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2015 Top Markets Report **Health IT**

A Market Assessment Tool for U.S. Exporters

July 2015



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Executive Summary and Key Findings

Health Information Technology (Health IT) is a dynamic, multifaceted, and evolving sector that has the opportunity to dramatically influence delivery, efficiency, and cost for healthcare markets worldwide. Health IT can be best described as the use of a suite of products and services designed to improve and coordinate patient care, address growing health costs, and confront the long-term burden of disease through the use of technology. Countries at all levels of development and sophistication in the healthcare and information and communications technology (ICT) sectors can derive benefits from implementing Health IT in their market, and it is this widespread potential for implementation that makes Health IT an attractive opportunity for increased exports by a wide variety of U.S. companies.

This Report is designed to inform industry stakeholders of key trends, challenges, and opportunities in foreign markets for Health IT products and services. The analyses and conclusions in this report are focused on top market prospects over the period extending from 2015-2018. Health IT (and healthcare more generally) is changing at a rapid pace; therefore the observations and ranking of priority markets will likely require reassessment over time.

Key Findings

One of the interesting features of the sector is the tremendous opportunity for developed markets to learn from developing countries (and vice versa) about innovative diagnostic and treatment delivery options using Health IT, as technologies, disease states, resource capabilities and patient demands can vary widely between countries. In addition, the intersection of health and ICT offers opportunities for the development of technologies that may cause significant disruption to the healthcare sector, often based on practices found in other industries.

While Low- and Middle-Income Countries (LMICs) rank primarily in the lower half of the market rankings for this report, they offer a variety of opportunities to test emerging Health IT models. This partly reflects the lack of human and financial resources available or invested in health and ICT. However, LMIC countries also

represent medium- to high-risk, high reward opportunities for companies in the Health IT sector, particularly those with breakthrough technologies.

This is so because: 1) healthcare systems in LMIC countries are not limited by legacy paper or electronic systems; 2) LMIC governments often feature Health IT (particularly mobile health and telehealth) in their healthcare strategic plans to improve services and increase coverage and deployment; and 3) the burden of disease (both communicable and chronic) is often high, thus generating immediate demand for products and services. By establishing proof of concept in LMICs, companies displaying disruptive technologies, services, or applications could use this route as a platform to develop export opportunities for other markets. The eventual shift away from pilot studies to large-scale implementation of Health IT in LMICs will further support market growth.

For purposes of this report, healthcare expenditures are being used as a proxy for Health IT spending. Therefore, countries with high health spending per capita tend to appear near the top of the rankings. However, this parameter alone did not guarantee a high ranking, and does not necessarily indicate whether the country has significantly invested (or plans to invest) in Health IT technologies or infrastructure.

Figure 1: Projected Top Markets for Health IT Exports (2015-2018)

1.	Japan	11.	Singapore
2.	Switzerland	12.	Australia
3.	Netherlands	13.	Canada
4.	Germany	14.	Iceland
5.	Finland	15.	Belgium
6.	Sweden	16.	France
7.	Norway	17.	United Kingdom
8.	Denmark	18.	New Zealand
9.	Austria	19.	Spain
10.	South Korea	20.	Ireland

A high rating for physician density (used as a proxy for presence of healthcare professionals) in a country may actually be contraindicative as to whether the country is a good Health IT candidate. Countries with fewer physicians may receive greater relative benefits from Health IT investment. In addition, the physician metric used does not provide indications as to the distribution of physicians in the country, as many might be concentrated in urban areas, leaving rural areas more sparsely serviced.

Using existing measures of mobile phone usage, such as penetration rates or number of subscribers, in isolation does not provide a complete portrayal of a market's mobile health/telehealth potential. For instance, the penetration rate of a given market is often measured based on sales of SIM (Subscriber Identity Module) cards. In many economies, a single consumer will often have 2-4 SIM cards at a given time, with only one card being active. Some consumers have multiple mobile devices for different purposes, such as one device for personal use and the other for professional use.

In addition, consumers in most countries worldwide utilize prepaid mobile phone subscription plans, which often limit the amount of data consumers can access per billing cycle. With limited data available under prepaid plans, consumers are less likely to purchase and adopt high data use applications and services. While the pervasiveness of mobile phones would appear to be a prerequisite for analyzing the potential for mobile health and telehealth service delivery, these figures need to be viewed in association with other measures to accurately assess each market.

Health specific metrics (physician density, spending on health) and ICT specific metrics (mobile subscriptions, Internet subscriptions, type of ICT service) were weighted equally in the Report's methodology. Adjusting the weighting to favor health metrics over ICT metrics (or vice versa) will have an impact on the rankings. There are sensible reasons to more heavily weight the presence of ICT infrastructure (since health data, images and the like are but one set of information sharable over an ICT network/system), but since treatment of patients is often cited as one of the reasons for instituting advanced ICT infrastructure, an equal weighting also makes sense.

Health IT technologies and delivery systems can help citizens both in urban and rural areas. Although healthcare professionals are often concentrated in

urban areas, leading policymakers to primarily focus on healthcare delivery to rural communities (including mobile and telehealth services), many countries also have an insufficient number of well-stocked hospitals and clinics, as well as adequately trained healthcare workers in urban areas. Therefore, U.S. companies looking to invest in most foreign countries should consider making these technologies and applications available to both urban and rural populations, as urban consumers can also benefit greatly from the introduction of mobile health and telehealth services.

Health IT Sector Overview

Health Information Technology (Health IT) is a relatively new and still developing commercial sector. Current challenges for entering Health IT markets overseas primarily stem from the lack of consensus around both what comprises Health IT, and how best to support market development for Health IT products and services. This report will cover some of the key parameters indicating potential export opportunities for the sector - focusing in particular on the mobile health and telehealth subsectors - and will measure the relative opportunities for business in the sector across 80 countries.

Export opportunities exist in many Health IT subsectors, including health services (hospitals, treatment protocols, clinical trials, administration of claims and supplies), data-related services and products (storage, analytics), ICT products (routers, computers, tablets, mobile phones), medical devices (data and images gathered and stored by products such as magnetic resonance imagery—MRI—machines and computed tomography—CT—scanners can help patient care when shared), education (training of Health IT professionals) and software (electronic health records, clinical decision software).

Cross-cutting issues that affect multiple industries also impact Health IT, including standards, availability of high-speed Internet, reliable power supplies, and the privacy and security of information. This diversity of sectors offers companies from a wide variety of backgrounds opportunities to make a meaningful (and possibly disruptive) impact on the scope and direction of the Health IT sector writ large, as well as creating new and distinctive policy questions.

The scope of this report will primarily focus on the mobile health and telehealth subsectors of Health IT. Other recognized Health IT subsectors not discussed at

length in this report include electronic health records (EHRs), tracking and detection of counterfeit pharmaceuticals, disease surveillance, drug monitoring, and wearable technologies. While there is some overlap among them, each Health IT subsector is characterized by separate sets of challenges and opportunities from those faced by the mobile health and telehealth sectors.

While policies and applications in other Health IT subsectors are either more established (such as EHRs) or still at a comparatively nascent stage (such as wearable technologies) and therefore also present significant export opportunities, mobile health and telehealth are the focus of this report because they have gained an increasing foothold internationally and are predicted to grow substantially in market size and importance in the near future.

Mobile health and telehealth are also appealing Health IT subsectors to examine for export promotion purposes because they can be adopted widely (while being tailored to individual markets) during this study's 3-year timeframe. In contrast, more sophisticated technologies, such as EHRs, typically require more time to implement, and demand resources often unavailable in less developed countries. Since mobile phones and Internet-based technologies are widely available, the mobile health and telehealth subsectors of Health IT present sizable opportunities for business on a global scale.

In 2012, PwC estimated that mobile health global revenue will rise from \$4.5 billion in 2013 to \$23 billion in 2017.¹ The lack of consensus among governments regarding best practices and policies for mobile health and telehealth also presents a role for the public and private sectors to have a meaningful impact on policy development that will drive future export growth in these subsectors.

Mobile health and telehealth as highlighted subsectors with promising growth in 2-3 years

Mobile health is medical health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants and other wireless devices.² Global mobile phone use has increased 25 percent since 2010 but is expected to increase worldwide at a low rate in the future because of market saturation.³ A large percentage of the world's population has access to a mobile phone; however, it is important to distinguish between the

number of existing mobile phone subscriptions (6.9 billion as of May 2014),⁴ and the number of unique mobile phone users (approximately 4.5 billion⁵). It is estimated that 450 million people worldwide live in places still out of reach of mobile phone service.⁶

As mobile health applications continue to be a priority for research and development, technologies and affordability continues to improve at a rapid rate. Additionally, many countries are upgrading mobile network services, particularly those supported by large telecommunications companies. With 3G technologies readily available, and 4G and 5G infrastructure upgrades being announced,⁷ the delivery capabilities of mobile platforms for increasingly sophisticated healthcare solutions should continue to improve. While increasing use of smartphones will drive mobile health use globally, developers have also taken advantage of more basic technical capabilities, such as Short Message Service (SMS) for sending text messages, to develop health technologies that can be implemented worldwide, particularly in low- and middle-income countries. Therefore, opportunities exist for mobile health entry into countries at all stages of development.

Telehealth services include surveillance, health promotion and public health functions like e-prescribing. It is broader in definition than telemedicine, as telehealth includes computer-assisted telecommunications to support management, surveillance, literature and access to medical knowledge.⁸ Telehealth products include video conferencing, Internet-based systems, and communications systems. Currently, telehealth is used primarily by healthcare facilities such as hospitals and clinics, rather than purchased directly by individual consumers, and serves as a way to virtually connect providers with patients, or providers with colleagues.

The market for telehealth is expected to grow 17.7 percent globally between now and 2019, to \$43 billion.⁹ While telehealth in the hospital setting has accounted for the majority of the market to date (60 percent in 2013), new growth will be primarily in reaching out to individuals in their homes or in outpatient settings, estimated to reach 55 percent market share by 2019.¹⁰

The G7/G8 started supporting telehealth as early as 1995 by outlining strategies to create networks for international information exchange and Internet connectivity.¹¹ While deployment of telehealth

remains a priority,¹² coordinated efforts towards universal standards and policies have been slow, and most progress has been made at the country level, particularly by countries outside of the G8. Though the increasing popularity of mobile health may eventually constrain the size of the telehealth market, telehealth should continue to grow, particularly in countries with a large rural population, or an unequal geographic distribution between trained medical professionals and the general population.

Both mobile health and telehealth have the potential to revolutionize the way that health care is provided to populations. As the global burden of disease, primarily non-communicable diseases, continues to grow and populations age, the costs of healthcare globally are expected to continue rising. Mobile health and telehealth solutions, while initially more costly to implement, are integral tools to reducing healthcare costs, increasing system efficiencies, and improving treatment.

Mobile health and telehealth technologies can be implemented in both rural and urban settings, expanding the reach of healthcare services to a larger percentage of the population, and have been shown to improve efficiency and continuity of care, making them attractive opportunities for preventive and personalized medicine and in-home care. These technologies can also serve to effectively connect a relatively small trained healthcare workforce to large populations, compensating for a lack of trained local personnel.

For instance, mobile health and telehealth can make it easier for patients to receive care from specialists, particularly for rare conditions, without the need to physically travel to the specialist's office, and for a mobility-challenged individual to better monitor a chronic condition from their home and be connected to healthcare professionals should the need for intervention arise. In addition, these technologies can allow for improved treatment for patients in remote areas, or if healthcare specialists are highly concentrated in major metropolitan areas or across long distances (within or between countries).

New ICT technologies under development and being deployed have an opportunity to further reshape and disrupt the delivery of healthcare. In addition, the Health IT market responds to influences and possible disruptions from many other sectors beyond ICT and healthcare, including energy, education, finance,

transportation, software, and global supply chains. Consequently, Health IT can be found in many forms and has become part of many initiatives. Therefore, diverse types of companies offer products or services relevant to the Health IT sector, not just those coming from a healthcare background.

System/Infrastructure Challenges Facing Health IT Sector

In reviewing the myriad of challenges facing wider application and acceptance of technologies under the broad Health IT umbrella, it's important to differentiate those that impact the entire sector from those primarily affecting mobile health and telehealth (although several have an impact on both). For clarity, those challenges specifically affecting mobile health and telehealth will be listed separately from those affecting Health IT as a whole.

Health IT products and services can address many demonstrated needs, but resources and priorities in many countries need to be closely aligned to promote widespread adoption and use. Development of a global telehealth infrastructure, and the ICT network to support this system, became one of the priorities of the G7 in 1995.¹³ Since then, international emphasis on use of ICT for health care has increased. For example, WHO and ITU published the "National eHealth Strategy Toolkit" in 2012 to help countries in their development of Health IT policies,¹⁴ though little is currently known on how widely the Toolkit has been used and the success countries have had using the Toolkit to implement these policies.

One of the Health IT sector's interesting features is that countries at all levels of technological and healthcare system sophistication can benefit from the deployment of Health IT products, services, and applications. In fact, many countries around the world (particularly LMICs) can obtain significant benefits from the introduction and large-scale rollout of relatively simple ICT technologies, such as text messaging patients encouraging them to take their medicines or to visit a physician. Tailoring the products and services offered to a country, region, or population will significantly increase the probability that the company's investment will provide the intended benefits and/or be profitable.

Policy Environment for Health IT

In the global marketplace, companies face challenges resulting from antiquated, inadequate or nonexistent

policies or regulations, such as data exchange and data storage provisions for health information (discussed further below). These can impact Health IT, mobile health and/or telehealth, and can complicate a company's decision-making process regarding which markets to enter with their products and services. Further exacerbating this issue is the fact that policy and regulatory gaps/inadequacies often differ from country to country, meaning that the approach to address these gaps will need to be tailored to the specific country. Until these challenges are addressed, the rollout of Health IT in many countries will likely remain a gradual process.

Additionally, policies are often promulgated at a national level but implemented on a state or regional level, which can result in a fragmented system that does not support widespread adoption and integrated use of Health IT. As the rate of Health IT development continues to outpace regulation and policy change, maintaining supportive, integrated policies and regulations for Health IT will continue to be a challenge well into the future.

Specific policy barriers that the Health IT industry faces include:

Preferential Procurement Processes and Budgetary Limitations for New Technologies

Lack of procedural transparency and preferential treatment for domestic products in government procurement policies affect many exporting sectors in the United States, but these issues are particularly acute in the health sector, as many countries operate wholly or largely government-run healthcare systems, with the public sector usually playing a major procurement role. Furthermore, in light of fiscal pressures, governments may not have the resources and/or appropriate incentives to support the introduction of new technologies, such as those offered by mobile health and telehealth vendors and consortia (See below regarding reimbursement).

In some countries, private sector and academic health facilities have sizable latitude to purchase new technologies and systems, but lack of transparency in bidding processes, and preferences for local competitors, are issues U.S. companies need to be aware of as they seek to enter overseas markets. Limitations on funding are causing government payers and private sector insurers to intensely examine both the financial argument for introducing Health IT-based

applications, as well as the medical rationale for performing those services. All stakeholders want proof that Health IT reduces healthcare costs and improves health outcomes, and instituting technology and applications that do not demonstrate improved care at lower cost will have a hard time obtaining approval from insurers or governments. Most mobile health and telehealth applications using phones, tablets and other technologies will first need to demonstrate a worthwhile care/cost tradeoff before receiving reimbursement consideration. It is possible that governments will eventually develop the political will to support these deployments as best practices are identified and the financial benefits behind use of Health IT are realized.

Medical Liability and Licensure Concerns

If Health IT medical procedures cross national boundaries, then the regulations between jurisdictions in many areas will also have to be reviewed and harmonized. Legal requirements within (and between) countries will need to be reviewed to determine whether a country legally allows remote care of citizens by physicians, regardless of whether the doctor and patient are in the same jurisdiction, or different ones. Other legal issues related to Health IT include allowing cross-border medical licensure of healthcare professionals offering treatment or diagnosis from a remote location; and medical liability, both regarding inaccurate or faulty treatment and diagnosis using mobile health/telehealth, as well as where and how one can seek legal redress. Companies need to be aware of these differences in rules between countries, and between jurisdictions within countries.

Data Privacy

Privacy protections will likely need to be developed to reassure consumers of the quality of Health IT products and services. Questions remain as to how best to protect patient privacy and ensure security of Health IT, and it's important to note that these questions are inextricably intertwined with broader questions of data privacy, security and storage affecting many industries. Health is just one sector impacted by policy decisions made on these issues, and since the implications of improper, inaccurate and/or illegal access, application, or use of health information can be extremely damaging to patients, special handling and procedures in these areas may be needed for the health sector. Consensus around these issues has not yet been reached, although the United States and the EU are discussing some of the broader

issues as part of the Transatlantic Trade and Investment Partnership (T-TIP) negotiations.

Universally Accepted Standards

As with many other sectors, adoption of internationally agreed-upon standards would facilitate generation of a global system for Health IT. Such discussions are ongoing in international fora such as the International Organization for Standardization (ISO), Health Level 7 (HL7), Integrating the Healthcare Enterprise (IHE), and the Institute of Electrical and Electronics Engineers (IEEE), but consensus on the appropriate standards has not been reached in many areas, and the standards approval process itself can purposefully move rather deliberately. Health IT's intersection of ICT and health also broadens the number of standards-setting bodies and committees who need to be involved in the standards development process, which can also elongate the consensus development process. The absence of consistent standards, or the need by international standards bodies to carefully choose between competing standards, has hindered the development of the Health IT sector as well.

IT Infrastructure

Besides the issues referenced above relating to data privacy, storage, and exchange, the structure of the physical network used to transport the information is another area of possible policy challenges. A number of mobile application developers and smaller enterprises are pushing for use of more open systems and architecture in Health IT to encourage data sharing and increased system integration (often referred to by the industry term "interoperability"). However, it is still unclear how open architecture and data sharing can adequately accommodate intellectual property protections and privacy concerns.

Most experts agree that limiting the depth and breadth of proprietary databases and exchange protocols (just to name two examples) to promote "interoperability" is desirable and necessary to permit Health IT to attain its optimal impact, but a significant number of Health IT vendors have not publicly advocated for an open architecture approach. This resistance may be partly driven by the need of some vendors to develop a "business case" for use of their Health IT solution (discussed further below). From an exporter perspective, this could lead to greater use of foreign markets as a "proof of concept" for management and collection of information using open source systems, and lead to the introduction of systems demonstrated overseas in the United States.

Integration into Medical Practice

Health IT also needs to fit within current medical practice for it to be adopted widely. Many experts in the sector recognize that the entrance of high-tech products and services into healthcare delivery needs to be paired with a close examination of physician and health professional workflow so that the technology will have maximum impact. The review of medical practice and how to integrate Health IT has occurred at a few hospitals and clinics in the United States, but has not yet occurred on a broad scale, and this effort will be replicated on a far larger scale as these technologies become available internationally. As a result, more sophisticated mobile health and telehealth technologies have yet to gain broad adoption.

Market Challenges Facing Health IT Sector

In order for healthcare providers to increase usage of Health IT generally (and mobile health and telehealth more specifically), several areas need to be addressed:

Provider Reimbursement Systems

Appropriate reimbursement for services provided remotely through mobile health and telehealth applications will need to be implemented among both public sector and private sector sources. This is part of a broader trend: rather than reimburse physicians and healthcare providers on the volume of care provided, insurance policies will need to shift (as insurers are starting to do in the U.S.) in favor of preventing emergency room visits, increased adherence to medication regimens, and emphasis on high-quality care (reducing patient readmissions to hospitals and lowering the number of acute interventions needed, just to name two examples).

There will likely be great variation in terms of reimbursement trends worldwide, as many countries have government-run healthcare systems, and many of those are dealing with tight budgets. In other markets, a significant portion of healthcare expenditure comes out of patient's pockets.

However, mobile health and telehealth applications can offer many benefits leading to more efficient use of healthcare resources and lower costs. This can occur by encouraging more frequent transmission of vital health statistics, and earlier intervention to treat a health condition, which should result in fewer emergency room and physician visits. It should also

increase patient involvement in managing their health (see immediately below).

Consumer Acceptance

Consumer acceptance of Health IT (and mobile health/telehealth) will also be needed for widespread adoption to take place. A focus on developing technologies that are easy to use by consumers without medical training, while being customizable enough to meet individual health needs, will be critical to improving adoption. In addition, consumers have not yet seen the value of selecting physicians and hospitals based upon their digital capabilities to manage a patient's condition, although some consumers in the U.S. are making healthcare decisions based upon the availability of IT connectedness between healthcare providers and facilities.

A related challenge is the consumer's reaction to use of these technologies. Individuals most likely to benefit from Health IT may lack the knowledge and understanding to fully adopt and maintain use of these applications once introduced, which may inhibit the widespread utilization of Health IT in a country, region, or within a population. Improving general awareness of available Health IT products and services, and their benefits, including addressing common misconceptions about security, will likely result in increased adoption. The United States has had some experience educating consumers about the benefits of Health IT, and may be able to assist other countries with this effort, but other countries may also have beneficial lessons to share with the United States in this area.

Provider Training

One of the necessary, but less heralded, aspects of Health IT deployment is the need to adequately train the healthcare workforce on development, implementation and use of the appropriate systems. This issue impacts both healthcare workers with many years of experience, as well as those new to the sector. Training often involves education on a multitude of related but distinct issues ranging from information governance, management of medical records and associated systems, and quality assurance of health information. The impact of this training can also have a direct impact on the career development path of healthcare workers. A careful review of the processes and workflow involved in patient care and treatment is often suggested for health systems and hospitals when instituting new administrative and records management systems, and this review will be even more complex when mobile health and telehealth

processes (which often take place outside the hospital) are involved.

The Department of Commerce's International Trade Administration (ITA) is supporting the American Health Information Management Association's (AHIMA) project concerning a comprehensive update and expansion of existing health information management education, both for career workers and those new to the sector, through ITA's Market Development Cooperator Program. The revised curriculum (with a sharp focus on standardizing workforce competencies in a variety of areas) is currently going through a comment and review period, with input from workforce experts based around the world.

Specific Challenges for Mobile Health and Telehealth

Provider Legal Protections

An area where policies and procedures must align for increased use of mobile health and telehealth concerns is the need to establish provider legal liabilities and protections for virtual treatment decisions. Since the patient and physician are not in the same physical location, making accurate medical diagnoses will depend on many factors, including lighting; clarity of the image transmitted to the physician; speed of the Internet/broadband connection; interaction between different service providers in transmitting the images; and existence of a consistent power supply, among other considerations.

Scaling-up Mobile Health and Telehealth Solutions

Pilot studies for mobile health and telehealth products are being implemented throughout the world. Some countries have many pilot projects ongoing simultaneously in different regions. For instance, India has at least 275 ongoing projects and Tanzania has over 80.¹⁵ In addition, pilot projects in mobile settings (involving mHealth, mAgriculture, mobile money, and mEducation) can also provide important insights to broaden the presence of mobile health and telehealth; these include 109 deployments in Kenya; 80 in Uganda; 59 in Tanzania; and 17 in Rwanda.¹⁶

However, an issue connected to the proliferation of pilots relates to making these initiatives long-term, viable businesses. For example, countries such as Pakistan have tried new technology on a national level with resounding success, only to have these projects ultimately fail because they lacked sustained funding and support. A significant number of these projects are supported by international donor contributions. When

the grant money runs out, the successful implementation of Health IT at scale also ends. Countries need to develop plans for the longevity of Health IT deployment, which include mechanisms to fund projects long term rather than relying on external sources, such as grants. The United States Government can publicize projects in need of new investments and/or partners if countries seeking assistance reach out. Once these pilot projects demonstrate long-term success, they offer excellent potential for becoming viable businesses, and these technologies and services can then be used to assist patients around the world.

Data Considerations in Assessing Market Potential

Many countries analyzed in this Report had high numbers of mobile phone and/or Internet subscriptions (a relative ranking greater than 100). Based on the Report's methodology, high numbers in these metrics often offset low healthcare spending. However, these numbers can be deceptive, as consumers owning multiple SIM cards and communication devices (work phones, home phone, tablet) at a given time leave many markets appearing to have a mobile penetration/subscription rate of anywhere between 100-168 per 100 people. These announced penetration rates often far exceed the country's population, and grossly overstate the true number of people with consistent access to a mobile device. It also explains why the number of people quoted as having mobile phone subscriptions (as noted in the overview) closely rivals the world's population. In addition, it is worth noting that, in developing markets, a single mobile phone may be shared among multiple people (family members or within a village).

Mobile Data-Access/Capacity Limitations

Additionally, the terms of subscription phone plans can restrict the growth potential for advanced wireless services and applications (such as mobile health and telehealth) directed at consumers. A potentially significant barrier to mass market adoption of advanced applications is the dominant preference for prepaid vs. post-paid phone plans among consumers in many emerging markets. For many countries in Southeast Asia (such as Indonesia, Philippines, Thailand, and Vietnam), it is estimated that prepaid mobile plans account for 80-90 percent share of the mobile subscription market.¹⁷ This is in contrast to other countries in the region like Singapore and Australia where post-paid plans comprise 85 percent and 65 percent of the market respectively.¹⁸ Prepaid plans often limit the amount of data consumers have access to per billing cycle. With limited data availability

under their plans, consumers are less likely to purchase and adopt data-heavy applications and services (such as those using images and/or video). Until service providers can convince consumers to make the switch to post-paid plans, the growth potential of advanced mobile applications and services is likely to be limited. Few countries have successfully converted consumers on a large scale from prepaid to postpaid plans.

ICT Infrastructure

Health IT requires a robust ICT infrastructure to be in place before more advanced mobile health and telehealth applications can be instituted. This includes widespread coverage for broadband communications and reliable electricity, including in rural areas. While 3G and 4G networks increase the speed and types of data that can be reliably shared, the presence of less advanced ICT infrastructure can become a barrier to widespread use of more sophisticated mobile health and telehealth services. As of 2014, 85 percent of the world's population had access to a 2G network and 55 percent had access to 3G coverage, primarily located in urban settings.¹⁹ Many country and regional markets are upgrading and expanding broadband coverage. Smartphone adoption is still low and restricted primarily to developed countries and higher income brackets.²⁰

Opportunities for Private Sector Input Into International Health IT Market Opportunities

The Health IT sector interacts and intersects with many economic sectors that have either not worked together before, or have done so either sporadically or episodically. Therefore, opportunities abound for increased collaboration between the public and private sectors with an interest in promoting international opportunities for U.S. companies.

Leverage Regional and Multilateral Dialogues

Because Health IT generally (and mobile health and telehealth more specifically) is a dynamic, emerging sector, use of international and regional fora may be a particularly effective way to raise pertinent cross-border issues. This approach would both encourage consensus and hoped-for agreement on many issues that cross international borders, allow for exchange of best practices, and serve as a template for cooperation that other countries and regions can follow to meet their needs. Some of this activity would occur in global standards bodies (such as ISO, IHE, HL7 and IEEE), but the Health IT industry can also provide appropriate

guidance on Health IT issues and concerns to U.S. policymakers when they enter into discussions under regional economic agreements. These include fora such as the GCC (Gulf Cooperation Council), ECOWAS (Economic Community of West African States) and ASEAN (Association of Southeast Asian Nations).

Heighten Awareness of Functioning Health IT Models

Mobile health and telehealth are generally recognized as necessary components for improving treatment and healthcare delivery while reducing costs. However, anecdotes, news stories and post-mortem studies on pilot projects are often the only evidence of these activities, and whether the projects were successful or not is normally not known and/or widely publicized for a number of months (or even years) after the fact.

Health IT companies can help with this effort by widely publicizing successful Health IT products and services developed by U.S. companies to encourage increased adoption and use. This can both help increase adoption and use of these technologies in the U.S. and other countries, but also provide viable, demonstrable “business cases” that mobile health and telehealth can improve treatment and delivery paradigms. The latter point is particularly pertinent to many Health IT-related projects primarily dependent on donor funding for their existence.

The evolution and lack of awareness of successful mobile health and telehealth technologies and services clearly show that increased visibility and awareness of these products and services would help increase adoption and use. As a result, organizing and promoting overseas Health IT trade missions for U.S. companies (based on industry interest), and planning reverse Health IT trade missions where international stakeholders come to the United States either in search of partner companies or ways to enter/increase their investment in the United States Health IT market, would be mutually beneficial. Since countries are at varying stages of development in utilizing mobile health and telehealth delivery and services, there are many opportunities for U.S. and international stakeholders to engage in bi-directional education and learning about best practices and implementation techniques.

Additional areas where the U.S. Health IT industry can assist efforts for the sector to increase exports of products and services, and expand the presence and reach of innovative U.S. technologies include:

- Standardizing education for the Health IT workforce, both for new-to-sector and long-term employees, and support international efforts currently underway (in the public, private and academic sectors) to develop and widely disseminate a global curriculum for health information management education.
- Using examples from U.S. companies as a basis for comparison, develop a repository to share outcomes and best practices from implementation and testing of Health IT, and using those findings to design strategic plans to increase the presence of these technologies.
- Promoting increased harmonization of Health IT standards, including for data exchange, healthcare terminology and coding, regulation, and trade, and promoting adoption and implementation of these standards internationally.
- Developing an industry-organized stakeholder group with interest in international Health IT trade that can advise U.S. Government officials on development and implementation of strategies to expand exports and lower regulatory and trade barriers.

Methodology

Developing a methodology to measure and compare market sizes and opportunities for Health IT across countries is presently very difficult. For instance, there are no North American Industrial Classification System (NAICS) or Harmonized Tariff System (HS) codes assigned specifically to Health IT products or services, making accurate measurement of the market size for individual countries, and analyzing import/export levels and corresponding trade balances, practically impossible. Therefore, the metrics used to rank the countries in this Report are proxy indicators covering six categories that might influence the overall Health IT market.

Since Health IT involves innovative and often high-tech solutions from other industries to address health-related problems, the Report includes a measure of research and development spending. The higher the figure, the more likely the country would be receptive to introducing cutting-edge healthcare solutions.

Healthcare workforce, measured by physician density, serves as an indicator of whether technology is needed to compensate for the lack of general practitioners and specialists. Developing metrics to track the sophistication of healthcare systems, ICT infrastructure, and ICT use in each country gives a sense of what mobile health and telehealth products and services would be most appropriate for each market. Healthcare spending per capita proved a helpful indirect measure of the scope of healthcare infrastructure. For ICT infrastructure, 2G was considered a minimum level of service for mobile health, with 3G and 4G services being preferred for more sophisticated mobile health and telehealth services. ICT use is an important driver of the mobile health and telehealth sectors and therefore mobile and Internet subscriptions were key metrics for determining potential market size.

Implementation of policies, such as a strategic plan for Health IT, indicates the level of government support for large-scale Health IT projects. Regulations that either facilitate or inhibit data exchange, data storage, privacy and security, and health technology, can serve to measure a country's receptivity to the latest products and services from Health IT vendors based overseas. Finally, creating a ratio of old vs. young people in a country gives a sense of the comparative rate at which a population is aging. This ratio is useful because an older population is likely in greater need of cutting-edge technologies to manage chronic disease; however, a younger-skewing population is more likely to adopt and integrate technology into their daily lives, and might be more receptive to healthcare delivery over smartphones, tablets, and other sophisticated mobile-based tools. More details on these categories are provided in Appendix 1.

Caveats

The metrics that were chosen for this Report's analysis were based on available data and the industry specialists' reasoned assessment of the factors that influence the Health IT market. Future availability of possible metrics that more directly measure Health IT activity (for example, Health IT Research and Development expenditures; Health IT expenditures as percentage of GDP; more direct measures of Health IT policy formulation and implementation; etc.) may affect subsequent rankings and conclusions.

In addition, country reporting for some of the chosen metrics is poor and/or not current; updated statistics on the metrics used may become available in the

future and impact the rankings. Reporting on some chosen metrics is also not available for all countries, resulting in the exclusion of several developing markets that might appeal to some U.S. companies, such as Estonia, Hong Kong, Latvia, Morocco, Philippines, Russia, Rwanda, and Tunisia. In general, there is an underrepresentation of LMICs in the rankings, which may be partly due to incomplete or antiquated data for the metrics considered.

The authors also considered other metrics for the Report's methodology (including worker density for nurses and/or other healthcare workers besides physicians; number of hospital beds and facilities; taxes and tariffs; and burden of disease), but the poor data coverage across countries resulted in exclusion of these metrics. In addition, the methodology used does not include a factor measuring the presence of local competition. This could be important for some countries, because competition in the Health IT sector can come from multiple industries, either individually or in combination (ICT, health services, health products, and medical devices, just to name a few), and strong local competition might make the market less attractive to U.S. Health IT companies.

The Report's scope is primarily limited to mobile health and telehealth (including remote monitoring, outpatient care, home care, and self-care). While some of the Report's information may have an influence and relevance to other Health IT subsectors (such as EHRs, disease surveillance, drug monitoring, and wearable technologies), additional information should be consulted along with this Report when assessing those subsectors.

There are also several caveats to be aware of in terms of assessing the metrics used, and how the resulting data impacted the country rankings. For example, the methodology used tends to give higher rankings to countries with elevated levels of health expenditures. It can be argued that lower health expenditure levels might increase the necessity to deploy mobile health and telehealth solutions, influencing interpretation of the rankings. However, determining how low the level of health expenditure needs to be for reevaluating mobile health and telehealth deployment is arbitrary, so the Report's methodology did not discount countries that had a high level of health expenditures.

In addition, the demographic ratio used (population over 65 vs. under 15) represents a recent, single point-in-time measurement. A comparison of the current

ratio used with a similar projection 10-15 years in the future might be more representative of future prospects in the market for business planning purposes, and will be considered as a metric for any future report updates. Finally, some of the mobile health technologies under development are targeted

for people younger than 65 (such as the maternal and child health population), making a comparatively low ratio for this metric more desirable and influencing interpretation of the rankings (this is dependent on the company's application or use of mobile health/telehealth and its target audience).

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Country Case Studies

The following pages include country case studies that summarize U.S. Health IT export opportunities in selected markets. The overviews outline ITA's analysis of the U.S. export potential in each market and offer recommendations to improve the effectiveness of U.S. Government export promotion programs across each Health IT subsector. The markets profiled represent a range of countries and geographies to illustrate a variety of points– not the top ten markets overall.

ITA's recommendations are meant to provide suggestions for export promotion efforts specific to these markets. Some activities, which are not mentioned, are effective in all markets. Webinars, market assessment reports, the International Buyers Program, and other trade events reach a wide cross-section of exporters and provide important information to U.S. companies about opportunities overseas and should continue as such.

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Brazil

Type of Market: Large/Emerging

Brazil has strong Health IT market potential for U.S. companies during this report's three-year time horizon, as sector development is currently at an early stage, few domestic companies exist, and regulations are minimal. Also, Brazil generally has a good ICT infrastructure, and recently passed legislation facilitating foreign direct investment in the healthcare sector. However, the Brazilian government does not have a Health IT work plan in place, has significant regional differences in healthcare provision, and provides a large percentage of healthcare services through an extensive public sector system of hospitals and clinics. Identifying Brazilian government Health IT priorities would be a beneficial prerequisite before making detailed plans regarding appropriate U.S. government and private sector activities in the country.

Overall Rank

34

Brazil received a mid-level ranking in the Report due to relatively modest scores on several metrics, compounded by low scores on ICT market development, health expenditures, and a very young population. However, Brazil has the sixth-highest GDP and the fourth-highest population among the countries ranked, indicating that a huge potential Health IT market already exists for the sector's products and services. The current Health IT market size is estimated between \$500 million and \$1 billion, with low levels of dedicated investment and minimal regulations in place, further illustrating the market opportunities available.

Challenges in the Market

Although plentiful Health IT opportunities exist in Brazil, companies should be aware of several factors when doing business in the country.

There are significant regional differences in healthcare expenditure in Brazil, leading to variation in both existing and needed healthcare infrastructure, as well as disease conditions and available services. Brazil has five major regions: north, north-east, central-west, south-east, and south. Each region is made up of several states offering diverse investment opportunities. The north region is home to states which have both the lowest (Pará, \$288) and highest (Acre, \$618) regional per capita healthcare expenditure, clearly demonstrating that, even within regions, sizable differences can exist in health

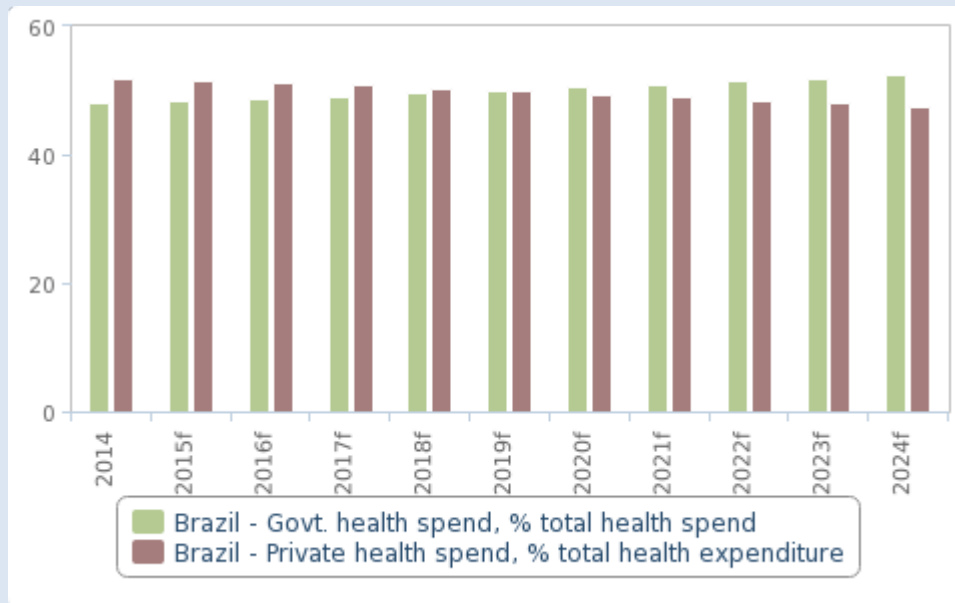
expenditures and resulting market potential. In addition, there is a wealth inequity split between the north and south, as north and northeast regions have generally lower household income compared to the south and southeast regions.

The southeast region is home to São Paulo and Rio de Janeiro. Both represent significant market opportunities, as the two cities account for approximately 40 percent of Brazil's total population as well as boasting higher than average per capita spending for healthcare. The national average for per capita spending is \$457, with above average per capita spending in the north (\$506), central-west (\$497), and southeast (\$463) regions. Below average per capita spending is found in the south (\$447) and north-east (\$374) regions. Companies interested in investing in Brazil should be aware of these regional differences as they develop their export strategies.²¹

In addition, Brazil's national government is expected to take on a higher share of medical service expenditures. Over the next 10 years, public healthcare spending in Brazil is expected to increase from 48 percent of total health expenditure to 52 percent (see Figure 1). This means that the private sector will continue to account for a significant amount of medical spending, which according to World Bank data requires nearly 60 percent of out-of-pocket spending by individuals, and might place long-term limitations on Health IT investments made by the Brazilian government.

Figure 1: Public and Private Spending to Remain Relatively Split

Brazil's Public & Private Healthcare Spending, as a percent of Total Health Expenditures



Source: Business Monitor International and World Health Organization

Two government agencies will play leading roles in the development of Health IT in Brazil. DataSUS, in the Ministry of Health, is the department of informatics for the Healthcare Public System (SUS) that supplies information systems and informatics support to all divisions of SUS, including planning, operation, coordination, and consulting services to maintain the national databank. The Telesaude Brasil Redes is a national program designed to improve SUS's quality of healthcare assistance and basic care, integrating education and services to promote Tele-assistance and Tele-education.

Telecom and IT investment in Brazil is expected to increase by 4.2 percent in 2015 to nearly \$76 billion, representing the largest portion of total ICT investment. 3G mobile connections are widely available in most regions of Brazil, particularly in the south and southeast parts of the country (where coverage is close to 100 percent).

Ninety-one percent of Brazilians had access to 3G services in mid-2014, but availability in the center-west, north and northeast regions of Brazil was below 85 percent at that time. In addition, Brazil did not reach the level of 2 million 4G LTE (Long Term Evolution) mobile connections until May 2014, according to figures from the country's telecoms

regulator Agência Nacional de Telecomunicações (Anatel) and telecoms operators association SindiTelebrasil, falling short of the Brazilian government's goal of reaching that level at the end of 2013.

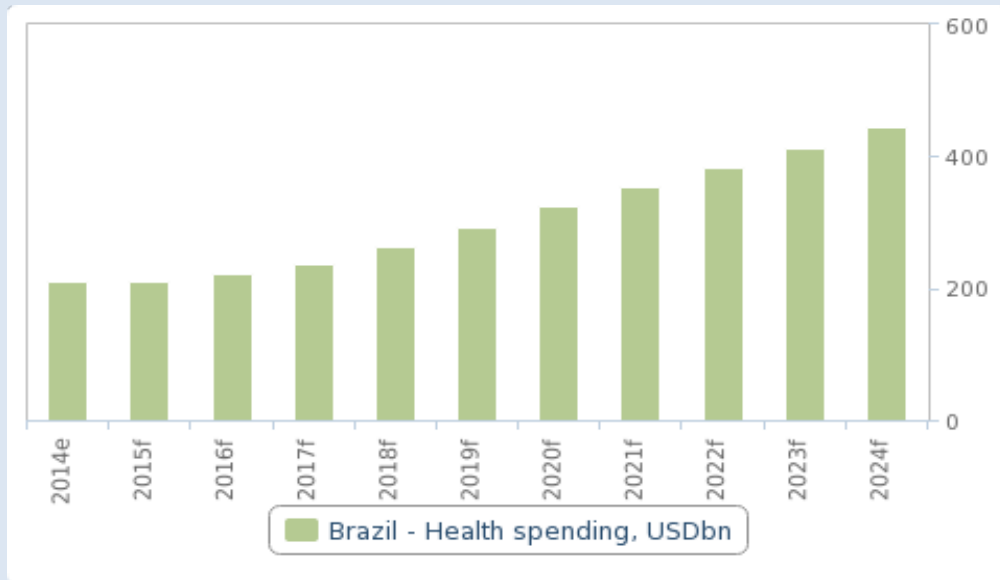
As of March 31, 2014, 4G services were available in 99 cities. In contrast, as of March 2014, Brazil had 145 million broadband connections, including mobile and fixed, up 51 percent year-on-year, according to SindiTelebrasil.²² Consequently, less advanced mobile health and telehealth technologies would seem to be more appropriate for the Brazilian market at this stage.

There are also some limitations on the availability of IT professionals to help implement a Health IT system in Brazil. It is estimated that Brazil's total IT workforce totals around 250,000, lower both nominally and as a percentage of overall population than other Latin American countries such as Mexico.²³ Not all of these professionals are working in the health sector, which may also constrain the expansion of Health IT in Brazil.

Opportunities for U.S. Companies

Determining market opportunities and potential with interested stakeholders (both public and private sector) will be an important aspect of a company's

Figure 2: Healthcare Spending to Increase
Brazil's Healthcare Expenditure (USDbn)



Source: Business Monitor International and World Health Organization

effort to enter the Brazilian market. Most notably, Brazil has few regulations related to Health IT at present, and the government is currently in the earliest stages of developing a national strategy for the sector. This is both a challenge and opportunity, as Brazil is highly dependent on foreign technology and innovation to jumpstart this sector. However, the Health IT priorities of government and private sector stakeholders are unclear at present.

The Brazilian healthcare market is extremely large, offering tremendous potential to use Health IT to modernize and update their healthcare system. Brazil's healthcare market was valued at \$210 billion in 2014. This figure is forecast to rise to \$446 billion by 2024 (see Figure 2), with a compound annual growth rate of 7.8 percent in U.S. dollar terms. Per capita healthcare expenditure is expected to grow from \$1,042 to \$1,924, and healthcare spending as a percentage of GDP is expected to increase from 9.5 percent to 9.7 percent over the same period. Brazil has the world's seventh-highest GDP (including the U.S., which has been excluded from this report's rankings), so GDP healthcare spending of more than 9 percent (a relatively high level compared to most countries) reflects the opportunity for strong Health IT expenditures in both the short- and medium-term.

The economic burden of non-communicable diseases in Brazil is set to rise in coming years, offering benefits for the greater utilization of mobile health and telehealth to better monitor patients remotely, and intervene before an acute care episode occurs. For instance, according to the International Diabetes Federation (IDF), Brazil has the largest population of diabetics in Latin America, at 11.6 million. The IDF also notes that the number of undiagnosed diabetes cases is 3.2million, while diabetes has an 8.7 percent national prevalence among the population. It is estimated that in Brazil approximately 116,383 deaths were diabetes-related in 2014, giving the country the largest number of diabetes-related deaths in Latin America. This figure also gives Brazil the sixth-highest number for diabetes-related deaths in the world, behind India, China, the United States, Indonesia and Russia. According to IDF, the annual cost of living with diabetes in 2014 was \$1,578.²⁴

Major investors in the telecoms market recognize the Health IT potential in Brazil, particularly for telehealth. For instance, Telefónica Digital, the digital development arm of regional powerhouse Telefónica, acquired Brazilian chronic care management company Axismed in February 2013. The acquisition allows Telefónica's Vivo unit, the country's largest mobile operator, to provide Health Monitoring services that also have Outpatient Care and Self Care applications.

Axismed says its services have reduced costs for chronic patients by 30 percent for private companies and healthcare providers.

The developments of Axismed's service offering will see Telefónica Digital enable the transmission of biometric data through connected devices in patients' homes. This vastly reduces the cost of specialist clinicians collecting data or the need for patients to go to a clinic just to provide regular information. The development will reduce time and costs for collating data, increase measurement of patient performance, and patient adherence to prescriptions.

The Urban eHealth Project gives clinicians access to a variety of portable tools and devices where health workers can visit and treat chronic disease patients with mobility issues in their homes. Using the specialized equipment, clinicians were able to give blood test results within a few minutes and also helped identify signs of greater problems. The project was undertaken in the Santa Marta neighborhood in Rio de Janeiro.

10 U.S. firms participated in the first ITA-organized Health IT Trade Mission to Brazil in September 2014. The delegation visited some of the largest hospitals in São Paulo and Porto Alegre and also met decision makers in the public and private sector. Despite not being a commercially focused event, companies informed ITA that they were discussing business with potential new clients they met during the events.

Research by PwC suggests the health app market in Brazil could reach \$46.6 million by 2015, while the GSMA trade association reported that mobile health projects would benefit 45.7 million Brazilians and save the healthcare market \$14.1 billion in care costs.²⁵

Legislative changes allowing increased foreign investment into Brazil's health system will aid the country's pharmaceuticals and healthcare market development as Brazil's economy becomes more open to external funding. As of January 20, 2015, the Brazilian government has begun enforcing the new Brazilian Health Sector Law, known formally as Brazilian Federal Law 13,097/2015. The new Brazilian Health Sector Law upholds an amendment to the Brazilian Federal Law 8,080/1990 which will "...allow for foreign investment, direct or indirect, including the acquisition of control, in activities related to the health sector, which includes investments in hospitals, clinics, laboratories, etc."²⁶

The amendment aims to attract new foreign investment within the healthcare sector. As one of the world's largest emerging markets, the allowance for foreign investment will further improve Brazil as an attractive and profitable destination over the long term. Moreover, new financial investment will significantly contribute to the country's sector developments aimed at improving infrastructure and service provision by boosting the flow of capital through the market.

Private Health Investment

Foreign investment in private health insurance, which has been legal since 1998, has already seen significant growth in recent years. In 2012, U.S. healthcare company United Health acquired 90 percent of Amil, Brazil's largest private health insurance provider. The acquisition was valued at \$4.3 billion. Brazil's expanded allowance of foreign investment into its health sector will continue to bolster market value through increased and diversified capital.²⁷

Mexico

Type of Market: Moderate/Growing

Mexico represents an important Health IT market opportunity for U.S. companies, as evidenced by its sizable market, the absence of regulations inhibiting innovation and expansion, and several recent trade missions organized by ITA that have demonstrated interest in U.S. products and services. However, Mexico does not have a Health IT roadmap or work plan in place. It also has incomplete availability of 3G and 4G mobile technologies, and has several agencies that will play a role in overseeing the sector, meaning that policy coordination will be an issue as regulations and procedures are promulgated. Engagement with Mexican public and private sector stakeholders on their Health IT plans, and offering to assist as appropriate, will go a long way to creating strong market opportunities in the future for U.S. Health IT companies in Mexico.

Overall Rank

42

The Mexican Health IT market is currently estimated at more than \$200 million, not as large as other markets (Brazil, Germany, and Japan) included in this report, but one with significant potential for U.S. companies. Mexico's Report ranking is influenced by low R&D and healthcare expenditures, an extremely young population, and relatively low mobile phone and Internet subscriptions. It should be noted, however, that the youthful population of Mexico today will translate, by 2050, into a society where approximately 32 percent of Mexicans will be 60 years of age or older.

Challenges in the Market

Few barriers to entry currently exist for U.S. Health IT companies; however, firms will have to carefully consider several factors when preparing for market entry into Mexico.

One consideration is the evolving regulatory landscape. There are several governmental institutions involved in developing a legal framework for Health IT in Mexico, including the Secretariats of Health and Economy; the Secretariat of Communications and Transportation; social security institutions; and private organizations such as industry chambers and academic institutions. Representatives from each of these stakeholder groups are reportedly working in committees to develop the legal framework and coordinate their activities, but policy jurisdiction and coordination could still be an issue as this process continues.

In a separate but related initiative, President Enrique Peña Nieto announced Mexico's National Digital

Strategy ("Strategy") in November 2013 with the intention of improving the level of digital inclusion. The Strategy rests on improvements in five key areas: connectivity, inclusion and digital skills, interoperability, legal framework and open data (see Figure 1).

By developing these aspects of the ICT sector, it is hoped that the Strategy will promote Mexico's move into the digital age, increasing the interaction between government and citizens, as well as contributions to the overall economy. The Office of National Digital Strategy (in the Office of the Presidency) is coordinating all efforts related to the implementation of the Strategy, which includes development of the Health IT legal framework. The Strategy provides some ideas and intent as to the future direction of ICT and digital inclusion for Mexico, but has largely not been translated into policies or implementation plans to date.

Local competition is presently not a major concern for U.S. companies, although Peña Nieto issued a national ICT strategy in 2014 (Prosoft 3.0) that would take several policy steps to increase local ICT competition over the next 10 years. About \$133 million has been budgeted for this initiative. Some of the provisions in the Prosoft 3.0 plan that might impact U.S. Health IT companies by 2024 include:

- Increase IT market value from \$14.4 billion (2013) to \$58 billion
- Move from number 3 to number 2 in export of IT services
- Double the number of IT companies to more than 8,000

Figure 1: Five Pillars of an Effective Export Promotion Strategy (Mexico)

Pillar	Description
Connectivity	Network developed and increased deployment of better infrastructure in the country, expanding capacity of the existing networks and the development of competition in the ICT sector to encourage lower prices.
Inclusion and Digital Skills	Equitable development of skills to operate technologies and gender equity.
Interoperability	Share information across different technical and organizational platforms.
Legal Framework	Harmonization of the legal framework with the ability to foster a favorable environment for the adoption and promotion of ICT.
Open Data	Availability of useful government information to foster civic entrepreneurship and promote transparency, thereby improving public services and creating more accountability.

Source: BMI, President's Office

- Develop five additional IT hubs (existing hubs are in Mexico City, Monterey and Guadalajara)
- Move Mexico from the fifth to third largest IT market in Latin America
- More than double the IT workforce from 625,000 to 1.6 million, with 90 percent of the skilled workforce (up from 50 percent in 2014) coming from Mexico
- Increase broadband coverage to 85 percent, reaching the OECD average²⁸

The Mexican market has fairly widespread coverage of 2G and 3G ICT service, along with mobile broadband, reflecting a readily available market for basic and moderately advanced mobile health and telehealth services. However, 4G service can presently be found only in large cities. In August 2015, a tender will be issued for a national broadband LTE network that, once installed, is expected to cover 98 percent of the Mexican population, which should expand the range of possible mobile health and telehealth services available.

Mobile phone subscriptions have increased in recent years. However, Mexico has low penetration in relation to other countries, meaning that not all Mexicans will be able to access mobile health and telehealth services. Affordability concerns (see below in relation to personal computers) may also be an issue with mobile phones.

Opportunities for U.S. companies

The Mexican government has instituted policies and programs to get citizens online. For instance, the government's e-Mexico plan aims to provide Internet access to 98 percent of all Mexicans. According to surveys, however, the main barrier for non-PC-owning households is cost, with 60 percent saying they were unable to afford a computer. The latest survey data show household PC penetration reached 38.3 percent in 2014, up from 35.8 percent in 2013.

Software sales in Mexico are expected to continue rising at mid-single digit levels throughout the remainder of the decade, as the public and private sectors are expected to continue modernizing their computer systems. The estimated \$4.6 billion Mexican software market in 2014 is expected to reach \$6.3 billion by 2019. Healthcare and ICT are expected to be two of the primary sectors seeing software investment during this period, with private sector health providers seeking to increase efficiency, while the public sector wants to develop infrastructure and raise health sector standards.²⁹

The disease profile of Mexicans is another driver for introduction of mobile health and telehealth services. Over 90 percent of private healthcare expenditure in Mexico occurs out-of-pocket, making some chronic diseases financially catastrophic for households. Chronic diseases such as diabetes, cancer and cardiovascular conditions are prevalent (and expected to become more so over time), and mobile health and

telehealth services can help out in important ways. For example, the Mexican government has stated that the country's inability to control diabetes represents a major economic burden to the country, and could bankrupt the entire healthcare system. In 2012, expenditures for treating diabetes increased by more than 30 percent.

According to IDF, approximately 12 percent of Mexico's population (9 million) has diabetes. The IDF also estimates that 2.2 million Mexicans are living with undiagnosed diabetes, while nearly 69,000 people died from diabetes-related diseases in 2014. The number of diabetics in Mexico is expected to grow from 9 million in 2014 to 16 million in 2035.³⁰

In 2012 and 2013, ITA organized two healthcare and medical trade missions to Mexico, with Health IT a featured sector in both cases. Comments by companies and ITA specialists from both missions indicated a significant opportunity for Health IT exports to Mexico. Most of this interest centered around using software to simplify administrative activities and for electronic health records. At least two companies reported success in entry and/or increased exports due to the two trade missions. Greater progress on policies to promote Health IT and mobile health/telehealth will certainly be welcomed by U.S. companies seeking to increase their presence in Mexico.

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South Korea

Type of Market: Moderate/Challenging

South Korea ranks highly because of its extensive and well developed ICT infrastructure and emphasis on supporting innovation in next generation technology, such as Health IT. 4G/LTE service and broadband Internet cover the entire population, with plans to upgrade services to 5G in preparation for the 2018 Olympics. R&D expenditure relative to GDP is among the highest in the world. While no Health IT policies have been implemented, the Korean government does have regulations on health, ICT, and data privacy, security, and storage that will affect the Health IT sector. Additionally, hospitals have begun to implement electronic systems, such as electronic medical records. However, the ability to provide mobile health and telehealth services is sharply restricted at the present time. For U.S. companies, competition with local telecommunications operators and giants like Samsung and LG may limit opportunities in the Korean market. However, these large international companies may also offer partnerships for smaller companies to enter the Korean market.

Overall Rank

6

South Korea ranks as a top market for Health IT particularly because of its aging population and well established ICT infrastructure. The Organisation for Economic Cooperation and Development (OECD) predicts that total population over 65 will increase from 11 percent of the population in 2010 to 37 percent by 2050³¹ due in part to a low fertility rate. The aging population also has a high burden of non-communicable diseases, such as cardiac disease, obesity, cancer, and diabetes, accounting for over 70 percent of deaths. The government has supported education and intervention programs around non-communicable and lifestyle diseases and therefore may promote use of Health IT in the future.

Health spending is only 7.4 percent of GDP, one of the lowest in the OECD, but that number is growing faster than in other countries due primarily to costs of hospital services. Hospitals average 9.2 beds per 1,000 persons, which is high for the region.³² However, the physician density is unusually low, at 2 per 1,000 persons. More than 80 percent of healthcare institutions and service providers are located in urban areas, commensurate with population distribution (approximately 90 percent in urban areas). However, there are some small islands and remote regions in Korea that would benefit from increased access to health services. In 2009, a telemedicine pilot program was set up in three remote counties, and has seen an almost three-fold increase in patient cases, rising to more than 4,800 in 2012. The program became

permanent in 2011, and has been expanded to two more counties.³³

Korea has a three-tier medical system: 1) private hospitals and public health centers that have limited services and are for early intervention; 2) inpatient and outpatient care and emergency services; and 3) general hospitals or medical school hospitals which are the largest, have more services, but are very expensive.^{34,35} The private hospitals and public health centers do not generally perform the usual coordination and continuous care services found in primary care services in other countries, leading to limited patient referrals and impacting overall system efficiency.

Additional outpatient resources, such as rehabilitation and long-term care, cannot keep up with demand. With such high quality medical services available, South Korea has become a destination for medical travel from other Asian and Central European countries. Korea has a compulsory national health insurance with high quality healthcare available. The government health insurance plan puts the financial burden on individuals through high copayments (up to 40 percent of costs). This results in 47 percent of healthcare spending coming from the private sector. Cost reduction technologies, particularly those geared towards consumers directly, may have a large market.

Korea ranks number one in the Report for research and development spending (4 percent of GDP). This reflects

an overall high interest in innovation, particularly in technology. In healthcare, the government has supported high-tech research and development through establishment of High-tech Medical Clusters, one of which (Daegu-Gyeongbuk) has an ICT focus.³⁶ While expenditures support domestic research, U.S. companies also have an opportunity for collaboration with local researchers.

Additionally, the culture is favorable for supporting next-generation products and services with high spending per capita, particularly on ICT. A large portion of the Korean population has mobile (111 percent) or Internet (97 percent) subscriptions, and there is high penetration of desktops, notebooks, and tablets. The country is supported by an extensive 4G network with plans to upgrade some services to 5G by the 2018 Olympics in PyeongChang.

Challenges in the Market

Government policies and regulations currently exist for data privacy and security, medical devices, public health, and ICT, but not specifically for Health IT. The government has developed an “e-Health roadmap” which may start discussions towards a larger Health IT policy. However, five different agencies currently have jurisdiction over aspects of Health IT, making coordination between agencies and updating current ICT regulations challenging.

Historically, availability of telehealth services in Korea has been extremely restricted (limited to the 2009 program noted above), as medical practice laws forced patients to see doctors in person, effectively precluding a market for telehealth products and services. However, in March 2014 Korea’s Cabinet passed a bill allowing a six-month pilot program to be launched permitting doctors to utilize telehealth technology to diagnose and treat remote patients, which then went to the legislature for approval.

If the pilot program is successful, telemedicine legislation will be considered in 2015.³⁷ However, existing laws will need to be reviewed and amended (if needed) in order to further expand the presence of

telehealth in Korea, and policymakers will also have to address opposition from some medical professionals and civic organizations.

Reimbursements for Health IT are still not common in Korea. The National Health Insurance Corporation offers Long-Term Care Insurance specifically for the elderly which covers healthcare services but also lifestyle needs, such as cooking and nursing.³⁸ While telehealth is not currently covered, the framework is in place to support such coverage in the future.

Local market competition is strong. All three telecommunications operators and other large Korean companies are entering into the Health IT market. For instance, Samsung is particularly interested in the healthcare sector and has had discussions with other multinational firms about possible partnerships. Samsung has also shown interest in purchasing Health IT products and services from other companies, proving possible opportunities for small- and medium-sized U.S. companies to enter the Korean market.

Opportunities for U.S. Companies

The strained medical system, combined with a primarily urban population and 4G network availability, create a positive environment to support an increased presence of innovative health products and services. Because local competition is strong, U.S. companies need to cooperate with local giants or have a strong marketing plan to effectively compete.

While the ICT infrastructure is particularly strong, plans to upgrade to 5G may support more advanced Health IT in the long-term.

So far the public and private hospital systems have installed a wide spectrum of electronic systems, including electronic medical records (EMRs). However, interconnected electronic systems are not widespread in Korea at present, in part due to low deployment of EMR interconnectivity standards. As a result, many reports are still on paper. Therefore, there is a ready market for Health IT solutions and systems.

Germany

Type of Market: Large/Challenging

Germany has a sizable healthcare market, with more than \$1 billion accounted for by Health IT. A rapidly aging society, with a significant share of chronic disease, national use of eHealth Cards, and high Internet and mobile phone penetration, generally make Germany a strong potential Health IT market, particularly for telehealth and mobile health. However, independent of issues common elsewhere (such as interoperability), there are some important headwinds for companies to consider if they are interested in entering the market. These include Germany's strict regulations regarding data management, security and use of Health IT software; lack of Health IT legislation; and related fallout from the U.S. surveillance scandal, as well as the presence of major international health and IT companies in Germany. A well-crafted market entry plan, and partnering with established international or local companies, will increase the likelihood of success for U.S. Health IT companies seeking to develop or expand their presence in Germany.

Overall Rank

4

Germany rated highly in the Report for several reasons, most notably one of the world's highest GDPs, above average healthcare spending per capita, a large healthcare market (more than \$300 billion in 2012)³⁹ and an aging population (second only to Japan among the countries studied). As a result, the German market is sizable, and offers many appealing features for increased overall use of Health IT, and for telehealth and mobile health applications in particular.

Challenges in the Market

However, there are also significant barriers and other considerations that U.S. companies need to keep in mind when entering or expanding their presence in the country. Companies should give these challenges careful consideration and seek consultation with experts familiar with the sector and country, when making decisions about whether and how to enter the German Health IT market. These challenges include:

- Roughly 90 percent of Germany's population (70 million) has public health insurance, normally using an eHealth card (eHC). However, these cards currently contain no health information (only a photo, name and birth details, and an insurance ID number) due to strict data security laws. Physician associations and insurance funds have

consideration in Germany is expected to address how the health information can be stored and accessed on the cards while addressing security concerns.

- Most of the remaining 9 million Germans possess private health insurance; collectively, more than 130 insurance companies exist in Germany.⁴⁰ Therefore, there will be limited demand for U.S. health insurance companies to enter the German market.
- While a telematics infrastructure has been piloted, it is incompletely implemented and standards, requirements, and specifications have not yet been finalized for all possible use cases.
- The current Health Law does not permit all Health IT applications and therefore it is difficult to develop business cases for each application.
- Hospitals generally have underinvested in IT (1.5-2 percent of total spending)⁴¹ in comparison to other European countries. According to a 2014 report prepared by RWI and Accenture, German hospitals have an investment backlog of roughly 15 billion euros, partly due to declining patient traffic at many facilities and rising costs. The report estimated that 13 percent of German hospitals could go out of business by 2020 if

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sult, mobile health
be well suited to

alleviate this lack of hospital investment expenditures.

- Germany has no national organization with authority to set Health IT standards; as a result, national interoperability does not exist between vendor solutions, limiting the scalability of certain Health IT products and services.
- Health IT software is currently regulated as a medical device through the Medical Products Law, requiring certification when the software influences clinical decision making.
- Germany has strict data privacy and security laws.⁴³
- Approximately 200 Health IT companies have established operations in Germany,⁴⁴ with just over half of them targeting clinical or hospital practices. Germany has a well-established Health IT industry trade association, the German Association of Health IT Vendors (Bvitg). Bvitg has more than 50 members, including German subsidiaries of U.S.-based firms such as GE, Cisco, Cerner and 3M; and German-based companies such as Agfa, Siemens, Deutsche Telekom, and SAP.⁴⁵ As a result, a well-established Health IT ecosystem already exists in Germany, with a mixture of large and small companies, but one that already has significant competition for new companies looking to enter the German Health IT market.

Opportunities for U.S. Companies

In early 2015, Germany introduced a draft eHealth Law (“Law”), containing a number of provisions to encourage Health IT and telehealth use, while incorporating financial penalties if the Law’s requirements are not satisfied. The draft Law includes payments for creation and acceptance of different medical reports, which will be temporarily channeled through the Federal Office of Information Security until the telematics infrastructure has been fully deployed.

In addition, the draft Law includes provisions for technical agreement on several telehealth applications and development of data services, along with financial penalties for medical provider non-use of the system and for government agencies failing to meet statutory deadlines; many of these provisions take effect in 2016.

The draft eHealth Law will hopefully clarify some of the remaining issues where consensus has not yet been reached, including who will cover costs for securing the Health IT information and building the infrastructure for the in-patient and out-patient environments; and the process for achieving Health IT system interoperability.

The German Secretaries for Health and Economics (from different political parties) have primary responsibility for taking the Law to other ministries for review and comments. After that process concludes, the draft Law will be edited and discussed within each party to make sure that, when the Law is presented to Parliament, it will receive a majority vote (this should take place in the second half of 2015). If the final Law passes Parliament, it is expected to take effect January 1, 2016.

Demographics and population health show favorable trends for more widespread use of Health IT, especially mobile health and telehealth. By 2035, 31 percent of population (24 million people) will be age 65 or older and the country ranks second in comparative population age in this report’s analysis, just behind Japan. In addition, chronic and long-term diseases account for roughly 80 percent of German healthcare spending.⁴⁶

Germans are also familiar with and frequent users of modern technologies, which portend well for Health IT and associated subsectors. About 77 percent of the population (63 million) uses the Internet frequently, one of the highest percentages in Europe. Germany also has strong sales of smartphones (about 26 million sold in 2013, up 23 percent compared to 2012).⁴⁷

There is a ready market for modern Health IT solutions and systems, with approximately 154,000 general practitioners and nearly twice as many medical specialists (296,000).⁴⁸ Many hospitals and physicians use Health IT to store health information in digital form. However, the information is not readily sharable and can only be retrieved by the hospital or patient upon request.

Surveys indicate patients and physicians are interested in a range of improvements to the medical system, including electronic storage of emergency data; electronic letters of referral; and EHRs, so commercial prospects for those areas are promising. Some of these services are already being used in private clinics and rural areas with a low concentration of physicians.

Germany has also made strides in establishing a mobile health and telehealth market, primarily through pilot projects. For instance, a telematics infrastructure pilot project is expected to launch in 2015, including all 131 public sickness funds (the statutory health insurance system that covers 90 percent of the German population).

In addition, an on-line portal already exists for telemedicine projects (Deutsches Telemedizinportal, or “Portal for the German Telemedicine Center”) and about 240 telemedicine projects exist in approximately

100 communities nationwide.⁴⁹ The German mobile health market is expected to double from approximately 1.5 billion euros in 2014 to 3 billion euros by 2017.⁵⁰

Finally, Germany hosts one of the largest annual European Health IT trade shows (conhIT), first held in 2008, which serves as a ready avenue for new companies to enter the market. The show takes place in Berlin, normally in April. The most recent show took place April 14-16, 2015, with nearly 7,500 visitors and more than 380 participating companies.⁵¹

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Singapore

Type of Market: Moderate/Growing

Singapore represents a significant market opportunity for U.S. Health IT companies. Singapore signed a contract with a consortium (including two U.S. companies) in 2010 to develop a National Electronic Health Record system, one of the first Asian countries to formally integrate Health IT into their healthcare system. In addition, Singapore has some built-in advantages for relatively high usage of Health IT, with a compact geography resulting in a highly urbanized society, high per-capita income, and widespread use of mobile phones and Internet. Opportunities exist for U.S. companies in this sector, particularly for care coordination for private insurers and physicians, and possible deployment of new mobile applications. However, firms involved in developing and integrating systems will find few leads in Singapore.

Overall Rank

11

Singapore scored relatively highly across the metrics used for this Report, but received a good overall rating due to its few weaknesses, rather than pronounced strengths in any given category. This correlates well with other comparative measures, showing Singapore with a high GDP per capita (nearly \$37,000 USD in 2013) and a rating as one of the best places to do business in many studies, including the top ranking in the World Bank's "Ease of Doing Business" index. Using this Report's methodology, the reasonably high level of mobile phone subscriptions, strong score on physician density, and its highly urban population, are noteworthy market characteristics.

Challenges in the Market

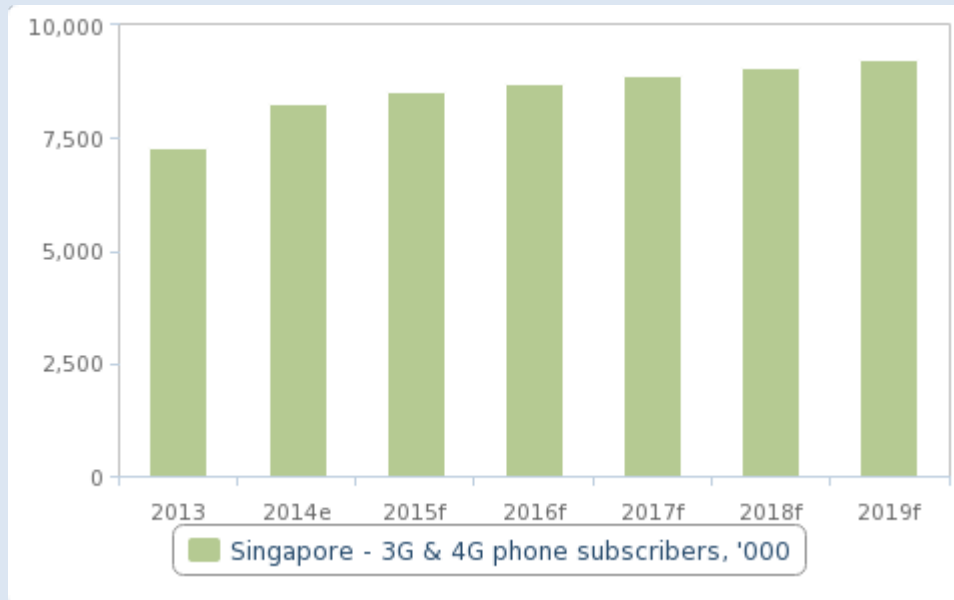
U.S. health insurance companies have few opportunities to set up operations in Singapore, as the subsidized, multi-layer government operated system has existed for many years to serve Singapore citizens. Singapore has a universal healthcare system with several distinctive insurance programs: one uses large government subsidies to support patients with acute care needs, and is augmented by a compulsory individual medical health savings account (where employers and citizens each contribute). Three other components of the system are: 1) a low cost catastrophic medical insurance scheme that spreads the risk pool across the entire population; 2) optional private insurance plans (usually purchased by middle- and upper-income residents) which permit access to private facilities; and 3) a medical endowment fund that supports low-income Singaporeans.

In addition, Singapore will soon be implementing universal healthcare for the population called "MediShield Life," a universal insurance coverage option. It will be rolled out sometime in 2015, most likely towards the end of the year. Under MediShield Life, even people with pre-existing conditions will be covered by insurance.

In 2009, Singapore initiated the National Electronic Health Record (NEHR) project, to provide each Singapore citizen with his or her own EHR. Singapore awarded a contract in 2010 to a consortium of two U.S. companies and one New Zealand-based company to create and develop the NEHR. In April 2011, the first phase of the US \$144 million NEHR system went live, including a National Health Identification Service (NHIS); summary care records for all individuals; access to discharge records and patient summaries; and data center equipment.⁵² The project was expected to be completed in June 2012, but is still being rolled out in phases. According to a May 2013 response to a parliamentary question, Singapore's Minister of Health Gan Kim Yong stated that US \$136 million had been spent on NEHR Phase One at that time, and the annual maintenance costs of the system amounted to US \$15.8 million. Although not a challenge as such, it is worth noting that if a country like Singapore (with a population of only 5 million) experiences difficulties in introducing a NEHR, such delays are likely to be pervasive in countries with larger populations.⁵³

Figure 1: Soaring Subscriptions

Singapore: 3G And 4G Phone Subscribers per 1000 Population



Source: Business Monitor International and IDA

U.S. healthcare stakeholders have expressed interest in greater transparency regarding Ministry of Health (MOH) policies. These concerns are not currently about Health IT, instead relating to greater clarity regarding MOH procedures for adding drugs to the Standard Drugs List, including timelines for evaluation and specific criteria for inclusion, and developing a feedback mechanism; transparency and procedural fairness regarding review periods for new medical devices; and related reimbursement processes.

However, given that the oversight of Health IT is shared between MOH and the Infocomm Development Authority (IDA), any lack of clarity and transparency related to policies and procedures (both within and between agencies) could pose challenges for Health IT companies interested in doing business in Singapore.

Opportunities for U.S. Companies

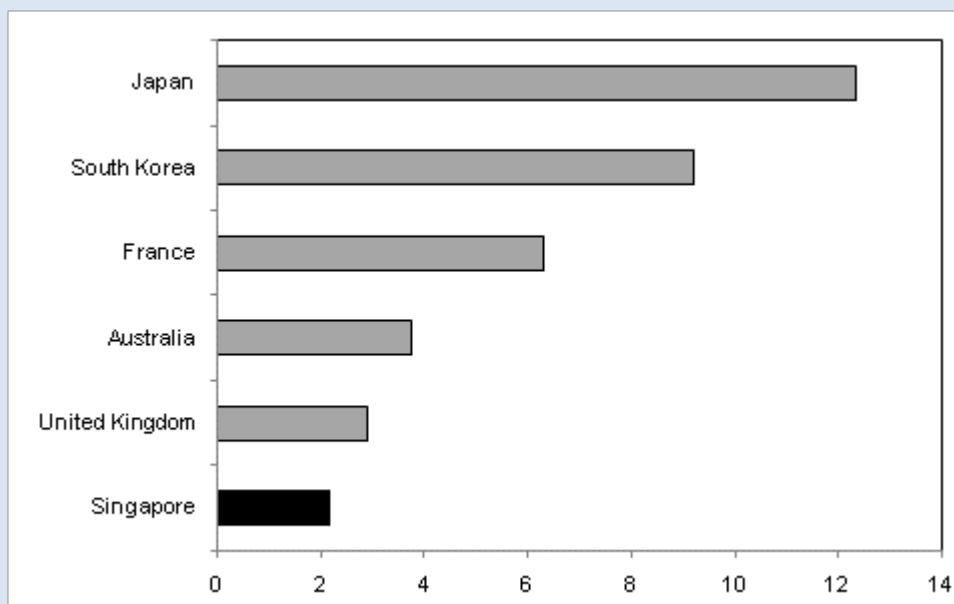
Singapore represents a strong market for introduction of more advanced mobile health and telehealth services for several reasons. Unlike many markets

where consumers primarily purchase prepaid mobile phone subscriptions, Singapore has a comparatively high uptake of postpaid subscriptions, which allows users to have larger data plans and ready access to more sophisticated mobile health and telehealth applications. In February 2015 (the latest monthly data available), IDA reported that, of the 8.1 million mobile phone subscriptions in service that month, 4.71 million (58.2 percent) were postpaid subscriptions.⁵⁴

Another reason Singapore can contemplate adoption of advanced mobile health and telehealth technologies is the overwhelming presence of 3G and 4G service. Using IDA February 2015 data, 4.42 million (54.6 percent) of all mobile phone subscriptions were 3G, and 3.38 million (41.8 percent) were 4G. Therefore, approximately 96.4 percent of the population using mobile phones has access to these more sophisticated networks. This high ratio (and increasing number of 3G and 4G subscriptions) is further reflected in forecasts from BMI, growing from 8.3 million subscriptions in 2014 to 9.2 million by 2019 (see Figure 1).

Figure 2: Singapore – Behind Developed Peers

Selected Countries: Hospital Beds per 1000 Population, 2014



Source: Business Monitor International

Singapore also has a disease incidence and hospital bed profile where mobile health and telehealth should help address patient treatment concerns. Chronic health conditions such as cancer, heart disease and diabetes rank among the top 10 health conditions leading to hospitalization in Singapore, and the rate of hospital readmissions (mostly for these diseases) increased by nearly 16 percent between 2011 and 2013. This situation, combined with Singapore's fairly low hospital bed availability (only 2.1 hospital beds per 1,000 people, compared to Japan's 12.3/1,000 and Korea's 9.2/1,000; see Figure 2), will likely lead to increased reliance on home-based healthcare. Low hospital bed availability has occasionally led to shortages in recent years, and the Ministry of Health's plans to add 1,900 acute care beds by 2020 will be insufficient to meet estimated demand. The combination of chronic health conditions and hospital bed capacity limitations should lead to a rebalancing of healthcare provision in Singapore, resulting in strong business opportunities for mobile health and telehealth companies able to provide devices to patients to more effectively manage their conditions at home.

Some home-based outpatient mobile health and telehealth initiatives are already in place. For instance,

five of the six Singapore public hospitals currently use a transitional healthcare model whereby medical staff visits patient's homes to ensure adherence to medication. This presents a market opportunity for telehealth initiatives to improve the delivery of healthcare and alleviate the strain on human resources in hospitals.

Public healthcare providers have also begun the transition towards home-based care such as Tan Tock Seng Hospital's Virtual Hospital Initiative. Under this scheme, a manager is assigned to monitor patients who have a history of hospital re-admissions and act as a link to primary care physicians. As of December 2014, the model served 284 patients over a two-year period. According to the hospital's analysis, comparisons of inpatient length of stay and emergency department attendance over six months showed a reduction of 26 percent and 34 percent, respectively.⁵⁵

In late 2014, Singapore announced the creation of a Smart Nation Programme Office ("Office"), focusing on development of infrastructure and innovative ways of connecting people and "things." This initiative includes health as one of the focus areas. As the Office's priorities and projects continue to evolve and develop, those related to health and Health IT which

incorporate innovative technologies may find a receptive audience. Health data analytics is another area that the Singapore Government is looking at as part of its population profiling and proactive health management initiatives. With the aging population in Singapore, the

government will focus its efforts on leveraging IT to improve care coordination among healthcare providers, presenting a solid market opportunity for companies with expertise in this area. Singapore has also hosted several Health IT industry conferences, further highlighting local interest in the sector.

Japan

Type of Market: Large/Challenging

Japan ranked as the top country in this *Health IT Top Markets Report*, with a favorable demographic profile for Health IT, a largely urbanized population, and sizable current market, coupled with significant ICT and healthcare investments in place. The U.S. and Japan have already engaged in several Health IT information exchanges to date, forming a good foundation for future collaboration. However, several challenges currently exist for Health IT companies doing business in Japan, including a lack of specific Health IT policies, and numerous government agencies playing a role in sector oversight, leading to areas of policy fragmentation.

Overall Rank

1

Japan held the top position among the 80 countries ranked, and rates highly on many Report metrics. For instance, Japan has the third highest GDP level globally (behind only the United States and China); a large Health IT market size (exceeding \$1 billion); the oldest-skewing population distribution; a high concentration of population clustered in urban areas; a tech-friendly society; and very good Health IT infrastructure. All of these factors indicate that Health IT already has a good foundation in Japan, with the potential for more growth. However, some important caution areas exist regarding access to Japan's Health IT market, particularly in areas not directly measured by this Report's methodology.

Challenges in the Market

The regulatory environment represents one important challenge to consider when evaluating Health IT market opportunities in Japan. At present, multiple ministries play distinct roles in Health IT oversight:

- Ministry of Economy, Trade and Industry (METI) has the lead in Health IT services and commercial engagement;
- Ministry of Health, Labour and Welfare (MHLW) leads on pharmaceuticals, medical devices, promotion of health products, and home healthcare;
- Ministry of Information and Communication (MIC) leads on telecom policy, privacy and open data;
- Consumer Affairs Agency leads on protection of personal information, with the above

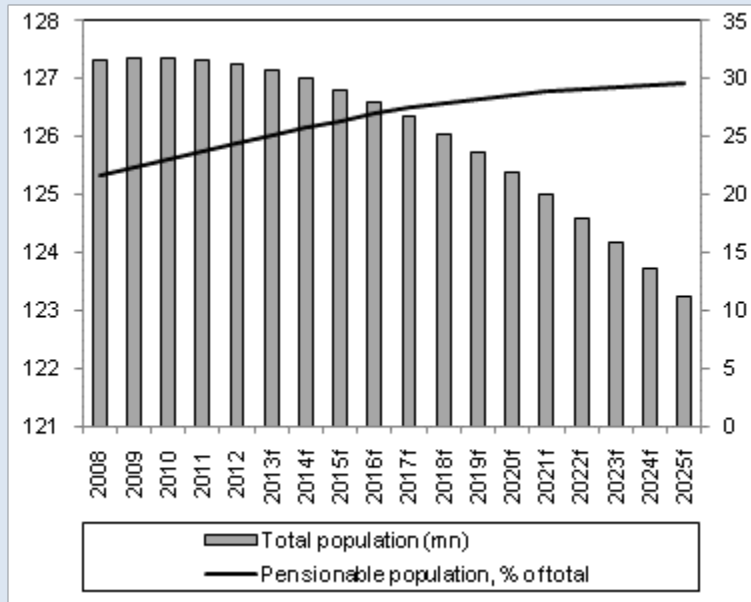
agencies and the Ministry of Internal Affairs and Communications providing guidance on regulations; and

- Ministry of Education, Culture, Sports, Science and Technology (MEXT) oversees university hospitals.

One example of the overlapping responsibilities concerns privacy and protection of personal information, as provisions vary among government agencies, and local governments may also impose rules. Consequently, this creates challenges for Health IT companies (particularly those in cloud computing and data analytics) to conform to the inconsistent rules of government bodies.

Since no agency has the clear lead role in overseeing all aspects of Health IT, and significant areas of the sector are not currently governed by rules and regulations, the result is regulatory and policy fragmentation, creating uncertainty regarding the rules U.S.-based companies will confront when entering the market. In 2014, the Government of Japan announced that a review of the Personal Information Protection Law would take place in an effort to facilitate data collection and analysis while ensuring personal information protection. As of late April 2015, a bill amending the Protection Law had been submitted and was under Diet deliberation. Regulations currently are also in effect regarding mobile technologies and population health.

Figure 1: Aging and Contracting Population
Japan's Demographics



Source: Business Monitor International

A second issue is a recent policy decision that the Social Security and Tax Number System, My Number System, (to be implemented in 2016) will not contain medical information. A separate system will be developed to handle the medical data, which has the potential to create system integration challenges for commercial and public health efforts that desire to effectively share patient information so that treatment decisions can be based on a complete patient record. MHLW would like to link these systems, but privacy concerns among Japanese citizens will not allow this to happen. In addition, the Japanese government has recently decided to postpone a planned consumption tax increase, where the additional revenue would have targeted social security and welfare, with health as a significant beneficiary. The Diet is deliberating amendment of legislation related to these topics together with the review of the Protection Law.

Another factor that could inhibit increased uptake of Health IT in Japan is the absence of Chief Information Officers (CIOs), Chief Medical Officers (CMOs) and Chief Medical Information Officers (CMIOs) at most hospitals. In the United States, CIOs, CMOs and CMIOs are often integral players in decision-making regarding the purchase of, and need for, health information systems, and often serve as advocates for purchasing integrated systems. In Japan, there is often no hospital official available (or sufficiently informed) to advocate

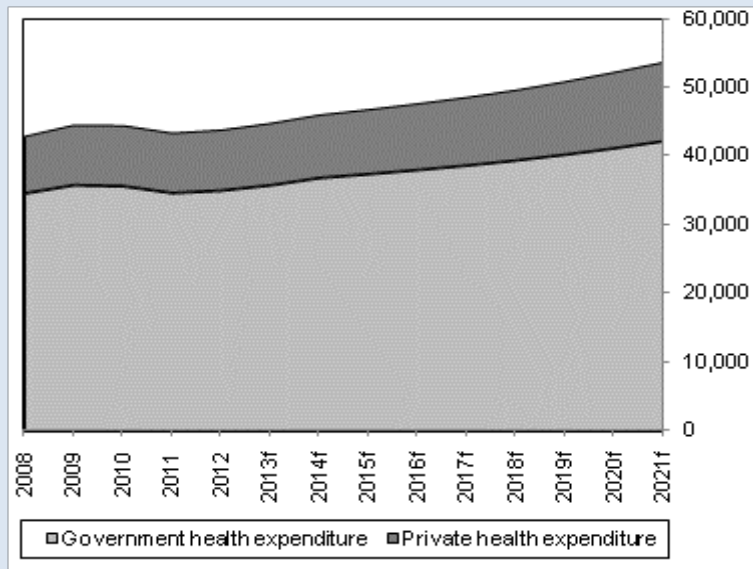
for the installation of Health IT systems. In addition, most systems are developed for use by individual hospitals, and are not designed for information sharing between facilities.

Hospitals usually purchase Health IT in two different ways: public hospitals publish their own procurements for Health IT products and services, particularly information management systems, and have a lot of autonomy. In contrast, purchasing by national university hospitals falls under MEXT's purview. The procurement processes used within both sets of hospitals often lack transparency.

There are several local companies active in the sector. These include Hitachi, who is focusing on "social innovation business" and development of healthcare infrastructure; a wristwatch sensor terminal; and "brain science," with a focus on healthcare and medical care. Others include Toshiba, Sony, Fujitsu, and Ricoh.

A fairly strong infrastructure exists for delivering Health IT in Japan, with 3G and 4G systems and high-speed broadband Internet widely available. Japan is a highly urbanized country, and the prevalence of Internet connectivity (82.8 percent, from MIC) may result in less mobile health and telehealth deployment in Japan than otherwise indicated by this Report's top

Figure 2: High Government Expenditure
Japan's Health Expenditure by Sector (JP Yen, billion)



Source: Business Monitor International and World Health Organization

ranking. However, an offsetting point would be that the more consistent collection and measurement of vital health information, and associated need to control health costs, might drive the Japanese to implement more mobile and telehealth services for those reasons.

Finally, Article 20 of Japan's Medical Law is ambiguous regarding the status of telemedicine, and may contain language that prohibits telemedicine. As a result, with no explicit guidelines or rules, the Medical Law is unclear about which medical specialists can practice telemedicine. However, a March 31, 2011 MHLW ordinance (in the aftermath of the eastern Japan earthquake and tsunami) "accepted telemedicine under the same conditions as face-to-face treatment."⁵⁶ Revision of Article 20 was a February 2014 recommendation from the American Chamber of Commerce-Japan (ACCJ) to promote the growth of telemedicine in Japan (more information below).

Opportunities for U.S. companies

The government's plans to revamp healthcare services are unsurprising given Japan's demographics (see Figure 1). In 2012, people over age 65 represented 24.4 percent of Japan's population. This proportion is projected to reach 29.6 percent by 2025 and 36.5 percent by 2050, and will be particularly impactful given the shrinking overall population in the next

decade. With the ageing population, the burden of non-communicable diseases is much higher than communicable diseases. These often-chronic diseases - cardiovascular and metabolic disorders, cancer, diabetes, Alzheimer's disease and other mental health problems - normally require prolonged treatment. An increased focus on home care (including mobile health and telehealth) will decrease the country's reliance on hospitals, allowing patients to receive proper care from home and leaving sufficient beds in hospitals for more urgent cases.

Despite the government's best attempts, the financial burden of providing generous healthcare benefits for the population is proving unsustainable, especially in slow-growth, developed markets like Japan.⁵⁷ In 2012, government healthcare expenditure reached Japanese (JP) Yen 35,093 billion (US \$439.5 billion) accounting for 80 percent of total expenditure on healthcare (see Figure 2).

As a result, private sector healthcare provision in Japan (through improved home care and community-based care, aided by mobile health and telehealth) will likely become a greater proportion of treatment services, particularly for the elderly population.

A variety of U.S. Health IT companies have expressed interest in the Japanese market in recent years. Companies with a wide range of products/services to

offer (including nurse call systems, administrative claims, and data exchange technologies) have approached the International Trade Administration for assistance, and large, multinational companies (such as Intel, Apple, and IBM) also have a presence in the market.

ACCJ is a key stakeholder driving interest in Health IT between the U.S. and Japanese governments. In February 2014, the ACCJ issued the report “Utilizing Telemedicine to Deliver More Efficient and Effective Healthcare in Japan,” which contained the following recommendations:

- 1) Revise Article 20 of the Medical Law (referenced above), particularly clarifying who can practice telemedicine, and broaden the scope of practitioners beyond medical doctors;
- 2) Clearly define reimbursement qualifications and expand the number of telemedicine services eligible for reimbursement;
- 3) Speed up the implementation of the “*Dokodemo MY Byouin* (My Hospital Everywhere) Project and complete and implement the “National ID” or “Common ID” number system (the Social Security and Tax System referenced above) as soon as possible;
- 4) Continue efforts and create incentives to increase EHR use to 50 percent or more within three years, and encourage greater data interoperability between medical facilities;
- 5) Harmonize privacy and personal information rules among competent government bodies for use of Big Data and analytics in cloud computing environments;
- 6) Introduce a policy framework that promotes delivery of telehealth services and supports companies willing to invest and develop new business models in this emerging sector;
- 7) Improve coordination across the various ministries involved in regulating the sector; and
- 8) Implement existing global telehealth standards and assume a leadership role in the ongoing development of future global standards.

In 2013, the American Health Information Management Association (AHIMA), through a project supported by the ITA, launched an effort to develop a global health information management curriculum to

instruct new entrants to Health IT (students and those switching careers), as well as career healthcare workers, on appropriate governance and data analysis techniques. This initiative involves experts from countries worldwide, including Yukiko Yokobori of the Japan Hospital Association.

The curriculum is currently under review by education and workforce experts, and may be ready for implementation worldwide by mid-2015. Japan would significantly benefit by being an early adopter of the finalized curriculum and introducing the coursework into universities and professional development institutions to address their Health IT workforce shortage and possibly increase adoption of Health IT technologies.

Japanese and U.S. Government and private sector representatives have also engaged in a series of meetings in recent years, forming a good foundation for future discussions. These include the following:

- 1) A 2013 week-long interagency delegation visit to Japan by representatives from HHS (Office of National Coordinator), Veterans Administration, ITA, and National Institute of Standards and Technology. The visit included meetings with Japanese ministries (MHLW, METI, MIC, MOFA), as well as industry, legislative, academic and trade association officials (more details on this trip below);
- 2) The 2013 and 2014 meetings of the U.S.-Japan Internet Economy Dialogue, which singled out healthcare as one of the major areas of potential cooperation;
- 3) A September 2014 meeting in Washington including U.S. Government, Keidanren, ACCJ and industry trade associations;
- 4) U.S. Government meetings with representatives of the Japanese Association of Healthcare Information Systems Industry (JAHIS) at HIMSS Annual Conference, 2013-14; and
- 5) Meetings with Japanese Embassy in 2013-14.

ACCJ and industry identified five possible Health IT areas of cooperation through the U.S.-Japan Internet Economy Dialogue: 1) healthcare data standardization, 2) healthcare big data and data utilization, 3) privacy and security, 4) How IT plays a role in National Health Insurance, and 5) preventative care and IT.

Some follow-up opportunities identified during the September 2013 U.S. delegation visit include:

- 1) Addressing the shortage of Health IT workers in Japan;
- 2) Advising Japan on efforts to standardize data exchange (such as the “SS-Mix” system);
- 3) Meeting with city and local government officials leading the effort on piloting new Health IT products and services (may include Shimane, Kanagawa, and Okayama prefectures);
- 4) Focusing on disease prevention, rather than treatment of chronic disease;
- 5) Pursuing METI interest in supporting private sector initiatives;
- 6) Educating Japanese officials on lessons learned from U.S. Health IT rollout;
- 7) Encouraging increased Japanese involvement and activity with international Health IT standards-setting bodies; and
- 8) Discuss transition of Health IT pilot projects in Japan to long-term sustainability.

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Kenya

Type of Market: Small/Frontier

Kenya, the second highest ranked country in this Report from the African continent (behind South Africa), has made noteworthy progress in developing a sound policy foundation to manage the rollout of Health IT in the country. Besides adopting a National e-Health Strategy extending through 2017, a Health Law is currently under stakeholder review that would develop policy for many subjects impacting the introduction of Health IT. Although a small Health IT market (between \$10-20 million), Kenya established sectoral policies early with strong stakeholder involvement, is recognized for general adoption and acceptance of modern technology, and has several large commercial projects currently underway. Therefore, Kenya is an appealing destination for companies looking for new markets for their mobile health and telehealth products and services.

Overall Rank

48

Kenya's overall rank is in the bottom third of the rated countries because of very low per capita expenditure on health, modest Internet access and mobile phone subscription rates, and a relatively young, highly rural population. However, Kenya has already taken several noteworthy steps to create a favorable Health IT investment environment, particularly for telehealth and mobile health applications. As a result, the low rating should not be seen as a disincentive for U.S. companies to introduce telehealth and mobile health applications.

On the contrary, the mismatch of healthcare professionals based in urban areas in Kenya relative to a largely rural population; a policy environment receptive to new technologies; and a lack of widespread reliable power supplies makes the use of devices for mobile health/telehealth interventions a more likely set of delivery mechanisms to communicate and gather health information. The relatively young population may also be more likely to embrace mobile technologies for transacting business and tracking their health condition.

In August 2011, Kenya instituted a six-year National e-Health Strategy ("Strategy") for the deployment of Health IT, the culmination of a three-year period of stakeholder engagement at both the policy and technical levels, including involvement by stakeholders from the public and private sectors, civil society and academia. The World Bank Group's Healthcare in Africa initiative worked with the Ministry of Health (MoH) and played a key role in developing the Strategy's implementation framework. Five "Strategic Areas of Implementation" are highlighted in the

Strategy: Telemedicine, Health Information Systems (HIS), Mobile Health, e-Learning, and Information Systems. Health cards are becoming increasingly available for individuals and families to spend on mobile health. Another motivation for the e-Health Strategy was to realize the citizenry's right to health contained in Kenya's Constitution.⁵⁸

In November 2013, at a U.S. Agency for International Development-organized mHealth conference in Addis Ababa, Kenya reported that the country had established an mHealth Committee containing public and private sector participants, comprised of three working groups: research; stakeholder mapping; and how best to link supply and demand. In addition, MoH completed a stakeholder mapping exercise, established a separate e-Health office, and was involved in ongoing discussions with the Communication Commission of Kenya (CCK) regarding affordable tariffs for mHealth applications.

In 2014, a Health Bill was introduced in Kenya that seeks to establish a unified health system and specifically focuses on Health IT as a recognized mode of health. The Bill provides for the enactment of legislation to facilitate electronic transactions covering:

- 1) The administration of health information banks, including provisions addressing appropriate standards for interoperability, data interchange and security;
- 2) Collection and use of personal health information;
- 3) Managing disclosure of personal health information;
- 4) Protecting privacy;
- 5) Business continuity, emergency and disaster preparedness;

- 6) Health service delivery through mHealth, eLearning and Telemedicine;
- 7) eWaste disposal; and
- 8) Health tourism

The Health Bill is currently undergoing a stakeholder review and consultation process.

Challenges in the Market

The Kenyan Constitution, updated in 2010, permitted the formation of 47 new county-level governments in 2013. These governments are both distinct and interdependent with the national government. Healthcare delivery is one of the services that have devolved to the county-level governments. The proposed 2014 Health Bill seeks to coordinate the relationship between the national government (represented by MoH) and the 47 county government health systems. With specific regards to Health Information Systems, while the proposed bill states that MoH shall facilitate the establishment and maintenance of a comprehensive Health Information System (HIS), it also acknowledges that county governments can make laws with regards to HIS for that specific county and the city, urban and municipal areas within that county.

Although all Kenyan government procurement is guided by the Public Procurement and Disposal Act of 2005 and Public Procurement and Disposal Regulations of 2006, there may be some early challenges in obtaining approval from the county-level governments on new mobile health and telehealth projects, resulting in possible delays in launching some of these projects. In addition, while consultations leading to the introduction and (possible) passage of the aforementioned Health Bill are taking place, there may be some hesitancy on the part of the local government to approve new projects until the rules under which the counties can make these decisions are finalized.

Opportunities for U.S. Companies

In February 2015, President Uhuru Kenyatta announced that the national government would upgrade and modernize 2 hospitals per county throughout Kenya (a total of 94 facilities) over the next decade with the latest state-of-the-art medical equipment to address specific non-communicable diseases (cancer, diabetes, and kidney failure). Total purchases over the decade under this initiative are expected to be in the vicinity of \$4 billion, with

internationally known vendors (including General Electric, Philips, and Mindray Biomedical of China) receiving a majority of these orders. Using this new equipment to treat patients likely will result in mobile health and telehealth applications that U.S. vendors can deploy to treat these conditions in the Kenyan population, and may also lead to further healthcare investment in other treatment areas.

In addition, several Health IT initiatives are currently underway in Kenya. Some notable examples are:

1. The Kenyan Government, Hewlett Packard (HP) East Africa, and the Clinton Health Access Initiative (CHAI) jointly launched an initiative in 2011 to develop an Integrated Disease Surveillance and Response (IDSR) system that enables health workers to detect and manage disease outbreaks through 250 HP Palm Pre-Smartphones via a Web Operating System (WebOS).
2. Safaricom, Kenya's leading mobile network operator (MNO), in partnership with "Call-a-Doc," launched in November 2011 a mobile health service called "Daktari1525" that enabled Safaricom's subscriber base of over 21 million to call doctors at any time of the day and receive expert advice on health issues. However, due to some unanticipated hitches, Safaricom has suspended the service.

Safaricom, and its philanthropic arm, mPesa (globally recognized as a leading platform for use of mobile money), see mobile health as an innovative way to deliver "innovative, commercially viable and sustainable solutions that transform the lives of Kenyans by increasing their access to services."⁵⁹ The company sees that there are unmet needs given (for instance) low doctor/patient ratio and high maternal and child mortality, and knows that their network may be the only access to the outside world for many people. Safaricom has also introduced a messaging service and a Micro Health Insurance scheme.

3. Also in 2011, it was reported that a South African IT firm, Pharos Avantgard was also looking for partners to use its mobile phone application that uses USSD and SMS platforms to monitor and manage medical therapies. Dubbed "M-Nurse", the application is used in South Africa by HIV/AIDS patients on antiretroviral (ARV) drugs and also allows third party monitoring to aid early intervention through notifications and monitoring trends.
4. The Center for Health Management Information

(CHMI), an organization funded by the Department for International Development (DFID), the Bill & Melinda Gates Foundation, and the Rockefeller Foundation, promotes programs, policies and practices that make quality health care delivered by private organizations affordable and accessible to the world's poor. CHMI has recently profiled 187 programs in Kenya – the second highest number of programs in any one country in the database and the most of any African nation.⁶⁰

In addition, there has been significant health-related R&D investment in Kenya over the last 1.5 years. This includes IBM's establishment of its first Africa Research Lab in Nairobi, and Medtronic's interest in establishing an R & D facility in Nairobi. Additionally, Dutch technology firm Royal Philips announced in March 2014 of its plan to establish its first Africa research laboratory in Nairobi.

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Saudi Arabia

Type of Market: Large/Developing

Saudi Arabia is ready for large-scale adoption of Health IT in its healthcare system. The government has a Health IT plan in place and is developing a network to connect all government supported health facilities and hospitals. The government has created a favorable environment to promote entry of companies into the Health IT market and particularly relies on imported technologies and workforce for the healthcare sector.

Overall Rank

30

Saudi Arabia has a relatively modest ranking using this Report's methodology, primarily due to low research and development and health expenditures per capita, and a reasonably young population. However, the market prospects for Saudi Arabia contradict this ranking in important ways, since the country imports the vast majority of its health care products and services; has an increasingly serious burden of non-communicable diseases among its citizenry; and is well-suited for widespread adoption of mobile health technology.

The size of the Saudi Arabian Health IT market is somewhere between \$500 million and \$1 billion. The Saudi government has already taken several significant steps to create a national eHealth network. First, in 2011 the government developed and started implementing a two-phase, 10-year plan to modernize and expand the Integrated and Comprehensive Health Program, which will connect more than 3,000 government-managed healthcare facilities by 2020. A large component of the plan is generating an interoperable and uniform nationwide information exchange platform. Saudi Arabia took the initiative to launch the system using internationally accepted standards, such as ICD-10, making it easier for U.S. companies to provide products and services for the Saudi health system.

The Saudi government has implemented regulations around Health IT, medical devices, data privacy and security, and telecommunications that are generally favorable to foreign businesses seeking to enter the Saudi market. The Ministry of Health (MOH) operates a procurement process for Health IT, and has now pre-qualified three global consortia to provide a connected Health IT network for all the public facilities and hospitals. The MOH has taken a lead role in developing standards so that the nodes throughout the network can easily communicate with each other.

Saudi Arabia's healthcare system has multiple tiers of care. Patients must first access care through local primary care centers and require referrals for general and specialized hospital services, which exist mainly in cities. Services are in high demand because the population is increasing and non-communicable diseases are becoming more prevalent. This is further influenced by a growing urban population, a sedentary lifestyle, and high (22 percent) smoking rate.

Non-communicable diseases such as cardiovascular disease, diabetes, and cancer, account for 71 percent of mortality, a high incidence made more noteworthy because the Saudi population is generally quite young, with 30 percent under age 15. The Saudi population has increased nearly 50 percent over the past decade, and by 2020, only about 22 percent of the population will be 45 years of age or above. The MOH has implemented educational and prevention programs through the Center for Non-Communicable Disease to promote healthy lifestyles.

The government has goals to balance the distribution of health services geographically and demographically throughout the country; adopt quality and performance measures/standards; improve healthcare service management and efficiency; and make care more affordable. To achieve these goals, Saudi Arabia must increase the size of the health workforce and the number of facilities, including providing adequate training and support systems. Currently, the healthcare system is dependent on importing healthcare workers, but the government is developing educational programs to boost the domestically trained workforce. About 67 percent of expenditure on health in 2010 was government support to provide free services.

Total healthcare spending is approximately 5 percent of GDP. The private health insurance sector is growing with encouragement from the government, though it is perceived as expensive with high out-of-pocket costs.

There were 26 different health insurance companies in 2012, causing fragmentation of the system and increased inefficiency and cost. Streamlining reimbursement processes is another area where the Saudi government plans to get involved. The Council for Cooperative Health Insurance regulates health insurance spending and is trying to implement a scheme to reduce the financial burden.

Challenges in the Market

The mobile communications market is saturated by mobile operators, and consumers often have more than one mobile phone plan (176 percent of the population has a mobile subscription, but roughly half of these are prepaid subscriptions). 4G services are prevalent in the big cities, with 3G available elsewhere. Saudi Arabia intends to expand 4G coverage in the next few years. The mobile market is not predicted to grow overall; U.S. companies interested in mobile health should rely on currently available handsets and services. The three main network operators (Saudi Telecommunications Company, Mobily, and Zain) and the recent addition of Virgin Mobile and Lebara have led to revenue declines for mobile service providers.

The high level of prepaid subscriptions may eventually impose limitations on availability of sophisticated mobile services, due to the sizable amount of data and bandwidth needed for sharing images and downloading video. Future developments related to the consolidation of the health insurance market and review of reimbursement policies may also become challenging to Health IT providers, particularly those seeking reimbursement for novel mobile health and telehealth interventions.

Opportunities for U.S. Companies

The Saudi Health IT market is relatively open. Since products and services are typically imported, there is no local competition, thereby representing a major opportunity for U.S. companies to enter the market and develop a presence. The national interoperable eHealth system that connects all levels of healthcare is particularly favorable as U.S. companies can implement products or services at a national scale. A standard strategy for controlling health insurance spending from the Council for Cooperative Health Insurance may boost the Health IT market.

In the meantime, strategies for increasing efficiency among the healthcare sector may be of particular

value to Saudi Arabia. This may also include telehealth strategies to connect the small healthcare workforce to the geographically distributed population.

In addition to increased efficiency, Saudi Arabia needs more widely available mobile health and telehealth interventions for lifestyle diseases, such as obesity and diabetes.

Saudi Arabia has a high rate of mobile phone penetration and 60 percent of the population has an Internet subscription. These factors provide a strong consumer base for uptake of mobile health technology. The population is young, growing, and well connected to mobile technology.

Saudi Arabia is also a regional leader in the Middle East when it comes to healthcare. It promotes collaboration through its leadership position in the Executive Board of the Health Ministers' of the Gulf Cooperation Council (GCC) and through the creation of the Eastern Mediterranean eHealth Information Network in 2014. Saudi Arabia provides regional support for healthcare through its centers of excellence in healthcare services and research. Therefore, U.S. companies entering the Saudi market, and effectively implementing Health IT solutions there, may serve as a springboard to the rest of the region.

Patient expectations are also rising in Saudi Arabia. Comparing satisfaction levels for public and private hospitals, surveys show that public hospitals come under more patient criticism than private hospitals (particularly for their limited appointment hours, long waiting times, and uncomfortable facilities). Healthcare officials in private and public sectors are focusing more on the patient's experience. This creates opportunities for Health IT companies to address this need.

In order to raise standards of care, the Saudi Government is already encouraging international institutions and companies to set up and/or manage health care facilities in the Kingdom. The advent of internationally-acclaimed providers will also bring about opportunities for IT providers to implement systems for clinical quality and cost-revenue analysis, thereby improving transparency and performance. In addition, the 2015 state budget announced a number of healthcare projects, including the construction of three new hospitals, eleven medical centers and ten comprehensive care clinics.⁶¹ These new facilities will

offer additional procurement opportunities for U.S. Health IT companies.

The Saudi government has made progress in combating illiteracy. Additional investments in ICT systems would also bridge the gap between physicians and their patients; as the latter are increasingly using the Internet for health care information, and engage with other patients and providers through social media. As Saudi healthcare officials adopt global best

practices, increasing the functional health literacy of their citizens will be crucial in improving patient engagement and treatment. Engaging the family caregiver is a cornerstone of patient engagement in Saudi Arabia.

Health IT companies offering products and services that enhance patient engagement will find a market with extensive but special needs in Saudi Arabia.

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Appendix 1: Methodology

As there is currently no consensus definition of Health IT, finding hard data on the sector is also very difficult. There currently are minimal Health IT-specific metrics for measuring the size and scope of the sector. For instance, there are no North American Industrial Classification System (NAICS) or Harmonized Tariff System (HS) lines for Health IT products or services, making accurate measurement of the market size for individual countries impossible, as well as determining import/export levels and corresponding trade balance. In addition, the large services component of Health IT (for example, healthcare services and services for data storage and exchange) is not well reported in government datasets, as is often the case with service industries.

As a result, many metrics used to rank the countries in this report are proxy indicators. For the purposes of this report, metrics were chosen to cover six categories that might influence the overall Health IT market: intensity (support for innovation and development); workforce; infrastructure (health and ICT); policy environment; demographics; and macroeconomic indicators.

For each category, a list of metrics that would be useful was generated. Those metrics with extensive datasets for at least one year from 2010-2014 were used. Other potential metrics did not have enough publicly reported data to be included in the analysis.

Data was collected from the sources indicated. The most recent data available with the broadest inclusion of countries was used for each metric. The year is indicated for each metric.

Raw data was obtained from datasets and reports from sources such as the World Health Organization's (WHO) Global Health Observatory (GHO), World Bank, and the International Telecommunication Union. Additional data was collected from WHO regional reports,⁶² other organization/industry reports, and U.S. Department of Commerce Consumer Service survey responses. While every attempt was made to use the most current data, some metrics were compiled from previous years' reporting to maximize the number of countries included in the final ranked list. No data prior to 2010 was used as part of the analysis. Complete datasets were obtained for 80 countries, which were ranked in the final analysis.

Categories and metrics used to determine country ranks

1. Intensity

Since the Health IT sector uses high-tech solutions from other industries to address health-related problems, the authors thought it important to include a measure of research and development spending. Higher spending reflects a country's increased desire to encourage innovation and development of new technology. A country that has high intensity scores could be more willing to invest in the new and growing field of Health IT.

Intensity is measured by:

Total R&D expenditure as percentage of GDP <http://wdi.worldbank.org/table/5.13>

2. Workforce

Healthcare workforce, measured by physician density, estimates the current number and distribution of healthcare workers in a country, and serves as a proxy indicator of whether Health IT is needed to compensate for the lack of general practitioners and specialists. While the workforce needed to support a broad Health IT infrastructure goes beyond healthcare professionals, mechanisms to define the various roles of all stakeholders in the Health IT workforce are still being developed and therefore accurate metrics are unavailable. In this report, workforce is used to indicate the health capacity needs of a country and potential avenues for greater use of mobile health and telehealth products and services as a result.

Initially, numbers of nursing and IT professionals were included in the workforce measurement, to reflect the broad scope of the Health IT workforce, but data reporting on these metrics is sparse and therefore

they were removed from the ranking analysis. In the future, improved reporting specifically on Health IT professionals (physicians, nurses, and other specialists) would aid in identification of workforce gaps in countries, and consequently areas where Health IT deployment could be utilized.

Workforce is measured by:

Density of physicians per 1,000 people <http://apps.who.int/gho/data/node.main.A1444?lang=en>; supplemented by WHO's Atlas of African Health Statistics 2014, p. 66 (permitted inclusion of five more African countries)

3. Infrastructure

The Health IT infrastructure consists primarily of health services and ICT services. The level of infrastructure in place in a country will determine what mobile and telemedicine products and services are appropriate to implement. Infrastructure may also highlight countries that require service improvements and identify markets for Health IT companies focused on more fundamental support. While reporting on healthcare expenditures is inconsistent from country to country, healthcare spending per capita proved a useful indirect measure of the scope of healthcare infrastructure. For ICT infrastructure, 2G was considered a minimum level of service for mobile health, with 3G and 4G services being preferred for more sophisticated mobile health and telehealth services. In addition to ICT infrastructure, ICT use is an important driver of the mobile health and telehealth sectors and therefore mobile and Internet subscriptions were key metrics for determining potential market size.

Infrastructure is measured by:

Per capita expenditure on health <http://apps.who.int/gho/data/view.main.1920ALL>
Mobile phone subscriptions per 100 people <http://data.worldbank.org/indicator/IT.CEL.SETS.P2>
Internet subscriptions per 100 people <http://data.worldbank.org/indicator/IT.NET.USER.P2>

Type of mobile and internet services available

- a. Scored services as follows: 2G=0, 3G=1, 4G=2
- b. Used Global mobile Suppliers Association data on LTE and HSPA commercial network deployment (gsacom.com), updated December 2014
- c. Confirmed and updated with GSM world coverage stats <http://www.worldtimezone.com/gsm.html>

4. Policy

The policy environment has a significant impact on encouraging a thriving Health IT market. However, this is a difficult area to measure, particularly as consensus does not exist regarding what constitutes a supportive Health IT policy environment. Policy scores reflect the government's ability to promote development of the Health IT sector. Implementation of policies, like a strategic plan for Health IT, indicates the level of government support for large-scale Health IT projects. Regulations that either facilitate or inhibit data exchange, data storage, privacy and security, and health technology, such as medical devices, can serve to indicate a country's receptivity to the latest products and services from Health IT vendors based overseas.

Policy is measured by:

If a country has an eHealth strategic plan and if it has been implemented

- a. Used WHO Global Observatory for eHealth 2010 and 2013 surveys
 - b. National ehealth policy/strategy exists Yes = 1, No=0
 - c. Implementation status Yes =1, No=0; 0.5 was awarded for partial implementation
 - d. Score reflects these two combined: nothing = 0, strategy or policy exists =1, and implemented =2
- Regulatory environment
- a. Used WHO International Health Regulations, coordination score (2013) which is a percentage of IHRs that have been implemented <http://apps.who.int/gho//data/view.main.IHRCTRY02v?lang=en>
 - b. For missing data, used survey responses to calculate the percent of regulations in topics related to Health IT that have been implemented

Aid received as percentage of GDP

<http://data.worldbank.org/indicator/DT.ODA.ALLD.CD/countries>

5. Demographics

Currently, the main use cases for mobile health and telemedicine are to expand access to healthcare services and help manage chronic conditions that primarily affect the aging population. The demographics of a country help estimate how much of the population would benefit from Health IT. Creating a ratio of old vs. young people in a country gives a sense for the relative rate at which a population is aging. This ratio is useful because an older population is likely in greater need of cutting-edge technologies to manage chronic disease; however, a younger-skewing population is more likely to adopt and integrate technology into their daily lives, and might be more receptive to healthcare delivery over smartphones, tablets, and other sophisticated mobile-based tools. For this report, a point-in-time ratio was used; the rapidity and scale of how this metric changes for each country would be valuable to include in the next update.

Demographics are measured by:

Percent of population that is urban <http://apps.who.int/gho/data/view.main.100015>

Ratio of population over 65: under 15 <http://wdi.worldbank.org/table/2.1>

a. a ratio of over 65: under 15 was used to get a sense for the population distribution

6. Macroeconomic Indicators

Macroeconomic indicators are important to include in any commercial market analysis. While not specific to HIT, these indicators provide information about overall market opportunities within a country.

Macroeconomic indicators are measured by:

GDP <http://data.worldbank.org/indicator/NY.GDP.MKTP.CD>

Together, these categories cover the primary factors influencing the international Health IT market.

As an additional source, the U.S. Department of Commerce's International Trade Administration Commercial Service specialists were surveyed for information on specific countries (see survey questions in Appendix III). Responses to this survey were included in the data compiled for top market rank determination and in the highlighted case studies. 27 survey responses were received from Commercial Service specialists from around the world.

Determining final score for ranking countries

To determine country rankings, each metric was assigned a weighting based on the quality of the data and on how much it directly influences Health IT. Values for each metric were normalized so the country with the top score received 100. Aid received was inversely correlated with score, such that countries receiving no aid received a score of 100. The physicians per 1,000 people metric was also inversely correlated with score, so that countries with few physicians in their population were considered more likely candidates to adopt mobile health and telehealth solutions. While a minimum number of highly trained staff may be required, physician density had little effect on the overall country rankings when considered as a driver or barrier to Health IT market. Normalized scores were then multiplied by the weighting and summed to generate a final score. Countries were ranked based on total final score. Countries with incomplete datasets were excluded from the final rankings.

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Appendix 2: Full Country Rankings

1. Japan
2. Switzerland
3. Netherlands
4. Germany
5. Finland
6. Sweden
7. Norway
8. Denmark
9. Austria
10. Republic of Korea
11. Singapore
12. Australia
13. Canada
14. Iceland
15. Belgium
16. France
17. United Kingdom
18. New Zealand
19. Spain
20. Ireland
21. Czech Republic
22. Slovenia
23. Israel
24. Portugal
25. Chile
26. Poland
27. Malaysia
28. Slovakia
29. Italy
30. United Arab Emirates
31. Saudi Arabia
32. China
33. Croatia
34. Brazil
35. Greece
36. Costa Rica
37. Montenegro
38. Iran
39. Panama
40. South Africa
41. Bulgaria
42. Mexico
43. Argentina
44. Uruguay
45. Colombia
46. Indonesia
47. Paraguay
48. Romania
49. Azerbaijan
50. Bolivia
51. Kenya
52. Thailand
53. Republic of Moldova
54. Botswana
55. Zambia
56. India
57. Armenia
58. Ghana
59. Georgia
60. El Salvador
61. Egypt
62. Turkey
63. Serbia
64. Uganda
65. Nigeria
66. Iraq
67. Jordan
68. Tajikistan
69. Tanzania
70. Gambia
71. Ukraine
72. Sri Lanka
73. Pakistan
74. Cuba
75. Ethiopia
76. Senegal
77. Mozambique
78. Madagascar
79. Dem. Rep of Congo
80. Burkina Faso

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Appendix 3: Consumer Services Survey

Thank you in advance for completing this survey. We are looking for information that provides us with a sense of how easy it is for Health IT companies to operate in your country, how much coordination takes place between government ministries involved in Health IT, and whether U.S. Health IT companies will face intense competition if they choose to enter your country's Health IT market. For the purposes of this survey and the resulting report, we are specifically focusing our study's scope to mobile health and telehealth products and services. The answers you provide on this survey will help to determine the outcomes of the report and the countries that are highlighted for more in-depth case studies.

1. What is the approximate size of the health IT market in your country (in USD)?
<\$10 mil; \$10-20 mil; \$21-50 mil; \$51-100 mil; \$101-200 mil; \$201-500 mil; \$501-1000 mil; >\$1000 mil
Is this amount likely to increase, stay the same, or decrease?
Is grant based funding a significant portion (more than 25 percent) of this total?—Yes/No
2. How easy is it for foreign (US) businesses to work within your country's Health IT policy and regulatory environment?
 - a. It is difficult or inhibitory for US health IT businesses
 - b. It does not hinder or help US health IT businesses
 - c. It is easy for US health IT businesses because the policy and regulatory environment is supportive
 - d. There is no policy or regulatory environment that impacts health IT businesses

Please provide some rationale or explanation for your choice.

3. Has the government proposed/implemented policies impacting Health IT? Policies relevant to mobile health and telemedicine may include data storage, privacy and security, telecommunications, health, etc.
 - a. No policies
 - b. Are developing a health IT roadmap
 - c. Have a health IT roadmap
 - d. Have a roadmap and are discussing policies
 - e. Policies have been implemented

If yes, for each policy, provide its name, which agency is in charge, the date it was implemented or last updated, the other agencies involved, and how much coordination takes place between agencies.

4. Has the government proposed and/or implemented regulations or standards in one of these areas that may affect Health IT?

	No regulations	Discussing regulations	Regulations implemented
a.	Health IT		
b.	Population Health		
c.	Patient-oriented Health		
d.	Medical Devices		
e.	Telecommunications		
f.	Mobile Technology		
g.	Privacy and Security		
h.	Data Storage		

If yes, please list each regulation or standard, which agencies are in charge of its implementation, and the date it was implemented or last updated.

5. Does the government purchase Health IT through a procurement process?—Yes/No

If yes, describe the process and what aspects of Health IT are subject to procurement, noting which agencies are involved.

6. What local manufacturers/service providers (including telecom) are planning to invest/enter the Health IT market? Please list.
7. Have U.S. Health or Health IT companies asked for Commercial Service assistance in entering the market in your country? Yes/No
If yes, which companies and for what products/services?

8. What types of mobile and internet networks are available in your country, and what are the penetration rates? Pick all that apply:

	Available in (percent)	Big Cities	Rural Areas	Not Available	Penetration Rate
a.	Mobile: Broadband				
b.	2G				
c.	3G				
d.	4G				
e.	Internet: Broadband <256 kbps				
f.	Broadband 256 kbps to 2 Mbps				
g.	Broadband 2 Mbps to 10 Mbps				
h.	Broadband >10 Mbps				
i.	Cable				
j.	Satellite				
k.	Dial-up				
l.	Wi-Fi				

Have any network upgrade plans been announced?

9. What does the R&D environment look like over the next 3 years (percent of GDP)?
<0.5 percent; 0.5-1.0 percent; 1.01 percent-1.50 percent; 1.51 percent-2.0 percent; 2.01 percent-2.5 percent; 2.51 percent-3.0 percent; <3 percent
Is this amount likely to increase, stay same, or decrease? What factors does this depend on?

Appendix 4: Glossary of Terms

There are no universally accepted definitions for many of the key terms used in describing the Health IT sector. Definitions from the World Health Organization (WHO)⁶³ are used in this glossary (unless otherwise noted) to minimize confusion and in an effort to present a coherent understanding of the interrelationships and distinctions between different components of Health IT.

It is worth noting that although the U.S. Department of Health and Human Services (through the Health IT.gov website) does not specifically define the sector, they focus on three specific software uses of Health IT (electronic health records (EHRs), personal health records (PHRs), and e-Prescribing (allowing a doctor or medical practice to communicate directly with a pharmacy)). As noted in the Sector Overview section, other Health IT definitions reference tracking and detection of counterfeit pharmaceuticals, disease surveillance, drug monitoring, cloud computing, health data analytics, and wearable technologies used for monitoring health.

Health Information Technology (Health IT): The transfer of health resources and health care by electronic means. It encompasses three main areas:

- The delivery of health information, for health professionals and health consumers, through the Internet and telecommunications.
- Using the power of IT and e-commerce to improve public health services, e.g. through the education and training of health workers.
- The use of e-commerce and e-business practices in health systems management.

E-Commerce (World Trade Organization): The production, distribution, marketing, sale or delivery of goods and services by electronic means.

E-Health: Used interchangeably with Health IT. E-Health is the preferred term in Europe and the WHO, and WHO uses the above definition for Health IT to define e-Health.

Mobile Health (mHealth): Medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants and other wireless devices.

Telehealth: Includes surveillance, health promotion and public health functions. It is broader in definition than telemedicine, as it includes computer-assisted telecommunications to support management, surveillance, literature and access to medical knowledge.

Telemedicine: Use of telecommunications to diagnose and treat disease and ill-health.

Telematics for health: A composite term for both telemedicine and telehealth, or any health-related activities carried out over distance by means of information communication technologies.

Telecare (Business Monitor International): the use of mobile and Internet technology to provide clinical care and non-clinical services such as health education, disease surveillance and drug monitoring.

World Health Organization (WHO): A United Nations specialized agency with 191 member states concentrating exclusively on health by providing technical cooperation, carrying out programs to control and eradicate disease and striving to improve the quality of human life. WHO's mission statement includes the following objectives:

- To act as the directing and coordinating authority on international health work;
- To promote technical cooperation;
- To assist governments, upon request, to strengthen health services;
- To provide technical assistance and, in emergencies, aid;
- To stimulate and advance work on the prevention and control of endemic diseases;

- To promote, in cooperation with other agencies, the improvement of nutrition, housing, sanitation, recreation, economic or working conditions and environmental hygiene;
- To promote and coordinate biomedical and health services research;
- To promote improved standards of teaching and training in health, to establish and stimulate the establishment of international standards for biological, pharmaceutical and similar products, and to standardize diagnostic procedures; and
- To foster activities in the field of mental health and the harmony of human relations.

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- ⁵⁷ Business Monitor Online - Industry Trend Analysis - Healthcare Costs Rising Despite Cost Cutting Initiatives - September 16 2013.
- ⁵⁸ "First National e-Health Strategy Paves Way for Quality Healthcare in Kenya," ReliefWeb (on-line resource), August 12, 2011
- ⁵⁹ "Scaling Up Mobile Technology: Applications for Accelerating Progress on Ending Preventable Maternal and Child Deaths," USAID mHealth Meeting, Addis Ababa, Ethiopia (November 2013), p. 9.
- ⁶⁰ For more information please visit:
<http://healthmarketinnovations.org/sites/default/files/Database%20at%20a%20Glance%20Kenya.pdf>
- ⁶¹ Saudi Arabia – "Increased Healthcare Budget Allocation Will Be Realised," BMI, February 11, 2015
- ⁶² For example, WHO-EM. *Demographic, Social and Health Indicators for Countries of the Eastern Mediterranean*. 2013
- ⁶³ Definitions from WHO taken from the website <http://www.who.int/trade/glossary/story021/en/>

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