second phase, "IMCI Latin America," whose objective is to train health workers at a mass level throughout Latin America and the Caribbean. It anticipates training over 100,000 health workers through the virtual telehealth education platform of the University of Caldas.

The project's funding and sustainability have been addressed by creating a network that draws on the participation of international organizations, ministries of health from the different countries, and private firms.

## Barriers to the implementation of virtual learning programs

There are numerous factors that prevent the successful implementation of virtual learning programs in the countries. In view of this, the survey asked Member States to list a set of suggested factors, in order of their importance, that hinder the ability of virtual learning to contribute to universal health coverage.

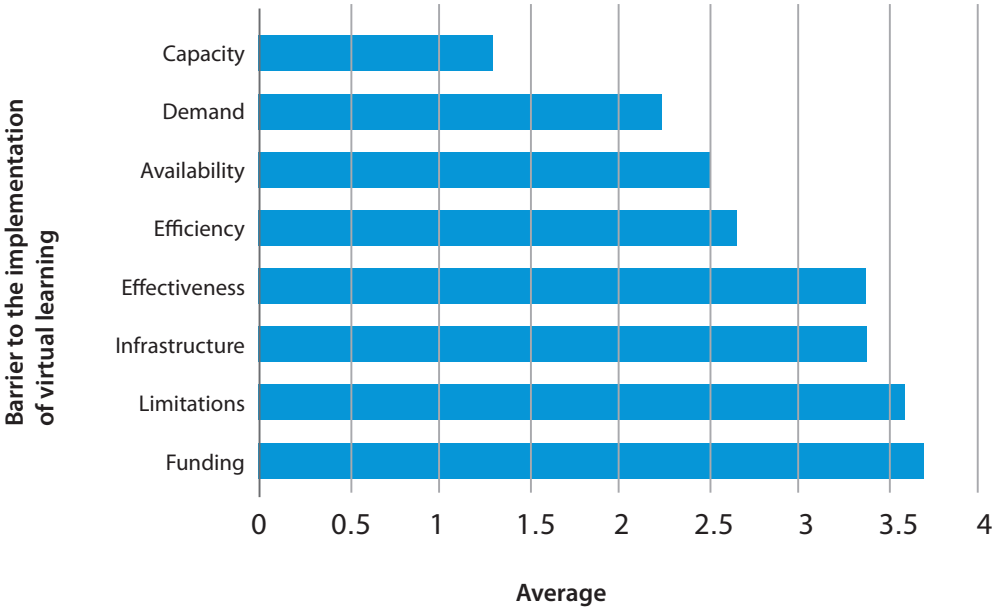
The 2015 survey listed 10 specific barriers to the implementation of mobile health programs; these were assessed by respondents on a Likert scale of 1 to 5, 1 meaning "it is not a barrier" and 5 indicating an "extremely important" barrier. Thus, each country could select the relevant barriers and specify the importance of each.

Respondents indicated that the principal barriers to the implementation of virtual learning programs are: lack of funding to develop and support the programs (funding); the fact that a health sciences degree cannot be earned entirely through virtual learning (constraints); lack of evidence on the effectiveness of virtual learning programs (effectiveness); and lack of equipment and/or connectivity (infrastructure). The average values obtained for each of these variables were 3.72 and 3.63 for the first two, respectively, and 3.42 for the latter two.

The scores that respondents assigned to each variable were found to be high, as in the cases cited above. Thus, 66.6% (12 countries) reported lack of funding as a "very important" or "extremely important" barrier to development and support of virtual learning programs (funding), while 68.4% (13 countries) indicated constraints as being "very important" or "extremely important" for the implementation of virtual learning programs. Additionally, 57.9% (11 countries) reported infrastructure as "very important" or "extremely important" barriers to the development of virtual learning programs, while 63.2% (12 countries) reported effectiveness as "very important" or "extremely important" in this respect.

Conflicting educational priorities rank next in importance as barriers: the fact that educational institutions do not include virtual learning in teaching health sciences (policy), lack of evidence on the profitability of virtual learning programs (cost-effectiveness), and lack of usable virtual learning courses, due to appropriate content being unavailable, for example, or for linguistic or cultural reasons (availability). On a scale of 1 to 5, the average scores given to these obstacles range between 3.26 and 2.53. Figure 19 shows all of the cited barriers in the Region covered by the 2015 survey, as well as their average scores. As Figure 19 illustrates, funding, followed by constraints, are the most important barriers to the implementation of virtual learning programs, with average scores of 3.72 and 3.63, respectively.

**Figure 19.** Entire list of barriers in the Region, with average scores




## Discussion

Today's society has brought with it a change of culture with regard to knowledge. If creating value does not depend on the number of hours worked, but rather on the knowledge generated, and if quality prevails over quantity, then time must be organized with a view to efficiency. Moreover, the location of the workplace is irrelevant, since technology can make resources available without space and time constraints, and can also facilitate collaboration. In this age of innovation, experience has for the first time become a tool for improving worker efficiency, increasing flexibility, and facilitating collaboration (173).

In this context, virtual learning provides a useful model for managing health-related knowledge. Incorporation of the multitude of resources available on the Internet (websites, OER, social media, and CoP, among others) makes virtual learning a new learning model, based on collaboration and the use of collective intelligence. When communities incorporate a virtual component, a wider variety of benefits accrue and a more diverse range of people is able to receive them.

The use of virtual learning has spread as a tool for improving care knowledge and practice, and is enhancing performance at both the individual and organizational levels. The survey findings reveal an awareness of the benefits of virtual learning methodologies, and indicate that most Member States are promoting the use of eLearning in formal health-related educational programs.

Effective implementation and exploitation of the benefits of virtual learning entail more than

merely changing the tools to incorporate technology in traditional educational content. Rather, what is required is a change of strategy, and a need to develop the professional skills to provide education under a new paradigm. The most important barrier is the scarcity of funding to develop and support virtual learning programs. Rigorous analysis of investments in virtual educational programs – consisting of an examination of return on investment – must be conducted to demonstrate the opportunity, viability, and effectiveness that these programs represent, compared with programs based on in-person teaching, which may now be obsolete in a scenario of continuous innovation and change. Return on investment should be carefully analyzed, not only in comparative terms, i.e., the costs eliminated, but also with regard to profit. Cost analysis focusing on the general population, and on patients in particular, will shed light on the benefits of virtual learning for patients, and on the potential for reducing consumption of health resources. The elimination of costs arising from health professionals' failure to keep abreast of developments or develop abilities and competencies is another fundamental element that needs to be examined through cost-benefit analysis.

Somewhat surprisingly, the second most important barrier is the impossibility of obtaining a degree in the health sciences entirely through virtual learning. Responses on this question reveal a genuine interest in virtual learning and on obtaining health sciences degrees in this way. Nonetheless, adequate online courses and degree accreditation are unavailable, constituting a basic obstacle to the spread and effective implementation of this type of learning. Motivation for virtual learning remains limited to individual desire and to the intrinsic motivation of concerned individuals. External incentives such as official accreditation to facilitate implementation of virtual learning are lacking. Similarly, international recognition of certifications granted for training conducted in the virtual modality must be addressed in order to ensure the quality and validity of the content.

The work conducted through the PAHO/WHO survey of Member States of the Region of the Americas highlights the need for participating countries to evaluate the barriers they face in implementing virtual learning, both for the initial education of health sciences students and for the continuing education of the sector's professionals. Findings from such evaluations will help in establishing guidelines for future national education and training programs.

It is also essential for national education and training policies to include measures designed to increase the use of virtual education, by encouraging the use of new technologies in education and the use of freely available online learning resources. Such measures can support students, teachers, and institutions, and can drive professional development, create jobs, and strengthen human resources.

## Comments and lessons learned by the Member States

Many of the countries pointed to the need for academic institutions that provide health sciences education to officially recognize virtual learning as a modality that can complement, or even replace, in-person education.

The absence of such recognition is aggravated in part by two factors. One is the lack of standards and policies to regulate and encourage this mode of learning and to recognize degrees that are obtained exclusively through virtual learning. The other is the lack of appropriately trained faculty with the necessary pedagogical and technical skills, and with expertise on virtual learning environments, capable of facilitating virtual training.

Some countries, such as Colombia, go further, stressing the need to create – or use, if they already exist – resources within public agencies or universities capable of facilitating the development of this type of higher education. As early as 2011, the **Atlas of eHealth country profiles** report identified a lack of infrastructure and the absence of legal frameworks to regulate online training as being among the barriers limiting eLearning in health-related fields (11).

## Summary

The 2015 survey examined the use of electronic learning in specific health sectors, and found that 89.5% of survey respondents use virtual learning in teaching health sciences students. The main reason for this, identified by 78.9% of respondents, is to improve access to content and to experts, followed by increased access to education where learning facilities are limited. The exponential growth of virtual learning throughout the world has increased access to educational content for growing numbers of people around the world, transforming the way people learn and the way available educational resources are utilized.

Of those countries responding, 73.7% reported that virtual learning is used in educating medical students, while 57.9% cited its use in training nursing and birthing assistants, as well as in biomedical research, life sciences, and public health.

The survey also explored how the institutions that teach health sciences in each country use virtual learning. Most of the institutions (78.9%) use virtual learning to develop courses for use by their own students; 68.4% of the institutions use virtual learning for preclinical subjects, 47.4% for clinical subjects; and 52.6% use courses developed by other institutions. Only 15.8% reported having universities that offer degrees or certification in health sciences obtainable entirely online, though 26.3% do have universities that offer certification in specific health sciences subjects that can be obtained entirely online.

The 2015 survey also asked about the evaluation of programs and barriers to the implementation of virtual learning in the Member States. Only 10.5% of Member States stated that their virtual learning programs for health sciences education have been evaluated.

The 2015 survey asked Member States about the use of virtual learning for on-the-job training of health professionals. The results show that almost all of the Member States have virtual learning for on-the-job training of health professionals. The main rationale reported by 88.9% of respondents is that such training can improve access to contents and to experts; 77.8% stated that their main reason for using virtual learning in preparatory training is the cost reduction associated with providing educational content in this way; and 72.2% of respondents reported that the main reason is that it allows access to education where learning facilities are limited. Most of the Member States use eLearning in the education of health science students and in continuing education programs for health professionals active in the sector.

Only 36.8% of WHO Member States of the Region that use virtual learning for the continuing education of health professionals are accredited by entities dealing with continuous medical education or by the country's professional regulatory agencies. The highest rates of adoption of virtual learning are in the fields of medicine (63.2%) and in nursing and public health (52.6%), while 42.1% of countries reported its use as part of educational programs in the field of biomedical research.

Finally, respondents reported that the principal barriers to the implementation of virtual learning programs are lack funding to develop and support the programs, the fact that it is impossible to obtain health sciences degrees exclusively through virtual learning, lack of evidence on the effectiveness of virtual learning programs, and lack of equipment and/or connectivity.

## Recommendations

- Training plans adapted to innovations in eHealth need to be created. The roles of health professionals will inevitably change, and health sciences curricula need to train these people in new disciplines.
- Member States are advised to incorporate incentives for online learning in national health strategies. Educational institutions and professional organizations need to ensure wider use

of eLearning in health sciences education and in the continuing education of health professionals, in order to remedy the scarcity of skilled health personnel.

- Educational authorities should undertake systematic evaluation of online learning programs in order to ensure their development and quality.

Section 6

# Legal frameworks for eHealth

eHealth is a complex technology that offers an alternative to the current way of providing health services. It can affect all phases of health care, changing the role of health professionals and the shape of physician-physician and physician-patient interactions. It also has ethical and legal implications (regarding professionals' responsibility for decisions, privacy of data, security of information, informed consent, etc.). This section of the survey focused on an increasingly important area of eHealth: the protection of patient data and the extent to which data are exchanged within the health arena.

## Key data from the survey responses

- 63.7% of Member States have legislation protecting the privacy of individuals' health-related data stored electronically in EHRs.
- 57.9% of Member States lack legislation facilitating people's electronic access to their own health data in EHRs.
- 36.8% of Member States reported that people in their country have the legal right to specify what health-related data in EHRs may be shared with health professionals whom they designate.
- 47.4% of Member States have policies or legislation governing the medical jurisdiction or responsibility for online health services, or for online payment for services.

## Introduction

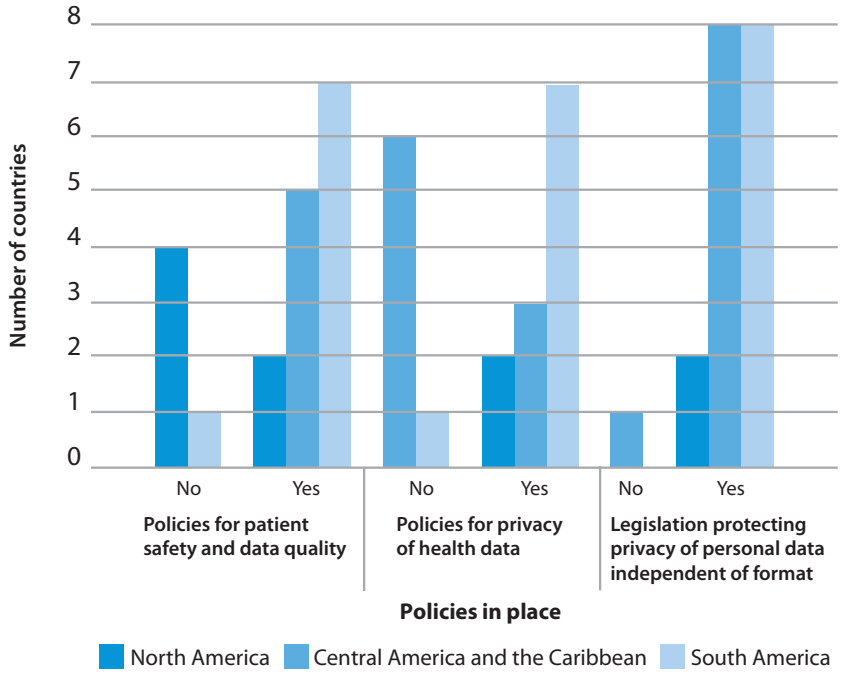
Regulatory issues are crucial in eHealth and in telehealth. In all countries, health-related data and data derived from them are considered highly confidential, and data security is one of the greatest challenges in implementing telehealth services. For this reason many countries are implementing legal and ethical frameworks to ensure that patients can feel confident that their data are well protected and will not be misused. Universal health coverage requires extensive collection and processing of data on everyone, in order to provide quality services and track progress. Compilation and use or reuse of these data require legal frameworks to protect the privacy and security of patient data. Unauthorized disclosure of a clinical condition can have highly negative effects on an individual's life. Legislation must accordingly address issues such as data privacy, access, confidentiality, ownership, quality, integrity, and sharing. This will allow patients to be better informed about how their data function and how data are used in online health services.

## Results of the survey: Legal frameworks for eHealth

There are significant legislative disparities in the policies that regulate eHealth. The section on legal frameworks for eHealth in the 2015 global WHO health survey asked Member States about their national legislation on digital health services and health-related data. That section of the survey was

designed to explore the degree to which digital patient data and sharing of that data were protected. Of respondents, nine countries (47.4%) reported having a policy or legislation defining the medical jurisdiction, responsibility, and online payment provisions of the eHealth system in portions of the system such as telehealth, while 73.7% of countries reported having policies or laws on patient safety and quality of care as related to data quality, standards for data transmission, and criteria for clinical competence. Figure 20 reflects policies in place to ensure the security of patient data.

**Figure 20.** Policies in place to ensure the security of patient data




Personal data make it possible to identify an individual. They can include, but are not limited to, name, date of birth, address, telephone number, occupation, photographs, and fingerprints, in whatever format or environment they are stored. Measure to protect the privacy of personal data and of individuals' health-related data are prevalent: almost all respondents (94.7%; 18 countries) cited the existence of legislation to protect the privacy of individuals' personal data independent of the format (paper or digital), a factor important for the development and use of online health services. Countries that do not have specific legislation to protect data privacy are likely to face greater difficulty in building confidence in their national online health programs.

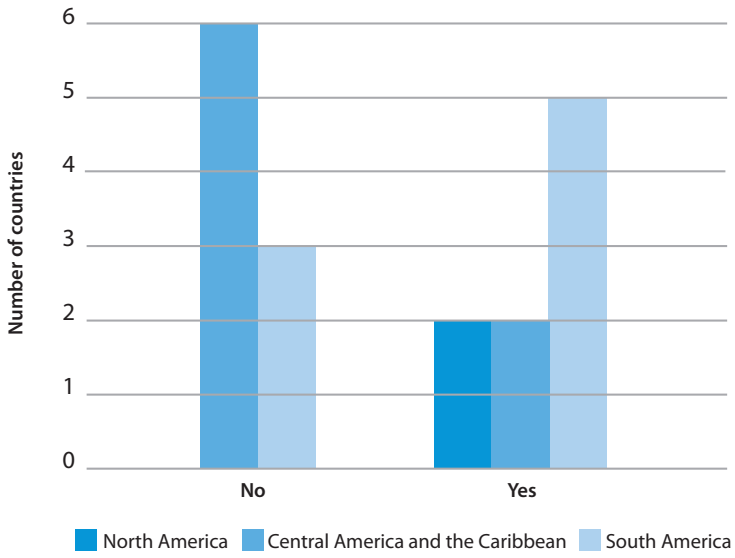
Health-related data consist of information recorded about an individual, including diseases and prescribed treatments. Such information usually includes data on medications prescribed and on any medical or surgical procedures conducted, as well as on treatments provided by multiple health care providers. For the purpose of general comparisons in this survey, the terms "electronic health records" (EHR) and "electronic medical records" (EMR) were used without distinction, although they are not strictly synonymous. In the 2015 survey, 63.7% of respondents (12 countries) stated that they have legislation protecting the privacy of individual health-related data stored electronically in EHR.

Asked about legislation regulating the exchange of digital data between health professionals in different health services at the national level through the use of EHR (as in the case of public or private health entities, social services, insurance companies, and pharmaceutical companies), 47.4% (nine countries) reported having such legislation, while a majority (52.6%, 10 countries) reported that they do not, and only 26.3% (five countries) indicated the existence of legislation regulating the exchange of digital data between health professionals in health services of different countries using EHR (as in the case of public or private health entities, social services, insurance companies, and pharmaceutical

companies). It is logical to expect countries with lower rates of EHR legislation to face greater difficulty in implementing EHR. Although some progress is evident since the 2009 survey, the continuing lack of national legislation on the exchange of digital information between countries will continue to be a barrier to crossborder health care.

The results of the 2015 survey also show that half of respondents (nine countries) cited the existence of legislation permitting the exchange of personal and health data among research entities. Figure 21 shows, by subregion, the proportion of Member States with legislation on data sharing.

**Figure 21.** Legislation on exchange of data among professionals and research entities, by subregion

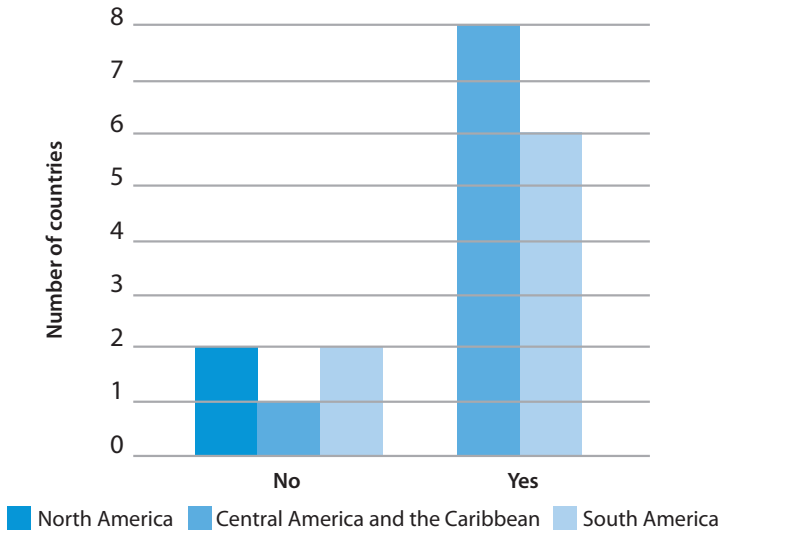



When asked whether they have legislation facilitating individuals' electronic access to their own health data stored in an EHR system, 36.8% (seven countries) reported that they do, while the majority of countries (57.9%, 11 countries) responded in the negative. These figures are percentages of the total number responding to this survey question, not only of those that stated they had a national EHR system (i.e., 52.6% of respondents, or 10 countries). While the issue of people's right to have electronic access to their own health information is an issue that deserves consideration, another important issue is the legal ownership of the information stored in EHRs. In some countries, health professionals or the health care system own the information; in others, patients are the legal owners of the data. One of the reasons preventing the interoperability needed for the exchange of health information through online health services is excessive resistance on the part of several types of vested interests. Until the ownership of health information and its uses are addressed, software developers will have no incentive for developing the necessary interoperability. Greater attention to legislation on health-related data, and on standards for interoperability and functionality in these countries, is needed if the aim is to increase the adoption of online health tools, technologies, and services.

Of respondents, 47.4% (nine countries) reported having legislation that allows individuals to request correction of health data about them stored in an EHR if the data are known to be inaccurate, while 52.6% (10 countries) do not have such a provision. The findings also show that, while 26.3% of respondents (five countries) have legislation allowing people to request the removal of their health data from an EHR, the majority of those that responded (73.7%; 14 countries) do not. Lastly, 36.8% (seven countries) reported that citizens have the legal right to specify what health-related data in EHR can be shared with health professionals whom they designate, while the majority of countries that responded (63.2%; 12 countries) do not. Many EHR systems do not remove erroneous data, but make it possible to include comments indicating that certain data should be regarded as having no value.

Finally, PAHO/WHO Member States were asked whether they have policies or legislation on their civil registry and vital statistics, to which 72.2% (13 countries) answered that they have such policies or legislation, while only 16.7% (three countries) stated that they do not; 21.1% (four countries) reported that their country has policies or legislation on the management of national identification systems, while the great majority (78.9%, or 15 countries) answered in the negative. These results are shown in Figure 22 for the different countries, grouped by subregion.

**Figure 22.** Existence of policies or legislation on civil registry and vital statistics




## Discussion

eHealth generates enormous expectations as a means of advancing universal health coverage, since it has the potential to improve the efficiency and effectiveness of care entities, as well as the quality of services (13, 20, 21, 49). By incorporating ICT, and the Internet in particular, electronic health can overcome constraints of spatial and temporal access. Nevertheless, the habitual use of ICT in clinical practice is still infrequent (114, 182). There continue to be major barriers to the spread of eHealth solutions. Worthy of note in the context of this section of the survey are: the low level of confidence among patients and health professionals, due to insufficient guarantees of security and privacy in the handling of data collected by online health systems and applications; the lack of security provisions in standards on interoperability and functionality, needed to facilitate the integration of both available eHealth solutions (such as EHR systems) and new and emerging health applications and services based on the penetration of mobile technology; and inadequate or fragmented legal frameworks that fail to provide cost benefits and that hinder crossborder interoperability, thus preventing the Region's citizens from exercising their right to crossborder health care. These barriers must be overcome by developing a holistic approach that integrates all elements of the health ecosystem, and that provides the methods and tools needed to implement the storage and exchange of personal health data, ensure privacy, and protect identity.

Possible explanations for the lack of specific legislation in the majority of countries regarding the exchange of digital data among different countries' EHR systems include: conflicting priorities; limitation in available resources, which focus more on countries' internal EHR systems; and the complexity of developing crossborder agreements. Cultural factors and linguistic barriers in individual countries pose an added challenge. Moreover, the transfer of health information through the use of crossborder EHR is regarded as a regional or international issue. In this regard, there needs to be cooperation among Region's Member States, in order to establish agreements for the crossborder exchan-

ge of health data, and to create guidelines for ensuring the security, quality, and efficiency of crossborder health care. The disparities between national legislative bodies must also be identified, examined, and addressed, in order to develop a standardized model for legal frameworks in the Region.

Developments since 2014 have led to the use of mobile applications that go beyond web applications. This trend is expected to increase in the coming years as access to information becomes possible independent of time and place, and as use of these solutions is less reliant on experience. Mobile applications provide the flexibility necessary to explore an increasing range of available services, and to integrate them in new services in ways that cannot be predicted. Health care delivery models are evolving, and are empowering patients in regard to health care and health-related decisions (14). Health applications and interventions using this technology are empowering users in the developed world, and are accelerating access to the best evidence and to health services in low- and middle-income settings (130). More and more patients are equipped with the knowledge required for decision-making, and are better informed about a broad range of issues related to health care (131, 183, 184). Increasingly, patients wish to use ICT, especially the Internet, in order to communicate and share personal health information (185, 186). Today, patient-centered care is recognized as basic to improving care quality and health outcomes (187, 188), while making it possible to reduce both costs (189, 190) and expenditure of resources (191).

There are now many portable medical devices capable of compiling large quantities of data that can be stored for subsequent analysis by health professionals. The integration of data provided by health professionals, combined with information provided by patients, along with the penetration of PHR, will lead to customized treatment and, more generally, to the need for experience with these technologies in medical care. Yet, all of these efforts will be in vain if the ecosystem in which they operate lacks adequate security, privacy, and legal guarantees, factors that can in turn affect the quality of care. Therefore, clear legislation is needed regarding the security and control of information, patients' access to it, and its collection and use by health professionals. This process should also adapt to current needs, so that it functions efficiently and continues to evolve with the technology and with society's use of the technology.

## Comments and lessons learned by the Member States

Most of the countries of the Region have legislation protecting patient data. This is understandable, since promoting the use of these systems at the global level requires first remedying the mistrust that patients (the principal users of the system) have with regard to the confidentiality and security of both personal and health-related information.

Still, existing legislation tends to be largely generic in nature. In most cases recent legislation is designed to protect information, but to largely without detailed provisions and without specifying the types of information to be protected, particularly with regard to electronic files. Furthermore, it fails to address some topics of special importance, such as the use and transmission of information flowing between patients and institutions, and between health institutions and entities not directly involved with patient treatment (such as research institutes).

Only certain countries, such as Canada and Trinidad and Tobago, stated that they have a comprehensive legal framework to regulate a substantial portion of the issues surrounding information transmission.

## Summary

Of the Region's Member States, 47.4% stated that they have policies or legislation defining the medical jurisdiction and responsibility of eHealth systems such as telehealth, and the use of eHealth to

pay for services; 73.7% of the surveyed countries stated that they have policies or laws on patient safety and care quality as related to the quality of data, data transmission standards, and clinical competence criteria.

With regard to protecting the privacy of individuals' personal and health data, 94.7% of the countries have legislation protecting the privacy of personal data independent of format (paper or digital); and 63.7% of countries have legislation protecting the privacy of individuals' health-related data stored electronically in an EHR. Although the vast majority of countries have specific legislation designed to protect the privacy of patients and their information, further improvements need to be made in this area.

The survey findings indicate that countries are focusing on legislation governing the national-level exchange of health-related data with health professionals; 47.4% have legislation regulating the exchange of digital data between health professionals in different national health services through EHRs; while only 26.3% of the countries surveyed reported the existence of legislation regulating the exchange of digital data between health professionals at health services in different countries using EHR. Half of respondents cited legislation that permits the exchange of personal and health data between research entities.

The survey findings indicate that the problem regarding patients' rights to access and change their health-related data have not been adequately addressed; 36.8% of the countries stated that they have legislation facilitating people's electronic access to health data about them stored in an EHR; 47.4% of respondents have legislation that allows individuals to request correction of their health data stored in an EHR if the data are known to be inaccurate; 26.3% have legislation allowing people to request the removal of their health data from an EHR; 36.8% of Member States reported that citizens have the legal right to specify what health-related data in the EHR can be shared with health professionals whom they designate.

Finally, 72.2% of PAHO/WHO Member States in the Region reported having policies or legislation regarding their civil registry and vital statistics, while only 21.1% of respondents stated that they have policies or legislation on national identification systems.

## Recommendations

- Member States are urged to enact national legislation regulating health-related information in electronic formats, covering: data protection; data privacy and confidentiality, and the individual rights of patients; and issues relating to responsibility for data. These issues become increasingly sensitive as systems become more interconnected.
- Training programs should be established to ensure that professionals are fully cognizant of what is needed to comply with regulations on health-related information in electronic formats.
- In an environment in which citizens are increasingly sensitive to issues of data security, privacy, and confidentiality, steps must be taken to ensure that patients are aware of their rights and responsibilities.
- In view of the general lack of comprehensive regulatory frameworks for eHealth services, these services tend to be addressed by preexisting laws on data protection. For this reason Member States are urged to periodically examine and revise the relevant national legal frameworks for online health, in order to ensure that they are adapted to the ongoing evolution of eHealth resulting from continuing technological change and due to the natural evolution of the health care sector.

Section 7

# Social media

Social media connect individuals and allow them to interact and have relationships of various types. These media tend to be generic, as is the case with Facebook, Instagram, Snapchat, Google+, and Twitter, to mention some of the largest. Nevertheless, there are also professional social media, such as LinkedIn, Xing and Viadeo, as well as specialized social media for professionals, such as HR.com for human resources, AnestesiaR for specialists in anesthesiology and resuscitation, and ResearchGate for scientific researchers. Specific knowledge areas are also the focus of some social media, as is the case with Flickr, Pinterest, and YouTube. And for people wishing to share literary opinions or create virtual libraries, there are systems such as Entrelectores, Anobii, Librarything, weRead, and Wattpad.

## Key data from the survey responses

- 73.7% of Member States reported that individuals and communities are using social media to learn about health problems.
- 100% of Member States reported that health care organizations are using social media to promote health messages as part of health promotion campaigns.
- 78.9% of Member States lack a national policy or strategy on the use of social media in the health professions.

## Introduction

Social media have become the most rapid and real-time vehicles for communication (192). The Internet, email, and chat applications make it possible for people to participate in various groups, share information, and promote products, or simply pave the way for various types of relationships between people and social systems in an open and dynamic way, whether the participants know each other beforehand or meet online.

New information and communication technologies have created increased flexibility, allowing more personalized and globalized treatment of knowledge in addressing pathologies with high public health impacts.

Today, social media are vastly increasing the range of applications in the health field, adding highly innovative applications to the traditional ones, helping to revolutionize diagnostic and therapeutic processes, as well as health surveillance and management. These new technological developments are generating paradigmatic changes in health, favoring preventive medicine over curative methods, focusing services on health promotion more than on curing illnesses, promoting remote diagnostic and therapeutic activities, and incorporating the use of ICT in traditional medical care. Traditional medical health care systems are changing, not only in terms of organization and the quality of services, but, more importantly, within the clinical, epidemiological, and social processes themselves. Medical technology is allowing people to gain direct access to health information, and is transforming society's social and ethical responsibilities for health.

Social media provide an easy-to-access platform, allowing various interest groups and people of all ages to share their ideas and knowledge regarding the handling of health issues. This creates new ways of confronting old challenges: new technological tools are available, with consequent implica-

tions for efforts to achieve health equity; increased knowledge is available and easily accessible to a larger number of users; and this knowledge can be shared through social media.

Social media make it possible to strengthen cooperation and human exchange by structuring information, services, and information resources around knowledge networks. They offer opportunities for interaction by creating services that provide information, training, consultation, advice, and discussion that encourage the use of virtual spaces for ongoing exchange among people involved in these processes, motivating their interactions and generating new knowledge regarding professional, social, and institutional development.

U.S. psychiatrist William Glasser (193), in developing his theories on learning, established that adults learn best when there is effective interaction with peers, when they discuss and exchange ideas, and when they teach others what they have learned. For this reason, the ease of interaction and knowledge sharing online is particularly relevant for the professional development of health sector workers. Peer-to-peer interaction and online sharing of expertise is creating a new learning model, a different way of obtaining training and information, and of gaining and updating the skills needed by health sector professionals

## Survey findings: Social media

Among the respondents, 78.9% of Member States in the Region (15 countries) have no national policy or strategy on the use of social media by governmental organizations; only 21.1% (four countries) reported the existence of a policy or strategy of this type. Nevertheless, when asked whether they have a policy or strategy that applies specifically to health, the vast majority of the countries (72.2%; 13 countries) answered affirmatively, and only three countries (16.7%) answered in the negative. Although social media are a relatively new phenomenon, and despite a lack of specific national regulation, it appears that the majority of health entities already have adequate policies on the use of these media.

The following questions concern the use of social media for health, exploring this from the standpoint of health organizations, as well as from the perspective of individuals and communities.

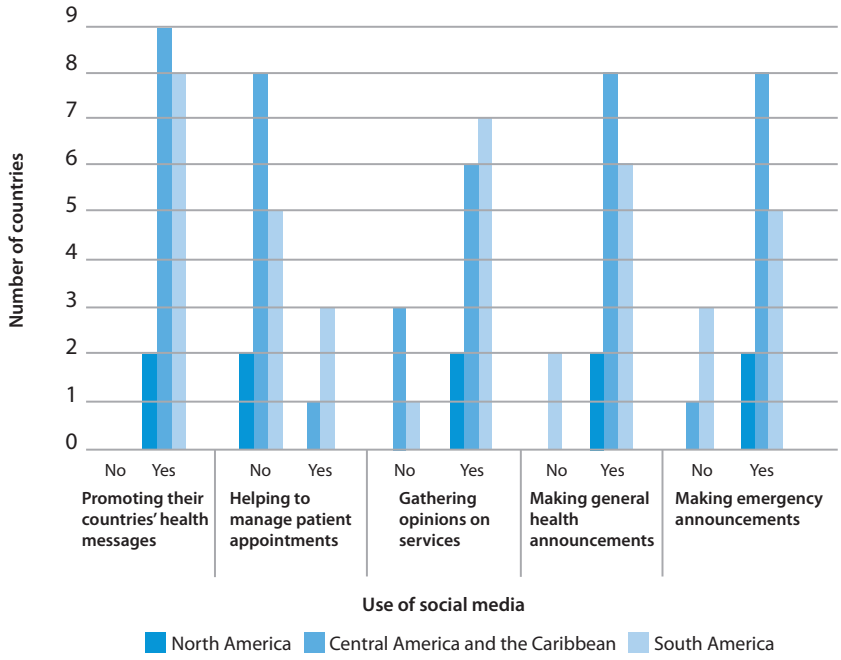
With regard to health organizations, 100% of respondents reported that these entities use social networks to promote health messages as part of their health promotion campaigns. This means that social networks are clearly being used and are already an important channel of communication with the public, despite the lack of legislation or formal guidelines.

Health organizations are also using social media for general health announcements in 88.9% of responding countries (16 countries). The great accessibility of social media suggests that these tools may have a high rate of adoption in comparison with other electronic or ICT tools for health. The comments of patients are a key element in increasing the quality of health care; encouragingly, 78.9% (15 countries) reported that health care organizations use social media to field opinions on the services they provide. Health systems, as social systems, face numerous challenges related to economic, technological, social, and cultural change (103). Since information and communication are basic elements of these systems, the interrelationship between the new technological and social paradigms should facilitate change in the ways people access and use health services (104, 105). The expected result is a network model that promotes changes in the roles of most of the stakeholders participating in health services processes, thereby generating a catalyzing, synergistic force for this transition, as empowered citizens become an integral part of the system.

The vast majority of the responding countries (78.9%; 15 countries) reported that their health organizations use social media for emergency announcements. Emergency information must reach a large number of people quickly, and social media provide channels capable of disseminating important and relevant information quickly. In spite of this, only 21.1% of responding countries (four countries) reported that health care organizations use social media to arrange patients' appointments.

Given the results of the other survey questions on social media, this percentage is lower than might be expected. Figure 23 shows the various ways in which organizations in different countries use social media, with countries divided by subregion.

**Figure 23.** Use of social media by organizations, by subregion




In 73.7% of the countries that responded (14 countries), individuals, and communities within the countries, use social media to learn about health problems and to launch community health campaigns, with only five Member States reporting that this is not the case. Accordingly, countries are aware that their populations use social media to obtain information and exchange opinions. If the key to new health models is strengthening an interactive model of the relation between citizens and the health system, then the new challenges of the health system are likely to involve innovation in the new corporate structure that is emerging, one that is independent of space and time, in which the empowered patient, or e-patient, plays a paramount role.

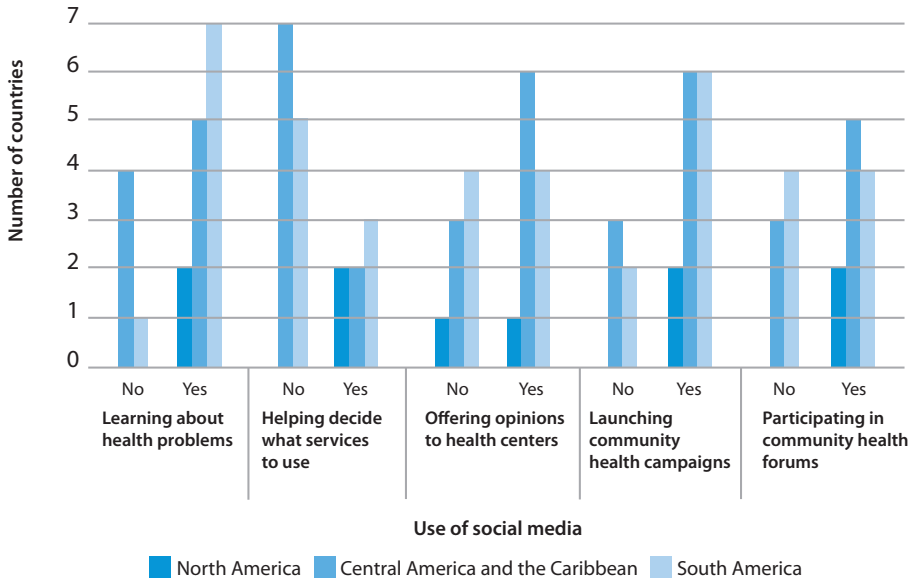
Furthermore, individuals and communities in 11 of responding countries (57.9%) use social media to communicate their opinions to health centers or health professionals, and in 61.1% of the countries they use these media to participate in community health forums. The interrelation between the new social and technological paradigms should facilitate the transition of health systems in the information society. Access to a vast array of information and the possibilities of constructivist approaches add to the enormous potential for social media to improve the quality and efficiency of the health system, redefine the health model, and transform relationships between health services stakeholders.

Nonetheless, in only seven countries (36.8%) individuals and communities use social media to help them decide what health services to use. In comparison with responses to other survey questions on social media, this is lower than expected: 73.7% of responding countries report that individuals and communities use social media to learn about health problems and launch community health campaigns, and 57.9% report that individuals and communities use social media to communicate their opinions to health centers.

A number of Member States also reported other uses of social media, including: information services for general management of health situations in emergencies or for general consultation; programs to ensure adherence to treatment; appointment reminders; mobilization campaigns; health surveys; vaccination programs; epidemiological surveillance; remote monitoring of medical variables; access to

information and databases; support for clinical decision-making; transmission of electronic patient information; and online learning. Figure 24 shows the different ways in which individuals use social media.

**Figure 24.** Ways in which individuals use social media




## Success stories

### The ACUARIO project: internal communication between health centers (194)

The ACUARIO project was implemented in 2012 in the Argentine province of Salta. It was approved in 2011 through ministerial resolution 1613/11, which mandates the establishment of the system in the province's health centers. The project is also part of the health-related section of the five-year plan for 2011-2016.

An initiative of the Ministry of Health of Salta and the Center for Studies on Information and Communication Technologies in Health, the system allows the region's health centers to organize administrative tasks using internal communications linking them. It facilitates transactions such as assigning shifts, providing patients' clinical histories, and managing the distribution of medications.

Nearly 65% of the province's health centers participate, and the project aims to reach 100% of these institutions. The project will continue to pursue efforts to improve the system, while at the same time taking account of important aspects such as training professional personnel in use of the system.

## Success stories

### e-Patient Dave: patient-to-patient assistance (195)

e-Patient Dave is a portal created by Dave deBronkart. Help from other patients, through the website acor.org, helped him conquer kidney cancer. The site he created brings together cancer patients, caregivers and family members to share information on their illnesses and treatments. It was these people who advised him to seek a specialized facility. As deBronkart stated in an interview conducted on a prestigious U.S. television program, "It was patients who gave me the contact information of four physicians who could administer the drug to me. Two months later, the tumors had shrunk".

The e-Patient Dave website presents concepts such as patients are the most underutilized resource in medical care and let patients help. Currently the portal is one of the world's most prominent examples of efforts to bring patients together. It not only provides extensive information that can be of great use for a first-time cancer patient, but also goes beyond that to offer a multitude of options for patients, hosting a number of patient communities, and providing links to reference centers and research institutions and to the training activities they conduct.

## Success stories

### Media strategy 2.0 of the Risalda Territorial Health Plan (196)

In 2014, the Risalda (Colombia) Territorial Health Plan was designed, under a strategy called PASE a la Equidad en Salud (MOVE to Equity in Health). The methodology identifies and considers the gaps and differences between various population groups. *PASE a la Equidad en Salud* is an organic set of regulatory, conceptual, methodological, technical, and operational elements that comprise the Territorial Health Plan. It takes account of the fact that the health status of populations relates directly to the specific conditions in the particular territories.

The media 2.0 strategy was designed to help harmonize and develop the Territorial Health Plans in 32 departments and five districts throughout Colombia. The product of this effort will make it possible to disseminate information in 2.0 media, or social media, by using clear and simple language to provide social media audiences with information on the Ten-year Public Health Plan and the *PASE* strategy, in the context of developing situations in the various departments.

The strategy will use the two most popular and widely used social media in Colombia, Facebook and Twitter, sending 10 messages per week consisting of a combination of images and text. Given the particular way in which information is managed in social media, it is essential that the writing and thinking reflected in the messages – whether with the use of characters, images, or video – be interesting, useful, newsworthy, and motivating.

## Discussion

A large number of technologies and applications currently used in health sector processes and procedures attempt to optimize resources and improve care for patients by eliminating certain barriers and creating new forms of communication for service providers and users of health systems.

Social media are conceived as structures with a set of actors (individuals or organizations) linked by mutual interests, professional criteria, friendship, or family relationships. In everyday language, the notion of a "social network" has been used freely for over a century to denote complex sets of relationships between members of social systems in all dimensions, from the interpersonal to the international (197).

Social networks, in any of the modalities described, are changing the dynamic and nature of interactions among consumers, professionals, and organizations, including in health-related contexts. Interactive platforms are being created for individuals, communities, and organizations to share and discuss content and issues, and to promote new ideas. This is exerting an influence on universal health coverage; expanding the participation of users of health services and making it possible for them to take ownership of information on their own health; and promoting their participation in activities to foster healthy habits and prevent disease. Real-time informal communication makes it possible for

health care providers to share educational information with users of the health system, and to promote healthy behaviors and improve adherence to therapeutic programs.

The use of social media in the area of health poses a number of challenges:

- At the individual level there is a lack of knowledge about available services involving the use of technology. People in various settings lack a culture of self-care and healthy life habits, and have limited access to high-quality information on health and disease processes.
- At the community level serious connectivity problems persist, due to the isolation of certain regions, in terms of access to health services, lack of economic resources on the part of the populace, and budgetary constraints that hinder efforts to increase access to technological tools.
- At the institutional level conventional health systems lack sufficient resources to deal with information and communication technology tools and services, thus creating problems for coordination and consensus-building in programs within the health care arena.

Lack of knowledge about legislation and lack of regulation are common additional hindrances. Comprehensive care requires coordination, monitoring, and feedback before, during, and after events requiring attention by health care providers; increased access to social media does not necessarily solve these problems, particularly where cure-based health models are concerned.

Health care providers have the opportunity to use social media to create knowledge networks and therapeutic communities for the benefit of the system's end users, ultimately benefiting patients, though use of these resources poses ethical and policy implications, particularly with regard to the confidentiality and proper handling of patient information.

In addition, the access that end users have to these technological tools can open up alternative paths for solving health problems when available services do not cover them, when the information is fragmented, and when there are limited mechanisms for validating information and lack of access to a preventive-health system.

The Region's countries have multiple opportunities, and even more challenges, associated with the use of social media in health services. The adoption of appropriate guidelines for managing these tools can have a positive impact on public health and on the organization of health systems.

## Comments and lessons learned by the Member States

The obstacles that arise when health services interact with social media are not unfamiliar to Member States. These are reflected in areas such as:

- Lack of a clear vision, on the part of health professionals, of the usefulness of social media (Argentina).
- Absence of a system of incentives to improve remuneration for health professionals and to encourage adoption of cost-effective models (Canada).
- Lack of knowledge concerning the advantages of mobile devices for health management (El Salvador).
- Absence of a culture featuring the use of ICTs via mobile devices (Honduras).
- Lack of knowledge, appreciation, and training among health professionals and decision-makers regarding the potential for mobile health to improve patient safety (Jamaica).
- Issues regarding protection and confidentiality of information and access to data (Peru).
- Lack of universal coverage of health services (Trinidad and Tobago).
- Limited training of health workers and decision-makers (United States).

## Summary

The countries were asked whether they have a national policy regulating the use of social media in the health professions. The majority of respondents (78.9%) reported that they do not. Only 21.1% reported that they have a national strategy or policy on the use of social media by governmental entities. Nonetheless, almost all of the countries (72.2%) reported that they have a national policy or strategy regulating the use of social media in the health professions.

Regarding health organizations, 100% of respondents stated that these organizations use social media to promote health messages as part of health promotion campaigns.

Health organizations also use social media for general health announcements in 88.9% of the countries that responded. The observations of patients are key in improving health care quality; encouragingly, 78.9% of respondents reported that health care organizations use social media to field opinions of the services they offer. The vast majority of countries that responded (78.9%) also reported that health organizations use social media for emergency announcements, but only 21.1% of responding countries reported that health care organizations use social media to help arrange patients' appointments.

Individuals and communities use social media to learn about health problems and to launch community health campaigns in 73.7% of responding countries. In 11 of the countries that responded (57.9%), social media are also used by the public to offer opinions to health centers or health professionals, and, in 61.1% of the countries, to participate in community health forums; but in only 36.8% of the countries do individuals and communities use social media to help decide what health services to use.

These findings contrast with the challenges cited by individuals, communities, and institutions.

The barriers reported by the Member States must be overcome if the potential of social media to generate value added in the field of health, addressing issues of equity and other public health challenges, is to be realized.

## Recommendations

- The Member States are urged to create clear directives on the use of social media, so as to create positive effects on the medical profession as a whole and on public confidence in the health system.
- First, national policies or strategies on the use of social media in the evidence-based health professions should be developed. Educational programs for health professionals should be incorporated to apprise them of the potential for social media and virtual communities to support their development and to advance the management and acquisition of new knowledge and the development of digital skills. It would be advisable to establish incentives for health workers to integrate social media in health promotion efforts.
- Second, programs should be promoted for the general dissemination of knowledge concerning the use of social media in supporting health programs. This means fostering a culture of self-care, supported by social media, with the aim of generating wider and better coverage of health promotion programs, with users assuming responsibility for the health information circulated in social media.
- All of this involves updating existing regulatory regimes in the Member States, so that technology can be employed in coordination with preventive approaches used in health programs; pro-moting open dialogue among patients and those supplying health information through social media and the Internet; and improving the technological infrastructure of developing countries to allow greater access to information by the population, especially in vulnerable areas.

Section 8

# Big data

The use of technology to capture and disseminate knowledge is essential for the promotion of universal health coverage. Technology also makes it possible to process a wide range of health data – not limited to clinical histories and radiological images – which, once stored, can be processed and viewed with different types of devices, provided that the necessary computer support is available. Collecting and analyzing health data can make a wide array of information available; this, in turn, can be used to further improve services and provide evidence for decision-making.

## Key data from the survey responses

- 31.6% of Member States have national policies or strategies regulating the use of large volumes of data in the health sector.
- 10.5% of Member States have national policies or strategies regulating the use of large volumes of data by private enterprise.

## Introduction

"Big data" is a concept that refers to the storage of large quantities of organized or unorganized data, and to the procedures used to identify repeated patterns within the data. When gathered in the health sphere, such data are often termed "big health." Big data (or "big health") is an essential component of digital health, and also includes elements of mobile health (mHealth), wireless health, health 2.0, eHealth, ePatient (patient empowerment), health information technology (Healthcare IT), cloud computing, quantified self, wearable computing, gamification, telehealth, telemedicine, precise medicine, personalized medicine, and connected health (198).

Large and complex groups of data usually require distributed databases and advanced data analysis methods. In health services, big data cover a wide range, including: clinical data from EHRs, electronic medical records (EMRs), pharmaceutical records and related data sources, genomic information, and data on other health determinants, such as lifestyles and the environment. In addition, data can come from many other sources, such as the increasingly widespread use of sensors, mobile telephones, the contents of social media, cameras, photos and videos uploaded to the Internet, etc.

There are several common approaches to analyzing large volumes of data for the purpose of clinical intelligence, as well as for business intelligence: data mining (exploring data to identify patterns and relationships among variables); business analytics (involving capabilities, technologies, and practices that make it possible to analyze business activity on the basis of existing data, in order to improve performance and plan for the future); and data science (processes and systems used to extract knowledge from data). Analytics, in the public health context, involves transforming data to formulate a vision, and to provide evidence for decision-making and policy.

Thus, complex analyses of large quantities of data can generate valuable innovative products, increase the efficiency of processes, and provide easily accessible information to optimize management procedures. For the purposes of universal health coverage, big data provide new and unique data on populations and individuals, thereby facilitating better health care for all.

Because the use of big data is relatively new in many countries, this section's questions concerning online health have been reduced, and are limited to issues of regulation and barriers to the use of large volumes of data.

## Findings from the survey: Big data

Member States were asked to provide information on the existence in their countries of a national policy or strategy regulating the use of big data in the health sector. Only six countries (31.6%) reported having such a policy. The countries were also asked about the existence of a national policy or strategy regulating the use of big data in private enterprise. Only two of the Member States (10.5%) reported having such a policy, and four countries (21.1%) stated that they did not know. The absence of national strategies or policies regulating the use of big data and the advanced analysis of such data, as well as related legal, ethical, and privacy issues, indicate that attention to this field is still embryonic in the Region.

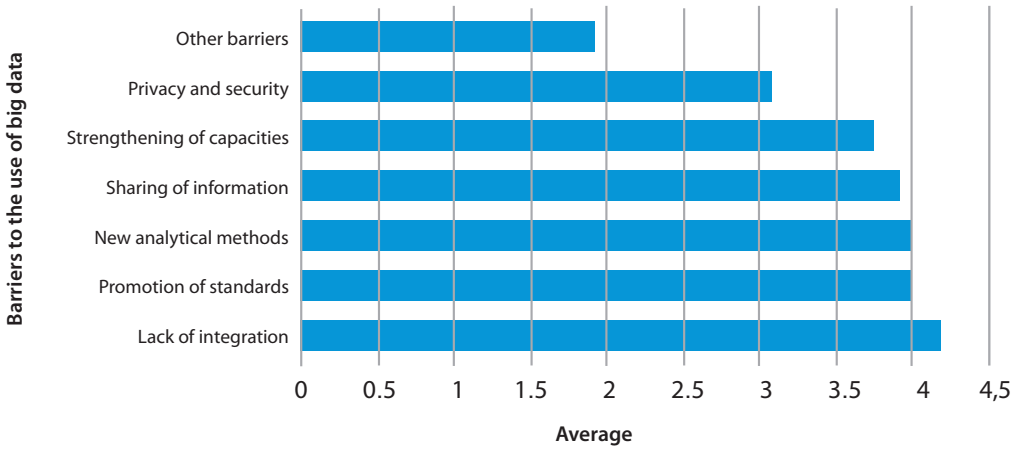
## Barriers to the use of big data in the health field

The fact that big data are not yet contributing to universal health coverage efforts in the countries is attributable to several factors. Some of the known barriers to the use of big data and advanced analysis of such data in the health field include the following: the inputting, collection, and storage of data can pose a challenge, particularly for health-related data that may contain personal information; there are legal issues with respect to personal data; the complexity of the data and the difficulty of compiling and storing large volumes of personal health data also present a challenge; and, lastly, there are the widely recognized problems related to data security and confidentiality.

The 2015 survey examined a total of seven specific barriers to the use of large volumes of data for health purposes; these were scored by the countries on a Likert scale of 1 to 5, with 1 meaning "not a barrier" and 5 indicating an "extremely important" barrier. Thus, each country could select the barriers relevant to it and specify the degree of importance of each.

Figure 25 shows these barriers to the adoption of big data in health, along with the average scores they received. As shown, the lack of integration of different systems and the concomitant issue of standards, along with the newness of analytical methods, appear to be major barriers, with average scores of 4.26 and 4.05, respectively.

**Figure 25.** Barriers to the use of big data in the health field



The main barriers to the use of large volumes of data in the health field, as reported by respondents, included four "very important" or "extremely important" factors: the need for greater integration between different health services and other related data-collection systems (lack of integration); the need to establish effective standards and best practices for the capture and use of big data in order to fully utilize their potential (promotion of standards); the need to support research on new analytical methods, in order to address the challenges of new data and emerging research scenarios (new analytical methods); and the need to provide incentives for the public and private sectors, in order to accelerate information sharing and prevent information from simply being warehoused (information sharing). The average scores for these variables are 4.26 for the first, 4.05 for the second and third, and 4.00 for the last.

These scores confirm the information described earlier. Thus, scores for the variables presented in the survey were high: 16 countries (84.2%) reported the lack of integration and the need for promoting standards as "very important" or "extremely important" barriers to the use of large volumes of data for health in their countries; 14 countries (73.7%) reported the challenge of new analytical methods to be a "very important" or "extremely important" barrier to the use of large volumes of data for health; while 16 countries (84.2%) reported information sharing as a "very important" or "extremely important" barrier to the use of large volumes of data for health. Since big data is a relatively new area, it is not surprising that the barriers to implementation in this area are scored as more important than variables explored in other sections of the survey.

## Success stories

### Neonate statistics generator (199)

Created as a public-private enterprise involving the CICITIC (Center for Research, Development, and Innovation in Information and Communication Technologies of the Technological University of Panama) and the Hospital José Domingo de Obaldía, the Neonate Statistics Generator was implemented in 2013 to obtain accurate and precise information through analytical statistical studies on pathologies in neonates, using data mining algorithms.

The project specifically focuses on the analysis of neonatal mortality in the Domingo de Obaldía Maternal and Child Hospital. The specific objectives are: (1.) to review the demogra-phic and clinical characteristics of neonatal deaths occurring at this hospital; (2.) to compare the characteristics of these deaths with those at other health institutions; and (3.) to evaluate the institution's neonatal case-fatality as a function of birthweight

## Comments and lessons learned by the Member States

Most of the countries recognized the merits of analyzing major volumes of data, but because of the lack of financial resources to implement programs of this type and/or the lack of experts capable of handling such data, few countries have programs to analyze big data.

Countries such as the United States and Canada – which are considered high-income countries, where the advanced level of technological knowledge has led to widespread use of big data in certain areas, such as market analysis – cited the lack of specific big data programs in the health field (United States), or noted that such programs are in very early stages of implementation (Canada).

Again, the public or private nature of the entities with the capacity to implement such efforts affects the speed with which initiatives of this type are implemented. Thus, in United States, private enterprise is relied upon for implementing big data analysis efforts, while in Canada the need for public agencies to take the initiative in this area is being discussed.

## Discussion

In the current context of severe budget constraints, the introduction ICTs in the health field is widely recognized as a highly useful instrument for improving public health, offering greater possibilities for universal health coverage, among other benefits. It is content (i.e., the data obtained from using this technology), however, that will ultimately contribute value and definitively change the health field.

The quantity of health data available online in both structured and unstructured formats is constantly increasing. A huge quantity of information is being created by individuals, in addition to the large volume of information associated with entire populations. The more data is available, the more powerful the statistical analysis of the data, and the greater the ability of researchers to formulate and answer new research questions. New analytical methods in the health field make it possible to improve health care, by identifying trends and correlations in data through predictive analysis, by developing clinical risk models, and through advances in personalized medicine.

For that reason, big data can be used for various purposes, ranging from providing a broad vision of health trends and patterns in the population to identifying people who are at risk for specific diseases. Big data can be used to study the epidemiology of diseases, the profitability of medical care and its comparative effectiveness, and to establish indicators of individual, community, and population-wide well-being when used in combination with data on social welfare (200). It is also expected that big data will help identify early warning signs and improve patient safety, which could be highly useful in resource allocation and in furthering universal coverage. Examples of this have been provided by the WHO (201) – which created a data repository with access to over 50 data sets on priority health topics, including mortality and the prevalence of Human Immunodeficiency Virus infection/Acquired Immune Deficiency Syndrome (HIV/AIDS) in different WHO regions (202) – and by the United Nations (203) and the Centers for Disease Control and Prevention (CDC) (204), which maintain online data repositories on various indicators for different countries.

Although these are important initiatives, efforts of this type are not common in the majority of countries in the Region, primarily because they do not have the means to apply large volumes of data to health issues. The limited integration between different health services and other relevant data collection systems, along with the lack of effective standards and best practices for the capture and use of big data, act as impediments to realizing their full potential. Given that data are transmitted in varying formats, through a variety of platforms, it is no surprise that making use of these different types of health information presents difficulties.

The need to support research on new analytical methods in order to address the challenges of new data and of emerging research scenarios, along with the need for incentives in the public and private sectors to accelerate information sharing and prevent information from simply being warehoused, are key elements in the future evolution of big data analysis. Data are typically diffuse, as are analyses of the data; thus, processing by traditional computational methods can be difficult or ineffective. To address this problem, powerful data management methods and tools are required.

## Summary

The enormous potential that new methods of big data analysis hold in supporting and improving universal health coverage deserves serious attention, now and in the future. At present only 31.6% of the Member States have national policies or strategies regulating the use of large volumes of data in the health sector, while 10.5% have such instruments to regulate the use of such data by private enterprise. The most important obstacles to the use of large volumes of data for health purposes are the limited integration between different health services and other data collection systems, the lack of effective standards and best practices for big data capture and use, the lack of research on new analytical methods to address the challenges of new data and of emerging research scenarios, and the

lack of incentives for the public and private sectors to accelerate information exchange and prevent information from simply being stored.

The analysis of big data has vast potential for reducing health care costs and providing more and better data for scientific research. Moreover, analysis of health data can also create incentives for health professionals, provided there is clear evidence of the benefits and usefulness of the information contained in EHR systems. This potential is lost, however, if countries fail to find ways to effectively use large volumes of data for health-related purposes. New policies to regulate the use of large volumes of data in the health sector must be developed, while taking account of important issues such as privacy and data protection.

## Recommendations

- Member States should take the lead in addressing issues of governance regarding data at the national level, working with ministries of health, ministries of justice, and data privacy regulators, with particular attention to data privacy and protection.
- Policies need to be developed and implemented to regulate the use of large amounts of health-related data in both the health sector and the private sector, while funding options for scientific research in this area need to be promoted.

# Conclusions

Universal health coverage is a citizen's right, an instrument of economic efficiency, and a mechanism to promote equality and social well-being. Public policy on economic growth and social welfare needs to facilitate access to, and use of, efficient, effective, and equitable health services. The new economic and social environment brought on by the advent of the information society places people at the center of a scenario of competition and social welfare. In this new context, having a population in an optimal state of health is essential. Today's information society (205) presents new instruments, challenges and opportunities that must be addressed using a targeted, dynamic approach with a relational focus.

Targeting is necessary because of the need to move from the concept of technology to that of multiple technologies; with this comes the need for people to familiarize themselves with a broad set of technological applications in the health sphere. A dynamic approach is needed, since the processes of economic and social change associated with changes in health are far-reaching and must incorporate a temporal dimension. A relational focus is needed, since changes in health practices are usually part of a broader context and incorporate technological, organizational, educational, economic, and social dimensions that must be taken into account. It is precisely this targeted, dynamic, and relational focus that has been the basis for analyzing data for the Region from the Third Global Survey on eHealth. The primary objective has been to identify the barriers and opportunities that eHealth brings in addressing the challenge of achieving universal health coverage, in the context of social change and the new information society – in which people and their health assume greater importance than ever before.

The delivery of health services is a discrete economic activity, first because of the special economic nature of health, which is a public (non-rival and non-excludable) experiential good, with increasing benefits, important externalities, and a high intrinsic value (usefulness) (206). Indeed, the ultimate objective of providing health-related goods and services, i.e. health itself,[1] constitutes an intangible good that transcends traditional concepts of disease and well-being,[2] one that takes account of personal, technological, organizational, cultural, and social factors. Any comprehensive analysis of health-related issues must consider the close relation between healthiness and health. Thus, health-related services may be conceived in terms of "the set of agents working to promote, maintain, monitor, and evaluate people's varying states of health and disease" (209).

Second, closely allied to the foregoing, is the fact that delimiting the health sector in economic terms is far from easy. Although health-related activities have a heading in the international classification of economic activities (ISIC) (210), they have direct relationships and important synergies with (and spillovers to) other branches of activity, particularly those associated with providing resources and funds for the health system, social protection and social work, the pharmaceuticals market, and biomedical clusters, among other types of activity.

Considering the two above elements, attention must also be given to the social dimension of health as a special type of good. This suggests that efficiency in the sector is not merely a goal for its own sake, but rather an instrument for attaining a more equitable and just delivery of services. Indeed, the literature on social inequalities in health, the so-called social gradient in health,[3] confirms the exis-

1 - The World Health Organization (WHO) construes health as: "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity." (207).

2 - In a seminal piece of benchmark research, Parsons defined health as: "the state of optimum capacity of an individual for the effective performance of the roles and tasks for which he has been socialized" (208).

3 - Based on the first research studies, conducted in the United Kingdom's health system by Townsend *et al.* (211), it has emerged that the

tence of a wide range of technological, social, and economic inequalities in health[4] among the populations of many countries. This is the case despite the persisting objective of free and universal health care systems. In light of the great social importance of health, efforts to probe the causes of health inequalities must continue, particularly given the evidence that improved efficiency from health innovations (and specifically from eHealth) serves as a powerful instrument, not only for improving people's health status, but also for making the delivery of health services more equitable.

Finally, though there is a growing abundance of studies on health, and specifically on health sectors, there are still few research projects involved in obtaining primary data (213, 214, 215) that investigate the innovative sources of efficiency in the sector (176), and specifically that focus on eHealth and on how eHealth can affect the principal determinants of health inequalities (22, 177). Addressing this gap is one of the main objectives of the research which we now conclude.

## eHealth and public policy: toward greater institutional support

Innovation –the deliberate application of knowledge and technology to develop new and better services, processes, and organizational change (216) – is one of the principal sources of productivity and efficiency in the delivery of health services in the new information society. The processes of innovation in health-related activities, especially those associated with eHealth, tend to have a broad set of common characteristics that can be summarized based on the following elements:

1. Greater coordination of work processes;
2. Greater information flow between health professionals and users;
3. Transformation of professional roles and tasks;
4. The need for training both health professionals and health system users;
5. Greater autonomy and flexibility for health professionals and users;
6. The creation of new services that overcome the spatial and temporal constraints that encumber health centers;
7. Economic and funding constraints that affect the sustainability of projects;
8. The need to establish new methods for managing and organizing the new services that are being created; and
9. The difficulties entailed in the technological integration of these initiatives, both in terms of privacy and security and in regard to the culture of the stakeholders.

In light of these common characteristics, an analysis was conducted to identify the ways in which eHealth offers innovations in the field of health, with emphasis on the relation between technological, strategic, organizational, financial, social, and cultural factors (217, 218). The analysis included an examination of elements that facilitate or limit innovative health practices – particularly in eHealth (219) – using a sampling of primary data selected based on the views of prominent stakeholders in public health systems in the American hemisphere, reflecting the realities in the sector's human resource management practices (220).

The main findings relating to eHealth innovation provide mixed evidence: some eHealth practices have already been broadly implemented in the American hemisphere, while others are in a more embryonic state.

causes of people's health status are not only a function of biological determinants and medical care, but can increasingly be explained by technological, economic, psychological, and behavioral factors related to their socioeconomic environment.

4 - Following the approach of Paula Braverman, one of the main researchers on this: "a health disparity/inequality is a particular type of difference in health (or in the most important influences on health that could potentially be shaped by policies); it is a difference in which disadvantaged social groups – such as the poor, racial/ethnic minorities, women, or other groups who have persistently experienced social disadvantage or discrimination – systematically experience worse health or greater health risks than more advantaged social groups." In fact, social inequalities in health are characterized by the fact that: (1) the differences are systematically between the more and less advantaged; and (2) public policy can change them (212).

Examples cited by over half of the countries in the sample include national health information system (HIS) strategies (cited by 84.2% of the countries), use of eLearning in training current (94.8%) and future (89.5%) professionals, teleradiology (89.5%), use of social media in health (73.9%), remote monitoring of patients (57.9%), mobile health (57.9%), and national electronic health record (EHR) systems (52.6%). Other practices, such as telepathology (42.1%), telehealth (36.8%), and the use of big data in health (31.6%), are also mentioned, but less frequently, with far fewer than half of the countries in the sample citing these.

The lack of institutional support in the form of policies or national strategies, in some cases more pronounced in percentage terms than figures on use, may explain disparities in the use of different eHealth practices. For example, only 61.1% of countries in the sample have national eHealth policies or strategies, clearly a lower percentage than the 77.8% of countries in the Region that report having a national policy or strategy for universal health coverage. If, as has been pointed out, eHealth provides a system, or set of practices, that reduces social inequalities in health, it is important for countries that do not have such national policies or strategies to move toward adopting them as quickly as possible.

Other eHealth practices show a similar pattern, in some cases with even larger disparities between usage levels and the presence of national policies or strategies. As already pointed out, for example, though 52.6% of countries in the sample have national electronic health record (EHR) systems, only 26.3% have specific legislation to support these systems. Indeed, the lack of legislation and the consequent lack of funding to develop and support EHR programs are cited as a very important or extremely important barrier to the development eHealth practices. The same is true for mobile health (mHealth) practices: although 52.9% of countries report using some form of mHealth, 73.7% of the countries have no entity to oversee mobile health regulation and to assure its quality, safety, and reliability, and even fewer perform evaluations of their public programs. Only 10.5% of countries in the sample conduct systematic evaluation of mobile health programs for which government provides incentives.

Lastly, there is clearly a lack of political and institutional backing for the use of social media (73.9% of the countries) and big data (31.6%) in health. Some 78.9% of the countries in the sample have no national policy or strategy on the use of social media in the health professions, while the percentage that does not regulate the use of big data in health is even higher (89.5%).

## eHealth and innovation: toward a new system of innovation

The diversity of practices and varying levels of adaptation indicated by these research findings suggest that the use of technology – specifically eHealth – to address health problems must take account of the complex set of interactions involving its explanatory dimensions (213). This conclusion is consistent with social research findings on technological innovation (and, in particular, with **Technology Assessment Models**, or TAMs) (221, 222, 223, 224, 225, 226, 227), which have confirmed, in recent years, that technological innovation is a complex system using trial and error, that takes on a disruptive function and that often proceeds in a non-linear fashion.

At present, technological innovation can be viewed as a learning process based on the productive application of knowledge, fed by both tacit knowledge and observable knowledge – a process whose explanatory aspects include a variety of internal dynamics within organizations, as well as influences elsewhere in the environment, and that emerges from a combination of both highly formalized and largely informal processes. It benefits from both competition and cooperation within/between organizations and institutions, and gives rise to radical technological changes, as well as small incremental improvements in existing technologies (229).

Given the organizational realities found throughout the many and widely varying health organizations, in which innovation is not highly formalized, technological innovation generally results from two conjunctions. The first is the assimilation of new knowledge and technologies from outside the organization; the second involves processes within the organization that typically are not highly formalized, and that give rise to incremental and continuous improvements rather than to radical changes in the stock of scientific and technical knowledge.

Thus, the development of eHealth innovations typically results from the cumulative value of specific and observable knowledge, as much as from the tacit knowledge people contribute during the course of their jobs. Accordingly, the nature of the organizational fabric means that technological innovation in the health field is a function as much of the characteristics of the surrounding environmental as of the specifics of inter-organizational innovative processes.

This has direct consequences in terms of the potential for endogenous generation of innovation, and with regard to the capacity to assimilate new technologies and knowledge from outside the organization. In short, a broad set of dimensions (a holistic model) transcending traditional temporally ordered sequences must be considered in order to ensure that eHealth has the desired effect on efficiency and equity within health organizations, as well as on social well-being.

eHealth practices, as a tool for innovation, facilitate the networking of health organizations (230). There are three main reasons for this. First, the use of eHealth stimulates innovative dynamics by helping to reduce obstacles and increasing the efficiency of interactions among those involved in innovation, both within and outside the organization. Second, eHealth alters the nature of innovations, making it possible to develop more sophisticated and interdependent processes. Third, given the complexity of the innovative processes brought about by eHealth, its use can be considered a sustainable competitive advantage only if the technology is integrated with the organization's resources and capacities.

Therefore, the availability of knowledge and of tangible and intangible resources, the way in which these are structured and managed, and the quality of the environment in which a health organization functions, together determine the outcome of technological innovation efforts. Accordingly, the innovative eHealth aspect of health organizations must be viewed from the perspective of internal and external determinants, as well as in relation to the consequences for the organization.

Whether the innovative dynamism is related to the sophistication of eHealth use within the organization must first be determined.[5] One could postulate that the use of eHealth by health organizations can increase the effectiveness of their management, operations, human resources practices, and outcomes, as well as their overall efficiency (232, 233, 234). Similarly, the use of eHealth may encourage cultural change within an organization, stimulating more innovative behavior.

The use of eHealth could also be expected to generate innovative dynamics within health organizations, inasmuch as innovation depends on generating knowledge, and given that this process is furthered by access to information and by the network effects of greater interaction with the environment (34). There is a clear and close relation between innovation and use of the Internet. Health organizations with more advanced equipment and more sophisticated Internet are also the most innovative (235, 236, 237). This is attributable not only to the fact that use of the Internet in an organization is, in itself, innovative, but also to the fact that it promotes greater participation and more effective integration in cooperative networks involved in collaborative innovative developments. This is typically the case for smaller health organizations and those in which increased connectivity can compensate for a lack of economic resources, and where there is no research and development plus innovation (R&D+i) department using cooperative networks for innovation.

With consolidation of the knowledge economy (237), innovative dynamism can be expected to go hand in hand with organizational change at health institutions, and with new human resources management practices. Technological innovation in regard to eHealth is also likely to be fostered by a form of organization based on processes and projects, with flexible work teams that can adapt to different lines of activity, formed around a less hierarchical, more objectives- and results-based approach to coordinating and supervising work (238, 239).

Other internal factors also affect the success of the technological innovation process. One of the most important is the availability of an R&D+i department (240).[6] The presence of such departments is

5 - Findings regarding the business environment confirm the existence of a close relation between intensive uses of information and communication technologies (ICTs) and the development of innovations using these technologies. For more information, see: (231).

6 - Findings on the business environment confirm that establishing formal structures for research, development, and innovation within firms is

a direct factor in generating innovation in health organizations. The economies of scale characteristic of these departments, which feature high fixed costs and tend to produce results in the medium term, go a long way toward explaining the differences between organizational segments. These economic factors suggest that there is a certain size threshold that must be crossed in order for an organization to establish its own R&D+i department. Although research can be important and can eventually lead to more sustainable competitive advantages, the front-end investment costs, the tendency to prioritize short-term yields, and common day-to-day pressures in many small and medium-sized health organizations generally inhibit formal, systematic research and innovation. Larger organizations are more likely to benefit from the endogenous generation of new knowledge, while technological innovation in smaller organizations, which are more isolated from scientific and innovational networks, depend heavily on support from the organization's immediate environment, and thus rely on network effects gained through cooperation.

If creativity and the development of individual talent are key to innovation in the knowledge economy, work can be expected to become increasingly self-programmable, allowing employees to continually reprogram themselves and develop new abilities and skills to meet new work responsibilities. Thus, ongoing learning by health professionals, and, particularly, ongoing customized training within health organizations, becomes a decisive element for improving the stock of technical and scientific knowledge, which in turn will foster the development of technological innovations relating to eHealth (172). At the same time, eLearning for health professionals, as a means of continually recycling knowledge and learning over a professional lifetime, is of obvious importance (173) .

The positive effects of eHealth on innovation within health organizations are traceable to this entire set of internal factors. As indicated earlier, however, a system of innovation is not based merely on organizational activities designed to develop new products, services, or processes; the capacity for innovation is also affected by the structure of the provider-user chain and by the quality of the organization's interactions with its environment – most importantly in the form of interactions between health professionals and patients. The network effects of using eHealth as part of technological innovation would appear to be significant, particularly where the development of more complex innovations is involved. Thus, how a health organization interacts with its suppliers and patients directly affects its ability to innovate and, consequently, its outcomes (176).

eHealth has encouraged greater interaction throughout the health value chain, fostering a work environment conducive to innovation, based on continuous improvement. One can therefore conclude that patient-oriented innovations and the overall efficiency of the value chain are particularly important to the success of technological innovation. eHealth facilitates the development of network-oriented approaches, not only internally, but also with respect to interactions between an organization, its suppliers, and the institutions with which it collaborates and shares interests. Thus, cooperation throughout the provider-patient chain, in efforts to innovate, serves as a means of seeking more efficient production, improved products or services, technological complementarity, greater flexibility in production, increased information on patients' needs, and better strategies to provide differentiated ways of responding more rapidly to changes in the demand for health services.

All of these approaches are critical for competitiveness in the knowledge economy. Their success, however, requires shared objectives and close contact among all members of the chain. The use of eHealth constitutes a model for more frequent, rapid, and efficient interaction between health professionals and the external agents closest to the health organization.

Given that technological innovation based on the use of eHealth facilitates the development of a more complex form of competitiveness, with greater potential for differentiation, the most innovative health organizations can be expected to develop more sophisticated strategies for competing – strategies that differ from the traditional model based on the cost of the services provided – and will therefore be more efficient and effective. The new competitiveness models for health organizations harmonize more closely with strategies for generating value in the knowledge economy. Not only does

a powerful stimulus for ongoing interactive innovative processes, and fosters ever more complex innovations. For more information see (240).

the use of eHealth make the innovation process more dynamic; it also makes it more interactive and more interdependent. Thus, the most competitive health organizations regard continuous innovation as crucial, since it allows them to develop competitiveness strategies based on advanced technological services and on continuously improving the quality of services provided to patients and other users. The ongoing development of technological innovations thus strengthens a health organization's position, improving the efficiency and effectiveness with which it delivers services (241).

In light of the potential effects of innovation in eHealth on value creation and on the outcomes of health organizations, an aggregate model that includes both the set of systemic eHealth practices and their various explanatory dimensions needs to be developed. It is in this context that PAHO developed and adapted the telemedicine "hat" (3). The main advantage of this model is that it adopts a holistic view of eHealth-related technological innovation – one that includes a range of non-uniform, non-sequential explanatory dimensions that go beyond technology (including personal, training, economic, organizational, social, cultural, and institutional factors). Moreover, the implementation of eHealth (and telemedicine) is multidimensional, based on complex, interrelated factors, with explanatory dimensions that include a variety of types of interactions (Figure 26).

Components of the eHealth "hat" include: first, the **monitoring, evaluation, and optimization phase**, in which the results of implementation are elucidated. ICTs should be incorporated in the health sector once a specific need has been identified, and after confirming the technology's value in terms of its effectiveness, safety, cost- effectiveness, and ethical and social impacts, while taking account of the social and political context in which eHealth services are being contemplated. Deficiencies in the planning and design of eHealth can result in a failure to achieve the desired outcomes. One of the leading causes of failure, seen in numerous eHealth projects, is a focus on the technology as an end in itself, rather than on its role in meeting the specific needs of the population or health system.

This layer or phase uses indicators (monitoring, evaluation, and optimization) to measure the practices at issue – metrics of medical, economic, and social outcomes, and of the subindicators which, by arithmetic decomposition, are associated with them, such as: the number of consultations, referrals, and patients served; degree of user satisfaction; and findings on the cost-effectiveness of the practice. Analysis of these factors should be based on a series of measures such as: analysis of the response capacity of ICTs (advantages and disadvantages of ICTs in addressing the problems posed) as compared with customary care practices; an evaluation of safety factors (detrimental effects of the practice such as errors in diagnosis, or effects on data privacy and confidentiality); etc.

Second is the **eHealth service development phase**, in which the eHealth "hat" takes account of explanatory factors of eHealth that are internal to the health organization. eHealth practices tend to be complex, and can affect all phases of health care, impacting the role of professionals and the form of physician-physician and physician-patient/user interaction. Ethical and legal issues also come into play (professional responsibility for decisions, privacy of data, information security, and informed consent, to name but a few). This layer includes elements of finance, human resources, organizational issues, technology, and infrastructure, as well as legal and institutional aspects involved in implementing eHealth within an organization.

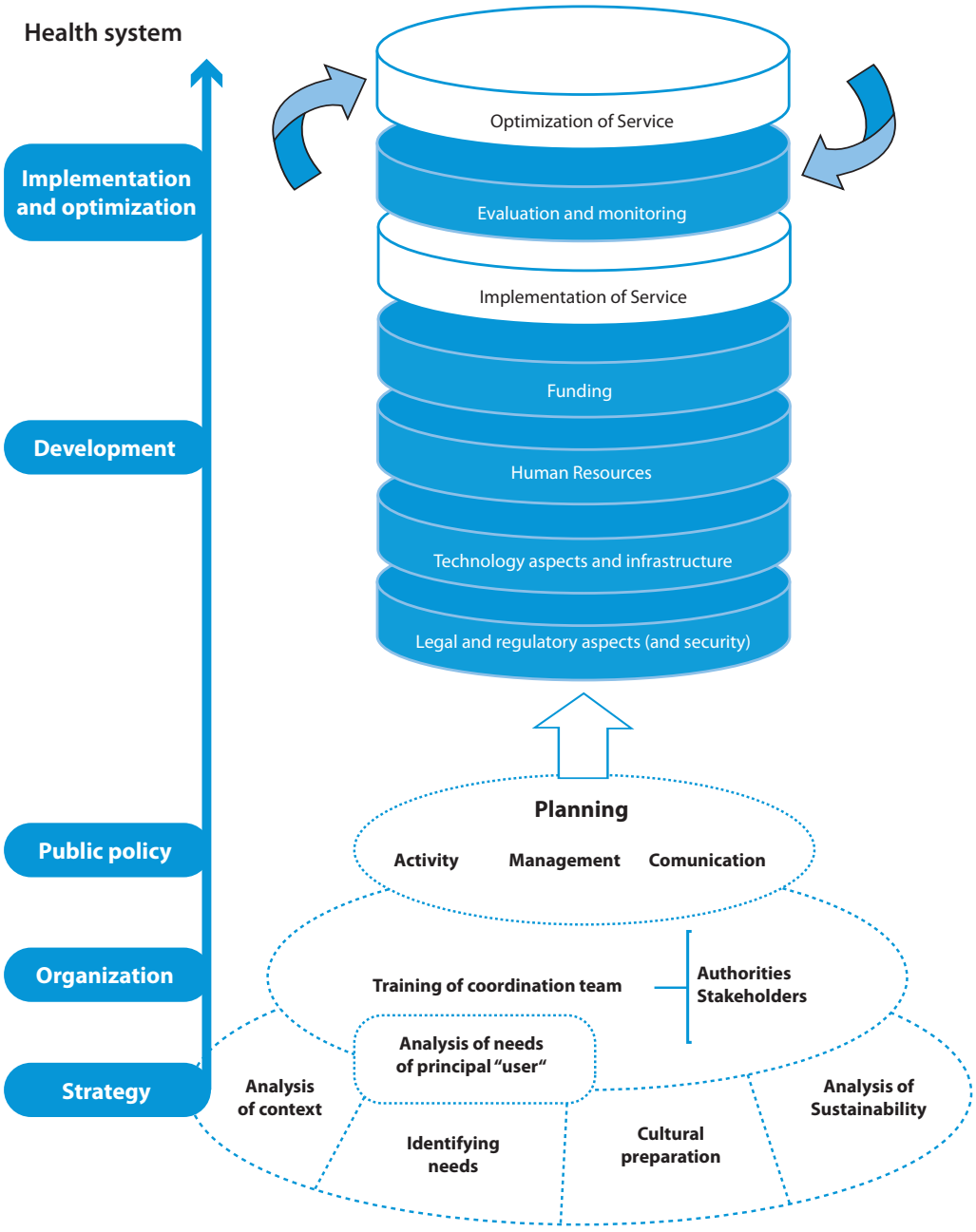
Such considerations include the financial costs of the practice; the personnel and teams required; the relevant driving factors and technological limitations, particularly usability and safety; and the legal and institutional motivating forces and barriers affecting implementation of the practice, including its medical and clinical effectiveness. In order to analyze these aspects, a series of factors should be considered and assessed, such as those involving ethical and legal issues, which entail important principles and vary from one country to another.

In addition to the tubular layers of the eHealth "hat," the model includes a series of concentric circles at the base, which are the true determinants of competitiveness: the set of factors, institutions, and policies responsible for the efficiency and equity that eHealth provides. The first layer includes the **basic elements related to public policy**: planning, management, and communication of the technology within

public health systems. In this layer, various factors are analyzed: the potential advantages and disadvantages of eHealth as a response to health needs; the needs themselves; and resources and organizational models (characteristics of the supply and demand for health services, in specific locations, to address a population's various health needs or the needs of the health organization).

The second layer includes the **technological elements directly linked to the organization**: work teams, training, organizational structure, rewards and incentives, and relations with immediate external agents, among others. For analysis of these aspects, a series of factors must be considered, e.g., the availability of human resources (selection and training of professionals for managing the new eHealth services and the importance of buy-in by professional stakeholders from the initial design and evaluation stages).

**Figure 26.** eHealth implementation model




Source: Novillo-Ortiz, D., (ed.), Saigí, F.; Torrent, J. *et al.* (2016). Framework for the Implementation of a Telemedicine Service. Washington D.C.: Pan American Health Organization, PAHO.

The third and final (outer) concentric layer incorporates the other elements underlying the competitiveness of eHealth, specifically those **associated with the strategy for applying the technology:** analysis of socioeconomic context, user needs, cultural realities, and the sustainability of the technology and of the innovative eHealth system within the health system. In addition, the selection, prioritization, and design of eHealth activities require detailed analysis of the context in which they are to be implemented, in order to identify activities that contribute the greatest value. This analysis will be based on the assessment of factors related to health needs and the characteristics of the conventional services designed to serve those needs.

Such analysis will require a number of measures to assess the magnitude of the health problems and needs (a description of the geographical, social, epidemiological, and demographic characteristics of the situation; the need and opportunity for developing new health services; issues relating to reorganization or complementation through eHealth); an inventory of resources in the area (type and quantity of resources available for addressing the problem); the evolution of care activity related to the services or specialties to be provided through eHealth – number of consultations; amount of income; number of transfers to public and private reference hospitals); description of conventional care processes and flows (description of the preexisting organizational model for delivery of services; description of health and non-health resources used; access; satisfaction; health outcomes); availability of infrastructure (equipment, communications, spaces) and their continuity (so that implementation does not remain in the pilot stage); etc. The result of this analysis should provide information for making decisions on prioritizing and selecting the eHealth program, application, or service.

The scientific literature may provide extensive evidence on the value of a given eHealth service from studies conducted in various places; however, even when scientific evidence is strong, implementation in a new context should be preceded by analyzing the features of the health system from a sociocultural, as well as an ethical and legal, perspective. In assessing the potential implementation of eHealth based on available scientific evidence, two issues should be considered. First, the results of complex health interventions, such as those involving eHealth, in which both equipment and professional personnel play a role, are not directly transferable to situations involving different teams, systems, and professionals attempting to replicate an intervention that occurred elsewhere. Second, most published scientific studies on eHealth are poorly designed, with limited control for bias, small sample sizes, a focus limited to specific technological practices, outcome measures that lack relevance, use of unvalidated measurement instruments, and only short-term monitoring.

Efforts must therefore be made to research the effects of introducing eHealth in health organizations, identifying the changes that are generated through interaction of the various explanatory dimensions with the technology introduced. Empirical evidence from studying and analyzing changes, rather than a *priori* design of formal implementation models, will make it possible to determine the factors that lead to success in expanding eHealth and in addressing the challenges faced by all health systems.

## eHealth and social health inequality: removing barriers and adopting specific solutions

The particular nature of health activities raises social questions that go well beyond concerns about the sustainability of their efficiency models. The links between eHealth and innovation practices have already been established, as well as the ability of eHealth to improve the efficiency of health systems; and the effects of eHealth on the well-being of populations have been analyzed, particularly with regard to closing the social gap in health.

The scientific literature on the determinants of health has confirmed[7] that the more disadvantaged socioeconomic strata continue to have higher mortality rates and a higher incidence of a broad

7 - For a review of this literature see (242).

range of health problems than do the more advantaged socioeconomic strata. Despite the implementation of free universal care in the health systems of many countries, socioeconomic inequalities in health have remained constant or worsened throughout the 20th century and in the first part of the 21st century (especially during the most recent global economic crisis).[8]

Available evidence confirms that solutions to the problems of health and inequality lie outside, as well as within, the health system. Thus, socioeconomic health inequalities cannot be reduced to the internal dynamics of the health system:[9] the information society requires that there be greater coordination between health policies, economic growth, and social welfare if these inequalities are to be effectively addressed. Improving the status of the most disadvantaged population groups, and taking action on all socioeconomic aspects of health, will help in reducing social health inequalities.

Moreover, a new element affecting social health inequalities has emerged in recent years – one which, though it adds complexity, also holds out the prospect of new solutions. The transition of health systems toward the information society is characterized by: (a)

a. turning the system's users into consumers or clients, giving them a more autonomous and proactive role in decisions that affect curative and preventive health measures (102); and

b. (b) changing the way in which medical practice is affected by scientific and technical networks, involving universities and research centers, government agencies, and industry (250), thus constituting a powerful instrument for increasing efficiency, improving health, and reducing social inequalities.

With the consolidation of technology, knowledge, and innovation as the three new basic dimensions of health systems, their interrelation with the corporate structure and with the consumption of health services is driving health sector activity on the demand side, while altering the experiences and the power of health system stakeholders (251, 252). Thus, a new scheme for health activity and consumption is taking shape, along with new social uses of digital health (eHealth). This report, throughout, has analyzed how new forms of consumption and social uses of eHealth affect social health inequalities.

The results of the 2015 Third Global Survey on eHealth, covering the Region of the Americas, revealed that 77.8% of the countries have a national policy or strategy for universal health coverage; however, only 52.6% of countries reported that their national policy or strategy specifically uses eHealth to further universal health coverage, and only 61.1% of the countries have a national eHealth policy or strategy. These findings point to the need for countries to more clearly incorporate eHealth in their national strategies for universal health coverage (Figure 27).

A more detailed analysis of the income brackets (high, middle-high, and middle-low) of the sample countries yields a range of recommendations, varying according to the prevalence of social health inequalities. The data obtained indicate that 83% of the high-income countries, 63.6% of the middle-high income countries, and 100% of the middle-low income countries have universal health coverage systems, and 50% of the high-income countries, 54.5% of the middle-high income countries, and 50% of the middle-low income countries use ICTs directly in their eHealth programs. Finally, 83% of the high-income countries, 36.4% of the middle-high income countries, and 100% of the middle-low income countries have national eHealth strategies.

8 - Many research studies demonstrate this. For example, research on a group of European countries confirms greater mortality among manual workers than among non-manual workers (243), and a more recent study shows a relation between educational level and mortality (with mortality rate inversely correlated to educational level) (244). In Spain, which provides an excellent case for observation, given the severity of the financial crisis, evidence has also been found relating type of work and educational level with mortality (245,246, 247). These social inequalities in health seem to have worsened markedly during the economic crisis, especially in those countries where the severity of the recession has been greatest (248).

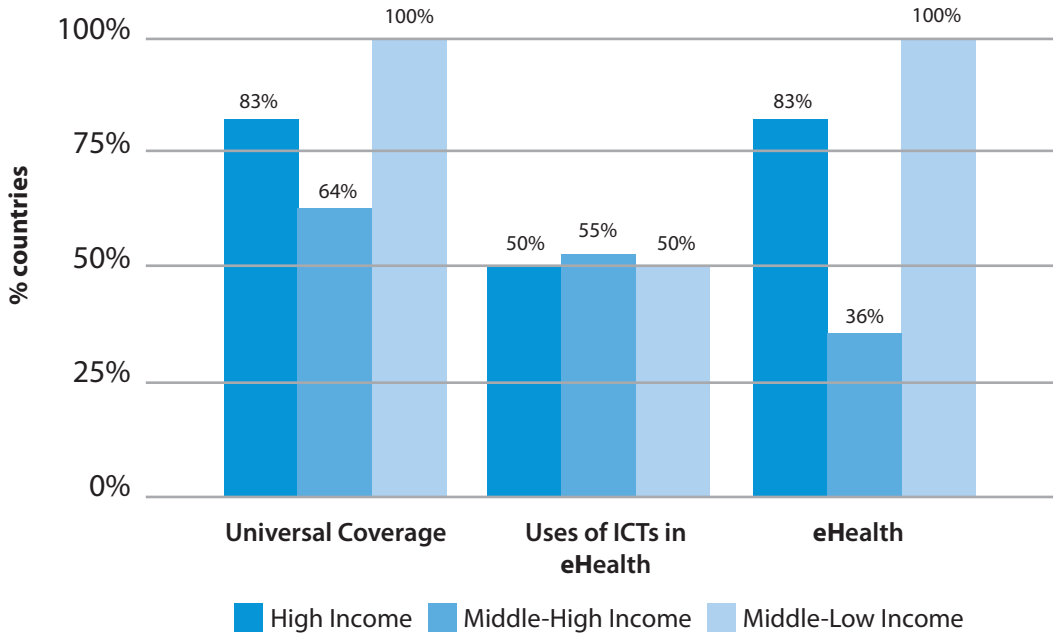
9 - In fact, a number of studies analyzing the determinants of the demand for health services in a wide sample of countries conclude that organizational, institutional, and cultural factors are primary causes of health differences between countries (248). Also see the information available from the European project SHARE (www.share-project.org).

All of the high-income countries that have a universal health coverage strategy have also implemented eHealth strategies as part of their efforts. The same holds true for the middle-low income countries, though the frequency with which ICTs are used in eHealth strategies is lower (around 50%). This finding is significant with regard to improving social health inequalities, in that the middle-low income countries clearly have fewer tools than the high-income countries for remedying inequalities overall, not just in the use of ICTs. Thus, these countries need to use ICTs in eHealth when implementing policies to overcome social inequalities.

Most of the middle-high income countries in the sample face a dual challenge. First, approximately half of these countries have not yet incorporated eHealth as a basic strategy or policy for ensuring universal health coverage. Second, much remains to be accomplished in regard to using ICTs as part of a national eHealth strategy.

An analysis of the relation between national strategies/policies on universal health coverage and those on the use of ICTs in eHealth indicates that: (1) the middle-low income countries should move more decisively to implement already-defined eHealth strategies/policies; and (2) the middle-high income countries should advance on two fronts: consolidating their national eHealth policies/strategies, and stepping up implementation of ICTs in eHealth..

**Figure 27.** National strategies/policies on universal health coverage, and policies on the use of ICTs in eHealth, by income bracket. Base: 19 countries




Source: World Health Organization (WHO)

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