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TRADE
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2016 Top Markets Report **Health IT**

A Market Assessment Tool for U.S. Exporters

July 2016



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Executive Summary

Health Information Technology (Health IT) is a relatively new and rapidly developing commercial sector, both in the United States and overseas. Current challenges for exporting Health IT frequently stem from the lack of consensus both around what comprises Health IT and/or how best to support market development for the sector's products and services. This Health IT Top Market Report (hereafter "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 assess the relative export opportunities in the sector across 100 countries.

Health IT can best be 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. Export categories include health-related services (for example, management of hospital departments, treatment protocols, clinical trials, administration of claims data and supplies), data-related services (storage, analytics), Information and Communication Technologies (ICT) hardware (routers, computers, tablets, mobile phones), medical devices (data and images, gathered and stored, that can help patient care when shared using products such as magnetic resonance imagery—MRI—machines and computed tomography—CT—scanners), education (training of Health IT professionals) and software (electronic health records, clinical decision software).

Several cross-sectoral issues also impact Health IT export prospects, including standards, availability of high-speed Internet and state-of-the-art mobile phone networks, reliable power supplies, and the privacy and security of data and images. The diversity of sectors which intersect Health IT offers companies from many backgrounds opportunities to make a meaningful (and possibly disruptive) impact on the scope and direction of the sector, 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 Health IT subsectors discussed in passing in this Report include electronic health records (EHRs), tracking and detection of counterfeit pharmaceuticals, disease surveillance, drug monitoring and wearable technologies. Most of the policy and market access issues for these subsectors are distinct from those affecting mobile health and telehealth, but areas of overlap will be noted as appropriate.

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, this Report focuses on mobile health and telehealth because they have gained a solid 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 and policy purposes because countries can adopt some of these technologies relatively quickly. In contrast, more sophisticated technologies, such as EHRs, typically require more time to implement, may not be appropriate in all situations 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, scalable opportunities for business globally.

A November 2015 report from MarketsandMarkets estimates that the global mobile health market is expected to experience a compound annual growth rate of 33.4 percent over the next five years, reaching \$59.15 billion by 2020,¹ whereas EHR technology has been adopted in only a handful of countries to date and is expected to have less significant growth in the near future. The lack of consensus among governments regarding best practices and policies for mobile health and telehealth also presents a role for the U.S. government to have a meaningful impact on policy development that will drive export growth in these subsectors.

In 2015, many developments took place in the Health IT sector, both among industry players and with closely allied stakeholder sectors (such as insurance companies). Examples of these activities appear below in the Overview section. Only a few of these developments, however, directly impacted the Health IT market globally. This

occurrence is relatively consistent with activity in recent years, particularly given that processes for overseas procurement of Health IT products and services often extend over a long timeframe. In most countries, before making investments, there appears to be a wait-and-see attitude as to how countries further along on the implementation curve, such as the United States, Denmark, and the United Kingdom, fare with deploying their Health IT systems.

U.S. companies, however, should also consider the potential first-mover advantage of turning their attention toward international markets, even in places where all rules and regulations have not been finalized, particularly because some countries are looking to develop indigenous capacity to meet Health IT sector needs. Several governments have announced investments in the health and life sciences sector, possibly leading to creation of companies which could become future competitors (see examples in Korea and Singapore Country Case Studies; China has also made a similar announcement).

Two other areas to pay attention to in 2016:

- 1) The development of the Internet of Things (discussed briefly below) and its impact on healthcare. Cities, regions and countries worldwide are looking closely at the opportunities available in digitally connecting devices under their jurisdiction. Given the high costs involved with provision and delivery, policymakers likely will have a particularly keen interest in using these technologies to address the cost and delivery of healthcare services.
- 2) The forthcoming update of the U.S.-European Union Health IT/eHealth Roadmap (hereafter “U.S.-EU Roadmap”),² the third edition since the December 2010 signing of a Health IT Memorandum of Understanding (MOU) between the U.S. and EU. More details on the Roadmap appear in the “2015 Key Developments” section. Depending on the agreed-on priorities under the “Innovation Ecosystem” work-stream, promising opportunities are possible for U.S. companies to develop pilot programs in Europe to demonstrate proof of concept of their solutions, and/or find collaboration partners for cutting-edge technologies.

Overview and Key Findings

Introduction

Health Information Technology (Health IT) is a dynamic, multifaceted sector that has the opportunity to dramatically influence delivery, efficiency, patient care and cost for healthcare markets worldwide. Health IT can be 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 Communication Technologies (ICT) sectors can derive benefits from implementing Health IT in their jurisdiction. The widespread potential for Health IT

Developments in the Internet of Things area will likely have a significant impact on the Health IT sector in 2016 and beyond.

implementation, along with the fact that other countries are facing concerns about providing affordable healthcare, makes the sector an attractive opportunity for increased exports by a wide variety of U.S. companies.

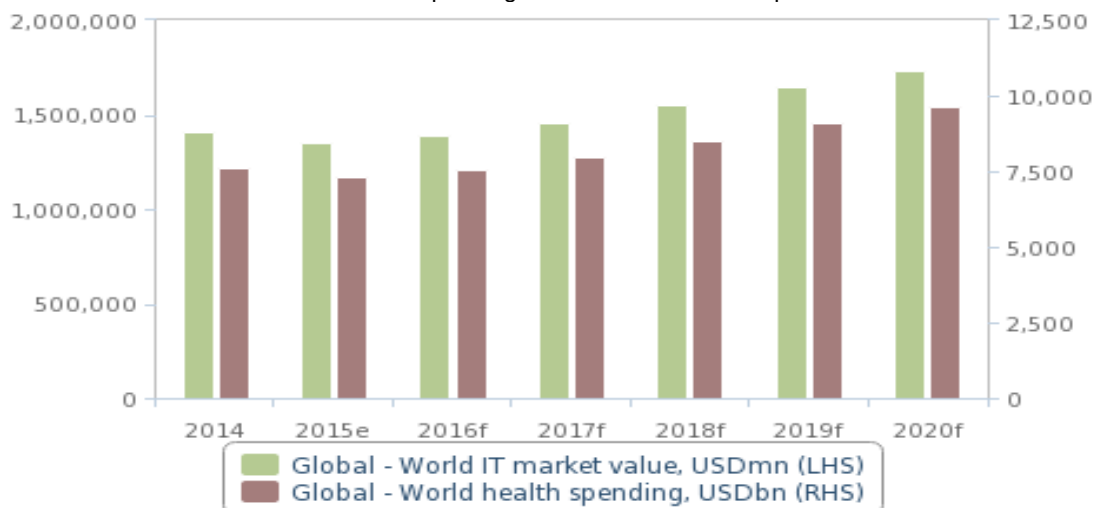
This Report is designed to inform decision makers and stakeholders of key trends, challenges, and opportunities in foreign markets for Health IT products and services and to make recommendations for how the U.S. Government can improve U.S. companies' access to these markets. Health IT (and healthcare more generally) is changing at a rapid pace; therefore the observations, recommendations and the ranking of priority markets will likely require reassessment in the future.

Before discussing recent Health IT sector activities in detail, data on the size of the overall healthcare and ICT markets give a sense of the huge possibilities for the Health IT sector. As seen in Figure 1 below, estimated healthcare expenditures worldwide were more than \$7 trillion in 2015 and are expected to exceed \$9 trillion by 2020, while the global IT market should reach \$1.7 trillion by 2020, up from \$1.36 trillion in 2015.³ As healthcare and ICT expenditures continue to grow, more partnerships will likely be established, including in the areas of medical data analytics and remote monitoring, both of which apply to individual patients, as well as larger populations.

2015 Key Developments

One of 2015's key policy developments occurred in March in the United States, as Stage 3 Meaningful

Figure 1: Healthcare and IT Markets Continue To Grow
Global Healthcare Spending and IT Market Value Expenditures



Source: BMI¹

Use rule and certification criteria were released for comment by the U.S. Department of Health and Human Services' Office of National Coordinator (ONC) and the Centers for Medicare and Medicaid Services (CMS). The draft criteria offered more flexibility to physician practices and hospitals to meet information exchange requirements without being penalized for non-compliance, with an increased focus on system interoperability and patient outcomes.⁴ The primary Meaningful Use program objective is that Health IT should be used to improve patient care, lower healthcare costs and deliver more effective treatment, rather than solely focus on gathering data and information through deployment of products, services and technology. As of late June 2016, the final Stage 3 Meaningful Use rule has not yet been issued, leading some industry observers to believe that the Meaningful Use program might conclude or be de-emphasized before Stage 3 criteria are issued.

In addition, a December 2015 report from the Health Information Technology Policy Committee, a federal advisory committee to the ONC on Health IT policy, outlined a set of challenges and barriers to achieving interoperability in the United States, in response to a Congressional request for information.

Interoperability is a frequently used Health IT term, defined by the Institute of Electrical and Electronics Engineering as "the ability of two or more systems or components to exchange information and to use the information that has been exchanged."⁵ The December 2015 report noted that:

"Although substantial interoperability amongst all stakeholders in American health care has not been achieved to date, there are pockets of meaningful health information exchange developing and momentum is starting to build."⁶

In October 2015, ONC released "Connecting Health and Care for the Nation: A Shared Nationwide Interoperability Roadmap, Final Version 1.0," outlining steps needed to make information flow more easily through the U.S. healthcare system by emphasizing interoperability. The Roadmap contained a number of actions that have target completion dates in 2017, with other objectives to be achieved over a longer time horizon.⁷

In December 2015, the United States and European Union announced a stakeholder consultation for

companies, individuals and institutions to map out future opportunities for collaboration in the Health IT sector and update the existing U.S.-EU Health IT/eHealth Roadmap (hereafter "Roadmap"). The Roadmap has developed into a useful resource for U.S. and EU stakeholders to work together on mutually agreed-upon initiatives that can serve as models for adoption by other countries around the world. The most recent version of the U.S.-EU Roadmap had two work-streams, one focused on standards and interoperability (efforts to develop integrated systems to encourage data sharing), and another focused on education and development of the Health IT workforce. The next version of the Roadmap will include an Innovation Ecosystem work-stream, designed to encourage greater collaboration and sharing of best practices between companies/organizations on both sides of the Atlantic, and cities/regions interested in learning from each other to deploy cutting-edge technologies, among other options. The next Roadmap version should be released in summer 2016.

One other significant Health IT policy development came from Germany, with consideration of a new eHealth Law (hereafter "Law") through most of 2015 and its passage in December. Germany has an approximately \$300 billion healthcare market, but only spends about 1 percent on Health IT, according to official figures (see the Germany Country Case study for more details). The promulgation of regulations to carry out the Law will likely extend into 2017 at the earliest, but early reviews of the Law indicate that it will not completely address many of the outstanding issues needed to raise the use and profile of Health IT in Germany.

A large-scale (although not policy-related) development that requires watching is the increasing interest in the "Internet of Things (IoT)" and the range of possibilities for the healthcare sector. Creating interconnections and linkages between electronic devices such as sensors and medical devices that can monitor, detect and exchange information have generated a lot of company and consumer interest across many sectors. Much of the current health-related activity is in the consumer market, with wearable devices, such as FitBit and Jawbone, being able to track a consumer's vital health signs, creating a readily accessible, data-rich profile of a person's health condition and potentially leading to customized

solutions. Healthcare companies, hospitals and governments are also looking closely at this trend to determine how best to gather and analyze the real-time health information being created by these devices and use that information to prevent acute care episodes among individual patients, with the ultimate objective of providing better care while reducing costs. The collected data can also improve treatment and care of a larger population, such as patients with a specific health condition. It is worth noting that concerns about cybersecurity and privacy (long-standing issues in healthcare, appearing in new ways), along with slow uptake by government officials, may delay the gathering momentum of IoT.⁸

Other significant 2015 Health IT market developments include mergers and acquisitions, announcements of Health IT investments and partnerships, and company efforts to explore opportunities in data analytics and increased patient engagement in taking care of their health condition (to name two examples). Regardless of one's area of interest, a lot of activity took place in the Health IT sector during 2015. Examples (and long-term historical data points) include:

- August 2014—Cerner Healthcare announces purchase of Siemens' Health IT business for a reported \$1.3 billion; deal closed in February 2015;⁹
- February 2015—as the Cerner/Siemens merger closes, the two companies announce a strategic alliance; initial plans are to integrate diagnostics and therapeutics with electronic health records (EHRs);¹⁰
- February 2015—insurer Anthem announces that hackers entered computer system; eventually reports that 80 million patient records were placed at risk;¹¹
- 2015—GV, Google's venture capital fund, invests 31 percent of its total capital into healthcare and life sciences;¹²
- June 2015—American Health Information Management Association (AHIMA) completes global curriculum for Health Information Management education;
- July 2015—Aetna and Humana announce plans to merge in a \$37 billion deal;¹³
- August 2015—HHS reports that 143.3 million people in the United States have been compromised in 1,282 separate breaches at

organizations handling protected health data since 2009;¹⁴

- September 2015—Rock Health, a digital health-focused venture capital fund founded in 2010, surpasses \$500 million worth of investment since its launch;¹⁵
- September 2015—Qualcomm Life purchases Capsule Technologie, a global company providing medical device integration and clinical data management solutions;¹⁶
- September 2015—Implementation underway of a new health information system in Barbados called Med Data, managing public health system medical data;¹⁷
- December 2015—Shareholders for Anthem and Cigna separately approve a \$54 billion merger between the two companies;¹⁸
- December 2015—ONC and the European Union's DG CONNECT directorate announce a stakeholder consultation for updating the U.S.-EU Health IT/eHealth Roadmap;
- January 2016—Novartis leveraging Qualcomm Life's connectivity solutions to power the Breezhaler, an inhaler meant to address Chronic Obstructive Pulmonary Disease (COPD) which will be connected to Qualcomm Life's 2net platform, a home gateway device;¹⁹
- February 2016—National Health Service (NHS) in England launches a \$5.7 billion digital transformation initiative seeking improvements in Electronic Health Records, prescriptions and consultations;²⁰ remote patient monitoring is also a key component;²¹
- February 2016—Healthcare Growth Partners reports a record 328 Health IT mergers and acquisitions in 2015, up from 222 in 2014;²²
- March 2016—Qualcomm Life and United Health announce a collaboration to deliver consumer-oriented connected health solutions across the United States;²³
- March 2016—The U.S. Bureau of Labor Statistics announces that the healthcare sector has added 503,000 jobs over the past year;²⁴
- March 2016—Philips announces fourth quarter 2015 financial results, notes that the largest share of company sales (46 percent, or \$3.66 billion) comes from healthcare,²⁵ and
- March 2016—Digital health institute DigitalHealth. London announces launch of first start-up accelerator program in the United Kingdom, to be run jointly with NHS; the accelerator plans to work with 20 to 30

businesses each year over the initial two to three-year period.²⁶

An ongoing trend that continues to accelerate is the continuing and increasing entry of technology and medical device companies into the Health IT space. Although not new, it is worth noting that some of the most active companies in this sector (such as Qualcomm and Intel) have their roots in the IT sector, while medical device firms (such as Philips, Siemens and Medtronic)²⁷ are also increasing their activity in the Health IT sector. Some analysts believe that it is even possible that most of the disruptive Health IT technologies in the future will come from non-healthcare companies.²⁸

Key Findings: Top Markets and Methodology

The first Health IT Top Market Report was released to the public in July 2015. During the report drafting process, the industry specialists learned that there were (and still 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 for the market size in individual countries, and analyzing import/export levels and corresponding trade balances, very challenging. Therefore, the metrics used to rank countries were proxy indicators covering six categories that might influence the overall Health IT market.

In the 2015 and 2016 Top Market Reports, healthcare expenditures are used as a proxy for Health IT spending; countries with high health spending per capita often appear near the top of each Report's rankings. This parameter alone, however, does not necessarily indicate whether the country has significantly invested (or plans to invest) in Health IT technologies or infrastructure.

The 2015 Report methodology leaned heavily on ICT usage and demographic data in each country, with some data on healthcare expenditures, research and development spending, physician density, and Health IT policy development. The results using this methodology, however, were not always defensible, as demonstrated in the following examples:

- 1) Japan received the number one ranking, even though the Health IT sector faced some business-unfriendly policies, making it a difficult market for U.S. companies; and
- 2) South Korea ranked number six, even though usage restrictions were so extensive that Korea essentially had no market for many telehealth and mobile health applications.

Similar circumstances currently exist in Japan and South Korea, but the new methodology (described further below) presents more defensible rankings in both cases.

It is also important to note that Health IT is a sector where export opportunities exist even for countries with less-developed healthcare systems, so markets with solid export potential exist below the top 10 ranked countries. This report contains Country Case Studies on Mexico and Turkey, two good examples of this situation.

The 2016 Report methodology retains some 2015 metrics (per capita health spending as the best available proxy for per capita Health IT spending, urban population density, and mobile phone and Internet services). Some metrics, however, have been tweaked (including use of a longer-term measure of the aging of a population rather than a point-in-time metric), and others are new (using several measures of the health of a country's

Figure 2: Near-Term Health IT Export Market Rankings

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

population). The rankings of 2016 generally look reasonable and defensible in many cases, particularly among the top 10 countries, even though the 2016 data sources are markedly different than the ones used in 2015.

Figure 2 lists the top 20 Health IT markets using this methodology. As expected, there is a strong concentration of developed countries that rank highly, particularly in Western Europe, the Nordic region, and Singapore and Japan in Asia. Many of these countries have aging populations and consequently are seeing increased healthcare costs, making the deployment of Health IT a key component of their future healthcare strategies.

In 2016, metrics used did not receive the same weighting across the board, as was the case in 2015. ICT-specific metrics (mobile subscriptions, Internet subscriptions and type of ICT service) received less weight in 2016, with new information about the health of the population, current spending on elderly citizens and the rate of aging in each country receiving greater importance. Shifting the weighting to increase the significance of health metrics over ICT metrics (or vice versa) will have an impact on the rankings. More details on the metrics used for this Health IT Top Market Report appear in Appendix 1.

Overall Health IT Top Market Report 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 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.) likely would affect subsequent rankings and conclusions.

In addition, country reporting for some selected metrics is poor and/or not current; updated statistics for the metrics used may someday become available and impact the rankings. Some less-developed markets also do not have sufficiently sophisticated statistical agencies to supply the information categories needed so that this methodology could generate a ranking. This resulted in several mid-level markets that could have strong potential for Health IT deployment not appearing in the rankings,

such as Malaysia, Hong Kong, Kenya, Kuwait, Qatar, United Arab Emirates, Algeria, Egypt and Tunisia. In general, there is an underrepresentation of low and middle-income countries (LMICs) in the rankings, particularly in Africa, which may be partly due to incomplete data for the metrics chosen.

Separate from the absence of trade data and NAICS codes, the industry specialists that did each of the Health IT Top Market Reports would have liked to incorporate additional metrics (including physician/nurse/other healthcare worker density, number of hospital beds and facilities, taxes and tariffs, burden of disease, and more specific spending on Health IT products and services) into both the original 2015 or revised 2016 methodologies but could not do so because of insufficient data.

Finally, 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 a 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.

Three Specific Caveats in Using Report Methodology to Assess Market Potential

The following caveats should be kept in mind when assessing the metrics used and how these caveats can impact the country rankings when assessing a market's potential.

Health Expenditures

First, the methodology tends to favor countries with high health expenditure levels. It can be argued that lower health spending might increase the need to deploy mobile health and telehealth solutions,

influencing how one would interpret the rankings. 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 penalize countries that had a high level of health expenditures. The health expenditures metric received a lower weighting due to this consideration when compared to the methodology used for the 2015 Report.

Interpretation of Mobile Phone/Internet Usage

The second caveat concerns interpretation of mobile phone and Internet usage. Using measures of mobile phone usage in isolation, such as penetration rates or number of subscribers, does not provide a complete portrayal of a market's mobile health/telehealth potential. For instance, the reported 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 two to four SIM cards at any given time, with only one card being active. Some consumers have multiple mobile devices for different purposes; for example, one device for personal use and another for professional use.

As a result, many countries analyzed in this Report had relative rankings of mobile phone and/or Internet subscriptions based on figures for these metrics that exceed 100 percent. Therefore, these numbers can be deceptive, as consumers owning multiple SIM cards and communication devices (work phones, home phone, tablet) at a given time leave some markets appearing to have a mobile phone subscription rate as high as 168/100 people. These announced penetration rates likely overstate the true number of people who own (or have consistent access to) a mobile device. It also explains why the reported figure for the number of people having mobile phone subscriptions closely rivals the world's population (as noted below). Based on the Report's methodology, high numbers in these metrics can offset low healthcare spending and therefore boost a country's ranking, so these metrics received a slightly lesser weighting in the 2016 Report.

It is worth noting that, in developing markets, a single mobile phone may be shared among multiple people (such as between family members or within a village). 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.²⁹ 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 (7.1 billion as of November 2015)³⁰ and the number of unique mobile phone users (approximately 4.5 billion).³¹ It is estimated that 350 million people worldwide live in places still out of reach of mobile phone service and that only 29 percent of the 3.4 billion people living in rural areas can access a 3G signal (compared to 89 percent in urban areas).³²

To a lesser degree, this is also a relevant issue for Internet subscriptions. A January 2016 United Nations (UN) Broadband Commission for Sustainable Development meeting in Davos, Switzerland reported that only about 3.2 billion people (43 percent of the world's 7.4 billion population) have Internet access, with the remaining 4.2 billion being offline. The International Telecommunications Union (ITU) estimates that it would cost \$450 billion to connect the next 1.5 billion people worldwide to the Internet.³³

Mobile Data-Access/Capacity Limitations

The third caveat (which cannot be easily controlled statistically) is the importance of prepaid versus postpaid mobile phone subscriptions, and its impact on the Health IT market in each country.

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 these plans, consumers are less likely to purchase and adopt data-hogging applications and services (such as those using images and/or video), which may constrain the potential for more sophisticated mobile health and telehealth services to enter these markets. 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. 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.

The preference for prepaid versus postpaid phone plans among consumers in many emerging markets can be sizable. For many countries in Southeast Asia (such as Indonesia, Philippines, Thailand and Vietnam), it is estimated that prepaid mobile plans account for 80 to 90 percent of the mobile subscription market.³⁴ 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.³⁵ Until service providers can incentivize and persuade consumers to make the switch to post-paid plans, the growth potential of advanced mobile applications and services will likely be limited. Few countries have successfully converted consumers on a large scale from prepaid to postpaid plans.

Finally, some mobile health technologies under development are targeted for people younger than 65 (such as the maternal and child health population), meaning that a country with a very young population could still benefit from particular Health IT products and services targeting this demographic.

Industry Overview and Competitiveness

Mobile health is medical health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants and other wireless devices.³⁶ As noted above, global mobile phone use has increased 25 percent since 2010 but is expected to increase worldwide at a low rate because of market saturation.³⁷

A November 2015 report from MarketsandMarkets estimates that the global mobile health market is expected to experience a compound annual growth rate of 33.4 percent over the next five years, reaching \$59.15 billion by 2020.³⁸ A September 2014 report from BCC Research estimated that the market for telehealth was expected to grow 17.7 percent globally between 2014 and 2019 to \$43.4 billion.³⁹ 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, reaching 55 percent of the global market by 2019.⁴⁰

As mobile health applications continue to be a priority for research and development, technologies and affordability continue 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,⁴¹ 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 taken advantage of more basic technical capabilities, such as SMS, to develop effective health technologies that can be implemented worldwide, particularly in low and middle-income countries (hereafter LMICs). 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.⁴² 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 G7/G8 started supporting telehealth as early as 1995 by outlining strategies to create networks for international information exchange and Internet connectivity.⁴³ While deployment of telehealth remains a priority,⁴⁴ coordinated efforts toward 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, it should continue to grow, particularly in countries with a large rural population or unequal geographic distributions between trained medical professionals and the general population.

One of the noteworthy features of the Health IT sector when looking at increasing the presence of the sector worldwide is the tremendous opportunities for developed markets to learn from developing countries (and vice versa) about innovative diagnostic and treatment delivery

options, with technologies, disease states, resource capabilities and patient demands that often vary widely between countries. The bi-directional nature of Health IT usage and deployment today offers many countries and companies opportunities for collaboration at an early stage, unlike some sectors. In addition, the intersection of health and ICT offers opportunities for technology development that may cause significant disruption –or “creative destruction” –to the healthcare sector, often based on practices found in other industries.

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

This is because healthcare systems in LMIC countries are not limited by legacy paper or antiquated electronic systems. LMIC governments often feature Health IT (particularly mobile health and telehealth) in their healthcare strategic plans to quickly improve services and increase coverage and deployment; and 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 can 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. As noted earlier, this version of the Report has relatively few LMICs, so companies making decisions about possible markets to enter should not be entirely beholden to this Report’s rankings.

Health IT technologies and delivery systems can help citizens both in urban and rural areas. Healthcare professionals are often concentrated in urban areas, leading policymakers to primarily focus on delivery to rural communities (including mobile and telehealth services). Many countries also have an insufficient number of well-stocked hospitals and clinics, and lack an adequately trained healthcare workforce. Therefore, U.S. companies looking to invest overseas 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.

U.S. companies are generally considered globally competitive in the Health IT sector, primarily because of the capitalist orientation of the U.S. economy, entrepreneurial approach of companies seeking to disrupt the healthcare sector, presence of incubators and accelerators to nurture start-up entities (before they become established companies), and the roughly 55/45 split between private sector and public sector healthcare provision and expenditures. As a result, U.S. companies often have a wide array of opportunities to test different approaches in other countries.

A key challenge can be how to persuade U.S. companies to take a rational, sensible decision on exploring countries overseas. Complicating this to some degree is that most companies cannot enter overseas markets on their own and not just because of ownership or partnership requirements. Many companies have one or two important component products or knowledge base to contribute to a system for overseas deployment, but a successful entry overseas (in many cases) might require a systemic installation or replacement, meaning that a U.S. company will need to partner with other firms to enter or expand their presence in the market.

Global Industry Landscape

As noted above, the lack of Health IT trade data makes empirical analyses of potential export markets difficult. A case can be made, however, that, with appropriate preparation and an appetite for manageable risk, sometimes less sophisticated markets can be a promising export option if the technology, product or service is suitable for market conditions. The absence of local competition and the ability to quickly meet and negotiate with the appropriate government official(s) may make the market less bureaucratic to enter, and the widespread need for countries to effectively manage their patient’s health condition at a reasonable cost may offer chances for companies of any size to successfully venture into these countries.

Some of the largest Health IT countries (based on country-reported revenue data, which may be inconsistent either with the Health IT

product/services scope listed above or between countries) appear to be Japan, Germany and South Korea, but all three are very challenging markets from a policy and/or competitive perspective. Canada is also a fairly large market, with the challenge there primarily resulting from most of the purchasing power (and nature of healthcare delivery) taking place at the provincial level. Smaller markets, such as the Nordic countries (Denmark, Finland, Norway and Sweden), can be very receptive to new products and technological approaches, so with the right products/services, they can offer promising potential as well.

Opportunities

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 reduce healthcare costs, increase system efficiencies and improve 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, well-trained local healthcare workforce to large populations in many countries.

For instance, mobile health and telehealth can make it easier for patients to receive care from world-renowned specialists, particularly for rare conditions, without the need to physically travel to the specialist's office, and better monitor a chronic condition for a mobility-challenged individual from their home and then connect 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 healthcare delivery. 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.

Challenges and Barriers

Systemic/Infrastructure Challenges Facing Health IT Sector

In reviewing the many challenges hindering the wider application and acceptance of Health IT technologies, it is important to differentiate those that impact the entire sector from those primarily affecting mobile health and telehealth (although several impact both). For clarity, the mobile health and telehealth challenges 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 need to be closely aligned in many countries 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 1995.⁴⁵ Since then, international emphasis on use of ICT for healthcare 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,"⁴⁶ 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 noteworthy 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 to encourage them to take their medicines or to visit a physician. Tailoring

products and services offered to a country, region or population will significantly increase the probability that the company's investment will be beneficial and/or profitable.

Policy Challenges Facing Health IT Sector

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 the policy and regulatory gaps/inadequacies vary from country to country, meaning that the approach to address these gaps will need to be customized for the specific country. Although some best practices are starting to be seen worldwide, until these policy/regulatory challenges are addressed, the rollout of Health IT will remain a gradual process in many countries.

Additionally, policies are often promulgated at a national level but are implemented on a state or regional level. This can be particularly problematic, given that healthcare funding happens at the national level, but delivery of healthcare services often happens at the sub-national level, possibly resulting in a fragmented and inconsistent 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

Procedural transparency and elimination of preferential treatment 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 government often playing a major role in developing procurement procedures. Furthermore, in light of possible fiscal pressures, governments may not have the resources and/or incentives to rapidly 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. However, absence of transparent bidding processes, and preferences for local competitors, can undercut otherwise promising market opportunities. U.S. companies need to be aware of these issues as they seek to enter overseas markets.

Funding limitations are causing both government payers and private sector insurers to intensely examine both the business case for introducing Health IT-based applications, as well as the medical rationale for providing those services. Stakeholders are increasingly demanding proof that Health IT reduces healthcare costs and improves health outcomes, and technology and applications that do not demonstrate improved care at lower cost likely will have a hard time receiving approval from insurers or governments. Most mobile health and telehealth applications using phones, tablets and other technologies likely will obtain reimbursement but will first need to demonstrate a worthwhile care/cost tradeoff. It is possible that governments will eventually develop the political will to support these deployments as best practices are identified and the financial incentives behind use of Health IT are demonstrated and realized.

Medical Liability Concerns

If Health IT is used to carry out (among other things) medical procedures or provide consultations across national boundaries, then the regulations between jurisdictions in those areas will also have to be harmonized. Legal requirements within (and between) countries will need to be reviewed to determine whether a country permits remote care of citizens by physicians, regardless of whether the doctor and patient are in the same state/district 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 (the United States is making some notable progress in this area)⁴⁷ 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. Even issues related to power

interruptions and blackouts during consultations or procedures can lead to medical liability questions. Companies need to be aware of these differences in rules between countries and between jurisdictions within countries.

Data Privacy/Security

Privacy protections will likely need to be implemented in many countries to reassure consumers of the quality of Health IT products and services.⁴⁸ Questions remain as to how best to protect patient privacy and ensure security of Health IT, and it is important to note that these questions are inextricably intertwined with broader questions of data privacy, security and storage that affect many industries across economies. Health is just one sector impacted by policy decisions made on these issues, and since the implications of improper, inaccurate and/or illegal access, entry or use of health information can be extremely injurious (or deadly) for patients, special handling and procedures in these areas may need to be considered for the health sector. Consensus around these issues has not yet been reached, but 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. The February 2016 announcement of the U.S.-EU Privacy Shield agreement⁴⁹ (not in force as of June 2016) also touches upon this topic.

Standards

As with many other sectors, adoption of internationally agreed-upon standards⁵⁰ 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. The sector's intersection between 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 elongate the process of reaching consensus on these topics. The absence of consistent standards and the need for users to carefully choose between competing standards have

also hindered the development of the Health IT sector.

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 be used appropriately and have maximum impact. The review of medical practice and how to effectively integrate Health IT has occurred at some hospitals and clinics in the United States, but has not yet occurred on a broad scale, and this effort will need to be replicated on a far larger scale as these technologies become available internationally. As a result, more advanced 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 economic challenges also 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 and healthcare provider policies will need to shift (as has started to happen in the United States) in favor of emphasizing high-quality care (reducing readmissions to hospitals and lowering the number of acute interventions needed, just to name two examples), preventing emergency room visits and increased adherence to medication regimens.

There will likely be great variation in terms of reimbursement trends worldwide, as most countries have government-run healthcare systems, and many of them are dealing with tight budgets while patient needs and demands continue to rise. In some countries, patients pay a significant portion of healthcare expenses, so companies considering the

question of reimbursement for their product or service need to closely understand this element of the market in each country where they plan to export.

Mobile health and telehealth applications can offer many benefits leading to more efficient use of healthcare resources and lower costs 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). In 2015, more than 200 telehealth bills were introduced in state legislatures in the United States, many designed to make the provision of telehealth, and reimbursement for it, easier.⁵¹

Consumer Acceptance

Consumer acceptance of Health IT (and mobile health/telehealth more specifically) 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 in improving adoption. Additionally, in many countries, consumers do not have much choice in selecting physicians and hospitals based upon their digital capabilities to manage a patient's condition, but this factor is becoming a consideration for some U.S. consumers.

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 (sometimes called "digital literacy"), which may inhibit the widespread utilization of Health IT in a country, region or population. Increased use of wearable technologies (such as FitBit or Jawbone) may help with consumer awareness and acceptance of their important role in each individual's healthcare journey. Improving 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 on this topic.

Healthcare Workforce Training

One of the necessary, but often less highlighted, 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 and those new to the sector. Training often involves education on a multitude of related, but distinct, issues ranging from information governance to management of medical records and associated systems to 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) entered into a cooperative agreement with the American Health Information Management Association (AHIMA) from 2013 to 2016, which consisted of a comprehensive update and expansion of existing health information management (HIM), Health IT and health informatics education, both for career workers and those new to the sector, through ITA's Market Development Cooperator Program. A finalized curriculum (with a distinct focus on standardizing workforce competencies in a variety of areas) was released in June 2015, and as of March 2016, governments and institutions in India, Nigeria, Saudi Arabia, Qatar and the United Arab Emirates have committed to implementing the new curriculum.⁵²

Specific Challenges for Mobile Health and Telehealth

Provider Legal Protections

Establishing provider legal liabilities and protections for virtual treatment decisions is an area where policies and procedures need to be aligned for increased use of mobile health and telehealth concerns. Since the patient and physician are not in

the same physical location, making an accurate medical diagnosis depends 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 (the Medical Liability section above also mentions some of these topics).

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 approximately 290 ongoing projects and Kenya has over 200.⁵³ 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; recent statistics show 109 deployments in Kenya, 80 in Uganda, 59 in Tanzania and 17 in Rwanda.⁵⁴

An issue connected to the proliferation of pilots relates to making these initiatives long-term, viable businesses. For example, some countries have tried new technology on a national level with resounding success, only to have these projects fail because they lacked sustained funding and support. Unfortunately, a significant number of these projects are supported by international donor organizations. When the grant money runs out, the successful implementation of Health IT at scale also ends. Countries need to develop plans for the long-term viability of Health IT, which includes mechanisms to sustainably fund projects rather than relying on external sources, such as grants. 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.

Successful mobile health and telehealth products and services already exist but are often not widely known, indicating that increased visibility and awareness of successful Health IT products and services would increase adoption and use of these technologies in the United States and other countries. Doing so would also provide viable, demonstrable examples of “business cases” that mobile health and telehealth can both improve

treatment and delivery paradigms (pertinent to many Health IT-related projects primarily dependent on donor funding for their existence, often located in LMICs), while being profitable for the vendor or consortium of companies.

ICT 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 develop integrated systems, encouraging data sharing based on commonly agreed-upon standards. It is still unclear how open architecture and data sharing can adequately accommodate intellectual property protections and privacy concerns. In addition, the perceived need of some vendors to keep their Health IT solution proprietary in an effort to make a profit may slow the sectors’ drive towards interoperability.

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 several Health IT vendors have not publicly advocated for an open architecture approach. There has been some movement in this area over the past year, highlighted by an “interoperability pledge” effort announced at the 2016 Healthcare Information and Management Systems Society (HIMSS) Annual Conference by the Office of National Coordinator (ONC)⁵⁵ and at the 2013 creation of the CommonWell Alliance.⁵⁶ From an export 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 eventually lead to the U.S. introduction of systems first demonstrated overseas.

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,⁵⁷ 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 November 2015, 89 percent of the urban population worldwide had access to 3G coverage, but only 29 percent had access in rural settings.⁵⁸ Broadband and mobile phone affordability is still a challenge in some countries, with citizens in almost 50 countries as of

early 2015 paying more than 5 percent of their average monthly income for broadband service, which is above the United Nations Broadband Commission for Sustainable Development target.⁵⁹ Many countries continue to upgrade and expand broadband coverage. Smartphone adoption is still low and restricted primarily to developed countries and higher income brackets.⁶⁰

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. The markets represent a range of countries and geographies to illustrate a variety of points, and not necessarily the top 10 markets overall.

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Denmark

Type of Market: Small/Growing

Denmark has long been considered a strong Health IT market despite its small population and market size, primarily because of its forward-thinking interest in using Health IT products and services to provide the most current and effective approach to patient care. Denmark is in the midst of undertaking a large-scale reorientation of healthcare delivery and treatment, which will feature fewer, digitally integrated hospitals with greater connectivity and more home-based care. This reorientation, estimated to cost billions of U.S. dollars, will provide U.S. companies with many opportunities to pilot new healthcare delivery approaches and offer proven treatment options at significant scale for Danish patients. U.S. companies should keep in mind, however, that the Danish healthcare system is quite different from the system found in the United States, and companies should gather advice in advance on best practices for entry into and expansion in Denmark.

Overall Rank

4

Description of Rank and Sub-score measurements

Denmark rates very highly on most of the criteria used for this Top Market Report (NOTE: the methodology used to rank countries has changed from the 2015 Report, so rankings are not directly comparable), particularly on per capita health expenditure, Internet subscriptions, a highly urbanized population and a low old age poverty rate. The widespread availability of advanced broadband and mobile infrastructure (which will be discussed further below) is a critical element in Denmark's high ranking in the Report, along with future opportunities for U.S. companies to enter or expand their presence in the country.

Opportunities for U.S. Companies

The Danish healthcare sector is oriented around the following principles:

- A public health care system
- Free and equal access for all citizens
- Freedom of choice
- Mainly financed through general taxes
- Decentralized organization
- General Practitioner (GP)/family doctor as gatekeeper⁶¹

Denmark is a small country with only 5.6 million citizens,⁶² but it is considered particularly willing and interested to adopt new healthcare technologies to create an integrated approach to patient treatment,

based upon a long history of partnership between healthcare facilities and the private sector. Along with their Nordic neighbors, Denmark is considered to be among the most progressive countries in the world in integrating Health IT solutions into patient treatment.

Every citizen has a personal identifier provided to them at birth.⁶³ At present there are 54 public hospitals in Denmark, with more than 106,000 employees; total healthcare expenditure is 5.6 percent of GDP, or roughly \$15 billion.⁶⁴ The [Ministry of Health](#), The [Danish Health and Medicines Authority](#) are responsible for central regulations and services and [eHealth strategy](#), while other state agencies such as the National eHealth Authority ([Sundhedsdatastyrelsen](#)) and [MedCom](#) work specifically with the digital health agenda, standardization and interoperability. The official Danish health portal, which is accessible to all citizens and health professionals, is called [sundhed.dk](#).

GPs and specialist clinics are all operated as private business units and reimbursed by the government. Most GPs are members of the [Danish Medical Association \(DMA\)](#). As of January 2015, there were about 4,400 GPs in Denmark, along with about 8,200 specialist doctors. About 92 percent of the population contacts their GP annually. According to the DMA, there are more than 27,000 doctors.⁶⁵

Denmark is in the midst of a nationwide project to reduce the number of hospital beds and facilities (through a program referred to as “intelligent hospital construction”⁶⁶) while treating an aging population with increased demands on the healthcare system, with the primary objective of decreasing public funding of healthcare. Part of the project is to promote health and wellness efforts so that Danish citizens can reduce use of health facilities, but some of the project is designed to increase the reliance on technology in patient care provision. The central government has offered Denmark’s five regions set funding amounts for building new hospitals and renovating/merging existing facilities so that patients can receive holistic care, and extensive use of Health IT drives the central government’s vision.⁶⁷

Each region is individually responsible for the construction and/or rebuilding of the hospitals in the respective regions. The national organization binding the five regions together, *Danske Regioner*, is ensuring coordination between the regions at an overall level in order to optimize resources and share knowledge gained throughout the process. *Danske Regioner* also arranges large meetings for industry, patients, doctors and the regions once a year, where various issues such as public/private partnerships, the construction process, hospital management and other relevant issues are discussed. Companies attending these meetings obtain firsthand information on what is going on, challenges and desired solutions and the opportunity to network with the project owners and decision makers.

Regional consortia play an important coordination role in this effort. One example of cross regional collaboration is a decision where two of five regions have decided to implement a common Electronic Patient Record system (Epic, from the United States) in order to further information flow. Another example is the decision about a common strategy for telemedicine solutions among the regions, along with focus on price and quality for the patients and ease of use all over the country.

Each region has established a project/advisor group, and it is that group that will define and work on the specific challenges, solutions and structures for the constructions and/or rebuilding of hospitals in the region in question. Therefore, the companies wanting to participate in the

constructions/rebuilding have to pay attention to the project groups in all five of the regions.⁶⁸

Awareness of the bidding requirements and submission deadlines for these projects is very important. This is generally a transparent process, accomplished through the following websites: udbudsavisen.dk or regionsudbud.dk. Most of these tenders go on the EU's main procurement website, <http://ted.europa.eu/>. There is also a [procurement guide](#) available, which has a section specifically dedicated to Health IT.

The goal of the central government’s program is to reduce the number of public hospitals to 16 (5 new, 11 renovated), each with extensive IT capability, at an overall cost of approximately \$7 billion. Health IT investments in these hospitals are anticipated to be approximately \$520 million, as part of an overall Health IT investment in Denmark of \$2.2 billion by 2022.⁶⁹ An example of the planned scope of these projects is a 780,000 square-meter mega-hospital which will eventually be built at the University of Odense, South Denmark Region, at a cost of \$1.2 billion. At least 150 million Euros will be spent on equipment in Odense, including IT.⁷⁰

Denmark’s five regions and 98 municipalities can also renovate existing hospitals and build new ones with their own money; in 2008, there were 22 regional projects underway.⁷¹ Each municipality covers about 20,000 inhabitants and is responsible for nursing homes, home care services and the emerging health centers (rehabilitation and preventive care). They are organized under the interest group / member authority [Local Government Denmark](#), and [health](#) is a major area of responsibility for this authority. Cities finance about 20 percent of total healthcare expenditure.⁷²

About 15 percent of healthcare is delivered by the private sector; however, there are as many as 249 private hospitals and clinics, significantly more than five years ago. Danish citizens have the right to choose treatment at a private hospital and get reimbursed if the waiting time in public hospitals exceeds two months, which has contributed to the upswing in usage of private sector facilities. 97,000 patients made use of private facilities in 2010. Private health insurance is also becoming more popular, with roughly 14 percent of the population covered by these supplementary plans.

One of the reasons Denmark has been able to take a leadership role in Health IT is due to the extensive presence of broadband services throughout the country. In March 2013, Denmark announced an action plan containing 22 separate initiatives to have broadband and mobile coverage with speed of 100 megabits per second (Mbps) download and 30 Mbps upload throughout the country by 2020.⁷³ By mid-2013, 70 percent of Danish households and businesses were expected to have access to 100 Mbps broadband, up from 60 percent one year earlier. Much of that improvement is attributed to upgrades in the country's cable TV network.⁷⁴ Seventy-eight percent of Danish citizens and businesses had a broadband connection⁷⁵ as of that time. Denmark also compares favorably to other OECD countries in terms of broadband and mobile broadband coverage.⁷⁶

In addition, as of mid-2013, mobile broadband coverage with capacity of 2 Mbps was still low nationwide (22 percent), but had increased from 17 percent one year earlier.⁷⁷ In mid-2013, Denmark had more than 1 million mobile broadband subscriptions exclusively for data use (up 22 percent in one year) and more than 1.2 million mobile broadband upgrade subscriptions (up 14 percent compared to mid-2012). The increasing popularity of these mobile subscriptions and priority placed by the Danish government in upgrading systems and making them more available nationwide appear to be areas of focus in meeting the ambitious 2020 goals outlined above.

Danish stakeholders (including the five regions, federal authorities, and academic institutions) have identified business potential in several areas, including:

- Development of new technologies and solutions within logistics, IT and diagnostics. The areas of telemedicine and home monitoring have great potential.
- Patient empowerment--the goal is to provide the patients with the tools and knowledge through Health IT solutions enabling patients to become 'masters' of their own lives. This is especially relevant for chronically ill patients and includes technology as well as education and training or monitoring programs.
- Energy efficiency and environmental friendly solutions.
- Non-patient related/administrative functions.
- Pharmacy/Infusion.
- Homecare – Renal, Infusion, Nutrition.⁷⁸

Challenge in the Market

The primary challenge in the market is creating a consortium of partners that can be considered as part of bidding on projects, either for the 16 federally supported hospitals or at the regional/municipal level.

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Singapore

Type of Market: Moderate/High Potential

Singapore continues to be a solid Health IT market, particularly among Asian countries. The city-state recently announced plans to expand its National Electronic Health Record system, first developed in 2010 and in existence since 2011. Singapore is also expected to have a sharp increase in its over-60 population over the next 15 years. Besides high expected growth in the over-60 population, Singapore's compact geography, highly urbanized society, high per-capita income and widespread use of mobile phones and Internet are other factors that support strong Health IT usage. Opportunities exist in Singapore for U.S. companies involved in care coordination for private insurers and physicians and deployment of new mobile applications, but firms involved in developing and integrating health-related systems may find few sales opportunities in Singapore, primarily due to the extensive health insurance system already in place.

Overall Rank

5

Description of Rank and Sub-score Measurements

Singapore scores relatively highly across the metrics used for this Report, highlighted by one of the largest increases of any country (and biggest among the top 20 ranked countries) in the over-60 population between 2015 and 2030. According to the Singaporean government, about 440,000 people in 2015 were over 65, and this figure is expected to reach 900,000 by 2030.⁷⁹ The accelerated aging of the Singapore population bodes well for greater usage of healthcare services, which are expected to lead to increased use of Health IT in the city-state. Singapore also has the highest GNI/capita (gross net income) of any country, as well as a reasonably high level of mobile phone subscriptions, high GDP/capita (nominal GDP/capita of more than \$53,000 in 2015)⁸⁰ and its urban (partly by definition) population. This correlates well with other comparative measures, such as Singapore having the top ranking in the World Bank's "Ease of Doing Business" index.⁸¹

Opportunities for U.S. Companies

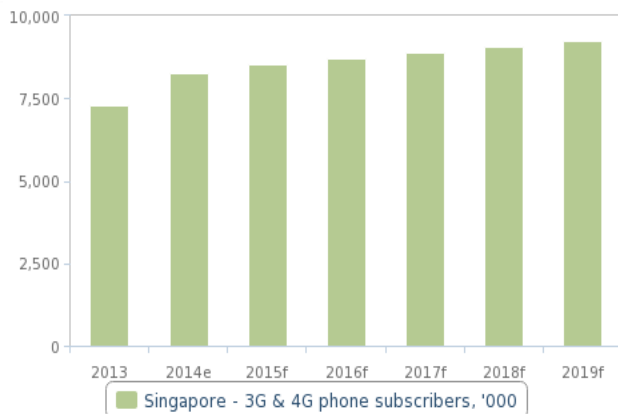
In 2009, Singapore initiated the National Electronic Health Record (NEHR) project, to provide each Singapore citizen with his/her own EHR. Singapore awarded a contract in 2010 to a consortium (Oracle and Accenture from the United States, and Orion Health, based in New Zealand but with offices now in 27 countries) to create and develop the NEHR. In April 2011, the first phase of its USD 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.⁸² The project was expected to be completed in June 2012, but is still being rolled out. According to a May 2013 parliamentary response, Singapore's Minister of Health Gan Kim Yong stated that SGD172 million (USD 136 million) had been spent on NEHR phase one to date, and the annual maintenance costs of the system amounted to SGD20 million (USD 15.8 million). The Singapore government is expected to continue to spend money to update and modernize the NEHR. It is worth noting that if a country like Singapore (with a population of 5.5 million) experiences difficulties in implementing a NEHR, significant delays will be even more likely in countries with larger populations.⁸³

Singapore represents a strong market for introducing 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 larger, more sophisticated mobile health and telehealth applications. In December 2015 (latest monthly data available), the Infocomm Development Authority (hereafter "Infocomm") reported that, of the 8.2 million mobile phone subscriptions in service that month, 4.84 million (59 percent) were postpaid subscriptions.⁸⁴

Another reason Singapore can contemplate adopting advanced mobile health and telehealth technology is the overwhelming presence and usage of 3G and 4G services. Using Infocomm December 2015 data, 3G represented 3.91 million (47.7 percent) of all mobile phone subscriptions, and 4.08 million (49.6 percent) were 4G. Between June 2014 and December 2015, 4G system usage in Singapore increased by 50 percent, and now exceeds 3G usage. As a result, more than 97 percent of the population using mobile phones has access to these very sophisticated systems. This high ratio is further reflected in forecasts from BMI, growing from 8.3 million in 2014 to 9.2 million by 2019 (see Figure 3).

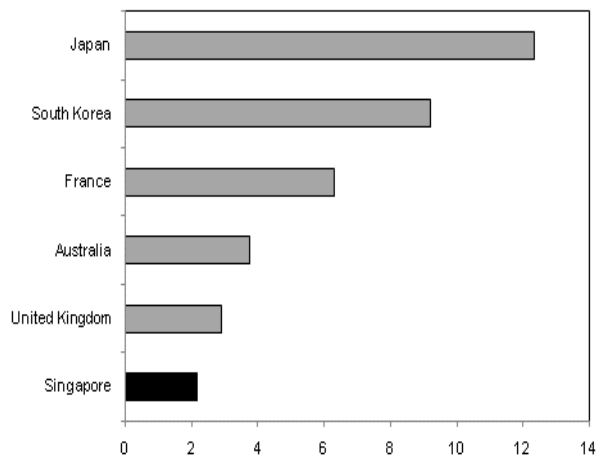
Figure 3: Soaring Subscriptions in Singapore
3G And 4G Phone Subscribers Per 1000 Population



f = BMI forecast. Source: IDA, BMI.

Singapore also has a disease incidence and hospital bed profile where mobile health and telehealth should help address patient treatment issues. 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, much lower than Japan’s 12.3/1,000 and South Korea’s 9.2/1,000; see Figure 4 below), likely will lead to increased home-based healthcare provision for Singaporean citizens. Low hospital bed availability has occasionally led to shortages in recent years, and

Figure 4: Singapore: Behind Developed Peers
Selected Countries: Hospital Beds Per 1000 Population. 2014



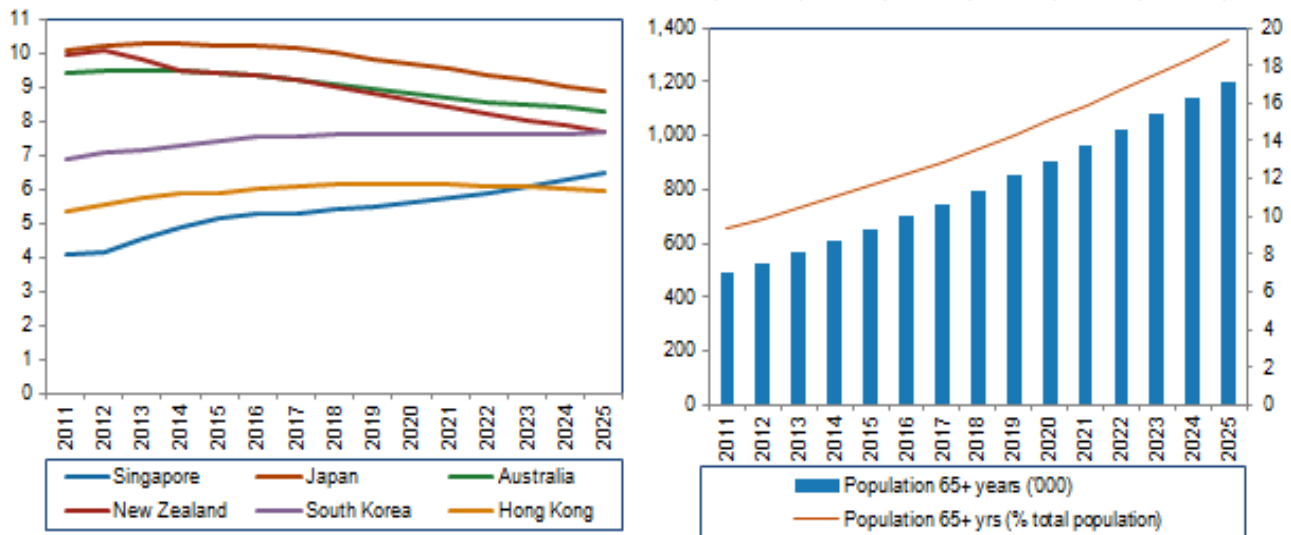
Source: BMI¹

the Health Sciences Authority’s plans to add 1,700 acute care beds by 2020⁸⁵ will be insufficient to meet likely 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.

Singapore has been historically frugal with its healthcare spending (4 percent of expenditures went towards healthcare as recently as 2011), but with the expected aging of the population, expenditures are expected to rise over time, potentially reaching 6.5 percent by 2025 (see Figure 5).⁸⁶ The rapid aging of the Singaporean population (see figures above)⁸⁷ is likely to increase use of healthcare products and services, creating market opportunities for Health IT companies. Interestingly, elderly Singaporeans may be more receptive to the use of digital health solutions than generally believed, as a recent survey showed that more than 70 percent of older Singaporeans expect to use these technologies in the future,⁸⁸ further highlighting the opportunities for the Health IT sector. Consistent with these intentions, in October 2015, the Singaporean government announced an investment of almost \$2.1 billion in “smart technology” targeted for senior citizens, including active aging hubs in new housing developments for care and rehabilitation, telehealth investment and use of automation.⁸⁹

Figure 5: Spending Efficiency Will Remain Despite Ageing Population

Healthcare Expenditure Percentage of GDP (LHS), Singapore's Pensionable Population ('000) and As a Percentage of Total Population (RHS), 2011-2025



Source: WHO, World Bank, UN, BMI

Some home-based outpatient mobile health and telehealth initiatives already exist. For instance, five of Singapore's six public hospitals currently use a transitional healthcare model involving sending medical staff to patient's homes to ensure adherence to medication. This presents an example where telehealth initiatives can improve healthcare delivery and alleviate the strain on human resources in hospitals.

The widespread availability of wireless broadband services should also lead to greater deployment of telehealth services in the home (87.7 percent of Internet connections in Singapore during December 2015 were wireless broadband).⁹⁰

Public healthcare providers have also begun the transition towards home-based care, such as the 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.⁹¹

Small and medium-sized U.S. Health IT companies could benefit from a partnership between Philips

and EDBI, Singapore's Economic Development Board's investment arm, announced in January 2016⁹² that would use Singapore's developed market status to help companies enter the rest of Southeast Asia. The partnership plans to invest in "select, high potential digital health companies working in population health management ... (including) telehealth, telemonitoring and other healthcare informatics solutions that apply differential care strategies to meet the needs of targeted patient groups."⁹³ EDBI plans to use its connections with health sector stakeholders to raise the awareness of innovative health solutions throughout the rest of Southeast Asia, while Philips will provide mentoring services to these new-to-market companies. Some of these new products and services could also be sold to Singaporean citizens.

In October 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 appears to include health as one area of focus. As the Office's priorities and projects continue to evolve and develop, those related to healthcare and Health IT, which incorporate innovative technologies, might find a receptive audience.

Further evidence of Singapore's interest in Health IT can be found in the city-state's 2016 Budget document, when the Finance Minister announced a

new entity called “SG-Innovate.” He said that “SG-Innovate will match budding entrepreneurs with mentors, introduce them to venture capital firms, help them to access talent in research institutes and open up new markets...(including) new and emerging sectors such as...Digital Health...”⁹⁴

Singapore has also hosted several Health IT industry conferences, further highlighting local interest in the sector.

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) to permit access to private facilities; and 3) a medical endowment fund that supports those Singaporeans who do not have funds available to contribute to the other systems.

U.S. healthcare stakeholders have expressed interest in greater transparency regarding Ministry of Health (MOH) policies. To date, these concerns have not been related to Health IT. Given that the oversight of Health IT is divided between MOH and Infocomm, 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.

Germany

Type of Market: Large/Challenging

Germany has a sizable healthcare market, with Health IT applications representing more than \$280 million at present. An aging society, with significant share of chronic disease, national use of eHealth Cards, and high Internet and mobile phone penetration, potentially make Germany a strong Health IT market, particularly for telehealth and mobile health. Besides significant concerns regarding system interoperability, companies need to understand and plan for some important headwinds if they are interested in entering Germany. These include strict regulations regarding data management, security and privacy, and use of Health IT software, as well as the established presence of major international health and IT companies. Implementation of the December 2015 eHealth Law is forthcoming, and it is unknown whether the new Law will address all outstanding issues. A carefully-considered market plan and partnering with 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

7

Description of Rank and Sub-score Measurements

Germany rated highly in the Top Market Report for several reasons: one of the world's highest GDPs, above average healthcare spending per capita, a large healthcare market (more than \$300 billion in 2012)⁹⁵ and an aging population (behind only Japan and Italy among the countries studied). The Health IT market in Germany in 2016 stands at \$284 million, but the sector is expected to grow annually by 22 percent to reach \$631.3 million by 2020. According to the Bitkom industry association, Health IT is now the eighth most important IT segment in Germany's sector index in the first half of 2016, behind segments such as IT security, industrial Internet, big data, and the Internet of Things (IoT).⁹⁶ 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.

Opportunities for U.S. Companies

In December 2015, Germany passed an eHealth Law (hereafter "Law")⁹⁷, which contains a number of provisions to encourage Health IT and telehealth use while incorporating financial penalties if the Law's provisions are not satisfied. The 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.⁹⁸

In addition, the 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 Law stipulates June 30, 2016 as the beginning of the nationwide rollout. Infrastructure tests will then transit into the nationwide rollout of electronic master data management, referred to as "online updates." This is the point in time when the Law will take effect.

The Law will hopefully address some long-uncertain issues, 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. Analysts have noted that patients will ultimately have to decide how much information they would like stored on the new eHealth card (eHC); like the old version, only administrative information will be mandatory.⁹⁹

In addition, as of 2018, patients have the right to have emergency data and medication plans listed on their eHCs. According to the Law, doctors and nurses can access those data in emergencies without prior

patient authorization. In all other cases, patient consent must be proof-ready. By the end of 2016, *gematik*, the major federal government contractor for the telematics infrastructure, has to come up with a solution for patient access, mobile and stationary, to personal data. An option under review is wireless communications between eHC and a patient app. Infrastructure for Electronic Patient Records should be developed by 2018, according to the Law.

Demographics and population health show favorable trends for more widespread use of Health IT in Germany, especially mobile health and telehealth. Using this Report's methodology, by 2030, Germany is expected to have the third highest percentage of people over age 60, behind Japan and Italy. In addition, chronic and long-term diseases account for roughly 80 percent of German healthcare spending.¹⁰⁰

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).¹⁰¹ With Germany planning to implement 4G systems by 2018 (these systems are not yet in place), market opportunities look bright in Germany for use of faster, more innovative Health IT solutions.

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).¹⁰² There is, however, an imbalance in the geographic distribution of doctors, with relatively few in rural areas,¹⁰³ which could spur further use of mobile health and telehealth solutions. Many hospitals and physicians use Health IT to store health information in digital form. 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 launched in 2015 included all 131 public sickness funds (the statutory health insurance system that covers 90 percent of the German population). A separate clinical trial on chronic heart failure, called TIM-HF II¹⁰⁴, includes more than 400 practitioners and 60 cardiologists, with first results expected in 2016 or 2017. 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.¹⁰⁵

Finally, Germany hosts conhIT, one of Europe's largest annual Health IT trade shows, first held in 2008, which serves as a possible avenue for new companies to enter the market. The 2017 show will take place in Berlin from April 25 to 27. In 2016, conhIT hosted approximately 9,000 visitors and more than 450 exhibiting companies.¹⁰⁶

Challenges in the Market

There are significant challenges and other considerations U.S. companies should keep in mind when entering or expanding their presence in Germany. Companies should give these issues 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). These cards, however, contain no health information (only a photo, name, birth details, and an insurance ID number) due to strict data security laws, so the eHC does not function like an Electronic Health Record. Insurance funds and physician associations have accused each other of delaying tactics in connecting health information to the eHC. The new eHealth Law¹⁰⁷ sets forth a plan for patients to allow health information to be included on an updated version of the eHC, starting in October 2016 (for

patients on at least three different prescribed medicines) and July 2018 (for information such as allergies and implants), but this information can only be included with patient approval due to security concerns.¹⁰⁸ Physicians are to receive remuneration if they are able to produce data sets from the emergency information on the new eHC, but are to be penalized if they do not comply by July 1, 2018.¹⁰⁹ The so-called “online updates” of master data are important to develop a blanket digital health infrastructure. Physicians will need to apply for an electronic pass (HBA) with a qualified electronic signature (QES) by 2017 with one of the three likely providers: Medisign (approved), T-Systems, and the Federal Government Printing Office.¹¹⁰

- 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.¹¹¹
- Roughly 9 million Germans possess private health insurance; collectively, more than 162 insurance companies exist in Germany.¹¹² Therefore, there will be limited demand for U.S. health insurance companies to enter the German market.
- While Germany has piloted a telematics infrastructure (combining elements of telemedicine and telehealth in a single system), it has not been fully implemented, and standards, requirements and specifications have not been finalized for all possible use cases.
- Germany’s new eHealth Law does not permit all Health IT applications (such as remote treatment of a patient for their first medical diagnosis or therapy by a doctor), so developing a reimbursement case for a specific application might be difficult. Remote counseling of patients, teleconsultations between physicians, and telemonitoring of known patients, however, are allowed.
- Hospitals generally have underinvested in IT (1.5 to 2 percent of total spending)¹¹³ in comparison to other European countries. According to a 2014 RWI and Accenture report, German hospitals have an investment shortfall 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 no

action is taken.¹¹⁴ As a result, mobile health and telehealth services may be well suited to meet patient needs not available in the hospital environment.

- Germany has no national organization with the authority to set Health IT standards; as a result, interoperability does not exist between vendor solutions, limiting the scalability of certain Health IT products and services.
- Approximately 200 Health IT companies have established operations in Germany,¹¹⁵ 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.¹¹⁶ 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.
- Alliances (such as the recent one between Royal Philips and Allianz, a major private sickness fund, to provide connected health solutions) and mergers (such as Agfa HealthCare’s recent purchase of Austrian TIP Group) are a key part of the German Health IT sector. According to Business Monitor International, cloud analytics is a rapidly growing segment, with IBM and Dell leading the race to build huge analytics platforms.

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Japan

Type of Market: Large/Challenging

Japan ranked among the top countries in this Health IT Top Market Report, with a favorable demographic profile, a largely urbanized population and sizable current market, coupled with significant ICT and healthcare investments in place. Challenges remain for U.S. Health IT companies doing business in Japan, including a lack of specific Health IT policies and involvement of many government agencies overseeing the sector, leading to areas of policy fragmentation.

Overall Rank

9

Description of Rank and Sub-score Measurements

Japan continues to rank among the top export prospects in this Health IT Top Market Report (NOTE: the methodology used to rank countries has changed from the 2015 Report, so rankings are not directly comparable between years), and rates highly on most metrics. For instance, Japan has the third highest GDP level globally (behind only the United States and China), a large Health IT market size (around \$4 billion), a significantly aging population, a high concentration of population clustered in urban areas, and a tech-friendly society. All of these factors indicate that Health IT already has a good foundation in Japan, with the potential for more growth. Japan did rate a bit lower compared with other countries in several new metrics used in this Report (including a shorter life expectancy once a patient becomes ill and less financial support of the elderly), which, along with some policy concerns, resulted in a lower overall rating.

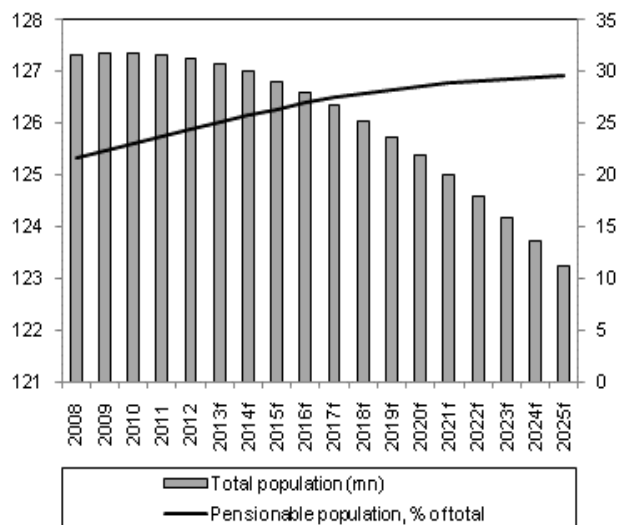
Opportunities for U.S. Companies

The government's plans to revamp healthcare services are unsurprising given Japan's demographics. In 2015, the over-65 population represented 26.5 percent of Japan's population and notably increased in size by 2.9 percent, while the 0-14 and 15-64 segments each declined (by 0.9 and 1.2 percent respectively) from 2014.¹¹⁷ The over-65 proportion is projected to reach 36 percent by 2050 (see Figure 6 for data through 2025). A noteworthy side effect of this trend is that the aging of Japan's population also affects the demographics of the caregivers themselves; a study by PLOS One indicated that Japanese doctors aged 60 and over will rise from 20 percent in 2010 to 36 percent by 2035, and a separate 2012 MHLW study indicated

that older doctors on average work fewer hours than younger ones.¹¹⁸

As a population ages, the burden of non-communicable diseases becomes much greater than that for 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, and also provide opportunities for U.S. companies to offer home-based treatment options. MHLW statistics from 2011 noted that Japanese

Figure 6: Ageing, Contracting Population
Japan Demographics
Percentage of Total Population (RHS), 2011-2025

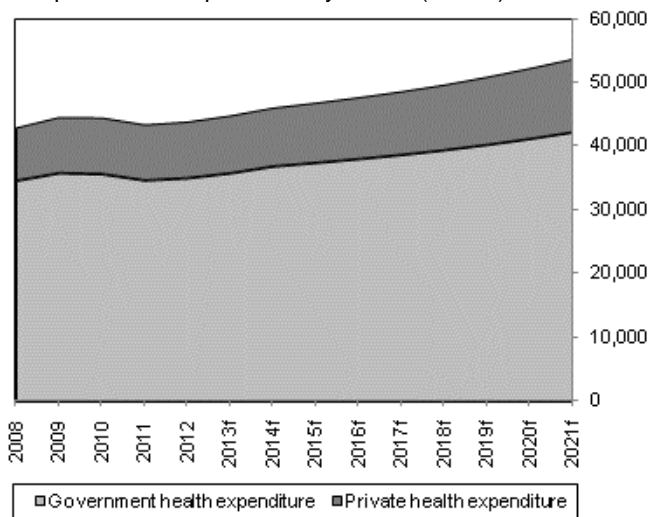


f = BMI forecast. Source: BMI, World Bank, UN

patients 65 and over accounted for 68 percent of daily in-patient visits and 46 percent of outpatient visits.¹¹⁹

Despite the Japanese government's best attempts, the financial burden of providing generous healthcare benefits for the population is unsustainable, especially in a slow-growth, developed market (see Figure 7).¹²⁰ In 2014, government healthcare expenditure reached USD 474 billion, leading to government initiatives to

Figure 7: High Government Expenditure
Japan Health Expenditure by Sector (JPYbn)



reduce total expenditure on healthcare.¹²¹

f = BMI forecast. Source: BMI, WHO1

As a result, private sector healthcare provision in Japan (through improved home care and community-based care, aided by mobile health and telehealth solutions) will likely need to become a greater proportion of treatment services, particularly for the elderly population. Such treatment solutions also will likely result in improved population health and analytical data about the overall condition of Japanese patients.

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 U.S. Commercial Service Tokyo for assistance, and large, multinational companies (such as GE Healthcare, IBM and Apple) also have a presence in the market.

The American Chamber of Commerce-Japan (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:

- Revise Article 20 of the Medical Law (referenced below), particularly clarifying who can practice telemedicine and broaden the scope of practitioners beyond medical doctors;
- Clearly define reimbursement qualifications and expand the number of telemedicine services eligible for reimbursement;
- 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 (note: now called the “My Number” system, shown below under “Challenges”) as soon as possible;
- Continue efforts and create incentives to increase Electronic Healthcare Record use to 50 percent or more within three years, and encourage greater data interoperability between medical facilities;
- Harmonize privacy and personal information rules among competent government bodies for use of “big data” and analytics in cloud computing environments;
- 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, including improving coordination across the various ministries involved in regulating the sector; and
- 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 International Trade Administration, 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 education

and workforce experts from countries worldwide, including Yukiko Yokobori of the Japan Hospital Association. The curriculum was finalized in mid-2015, and is now being rolled out worldwide. Countries such as India, Nigeria and Saudi Arabia have already committed to adopting the curriculum and will begin instruction shortly. Japan would significantly benefit by being an early adopter of the finalized curriculum and introducing the coursework into universities and professional development institutions to educate their workforce and increase adoption of Health IT technologies. With a healthcare workforce of more than 300,000 physicians, over 1 million nurses and more than 280,000 pharmacists,¹²² increasing the capacity and knowledge of Japan's workforce on how to appropriately and efficiently use Health IT appears to be a sound investment.

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

- A 2013 week-long interagency delegation visit to Japan by representatives from HHS (Office of National Coordinator—ONC), Veterans Administration, International Trade Administration and National Institute of Standards and Technology. The visit included meetings with Japanese ministries (MHLW, METI, MIC, and MOFA; acronyms spelled out below), as well as industry, academic and trade association officials (more details on this trip below);
- 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;
- A September 2014 meeting in Washington including U.S. government, Keidanren, ACCJ and industry trade associations (HIMSS and TIA);
- U.S. government meetings with representatives of the Japanese Association of Healthcare Information Systems Industry (JAHIS) at HIMSS Annual Conference, 2013 and 2014;
- Meetings with Japanese Embassy in 2013 and 2014; and
- Meeting between Government of Japan Office of IT Secretariat, ONC and Commerce at HIMSS Annual Conference, 2016.

ACCJ and other industry participants 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 included:

- Addressing the shortage of Health IT workers in Japan;
- Advising Japan on efforts to standardize data exchange (such as the "SS-Mix" system);
- Meet with city and local government officials leading the effort on piloting new Health IT products and services (may include Shimane, Kanagawa and Okayama prefectures);
- Focus on disease prevention, rather than treatment of chronic disease;
- METI interest in supporting private sector initiatives;
- Education of Japanese officials on lessons learned from U.S. Health IT rollout;
- Encourage increased Japanese involvement and activity with international Health IT standards-setting bodies; and
- Discuss transition of Health IT pilot projects in Japan to long-term sustainability.

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 the oversight of Health IT:

- Ministry of Health, Labour and Welfare (MHLW) leads on pharmaceuticals, medical devices, promotion of health products and home healthcare;
- Ministry of Economy, Trade and Industry (METI) has the lead in Health IT services and commercial engagement;
- 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 relates to privacy and protection of personal information, as provisions vary among government agencies, and local governments may also impose rules. As a result, this creates challenges for Health IT companies (particularly those in cloud computing and data analytics).

Since no agency has a clear lead role in overseeing all aspects of Health IT, and significant areas of the sector (such as data storage and patient-oriented health) are not currently governed by rules and regulations, the result is regulatory and policy fragmentation, resulting in uncertainty regarding the rules U.S.-based companies will confront when entering the market. For example, in early 2015, the Japanese Diet undertook a review of the Personal Information Protection Law, which led to the introduction of the “My Number” system later in the year. The “My Number” system provided all Japanese citizens with a Social Security/tax identification number, but the system currently is used only for immunization records and health check information in relation to healthcare and treatment. Other health information has been kept separate from “My Number” due to privacy concerns. There has been discussion that another system will be created to handle medical information, but no decisions have been made on that topic as of May 2016. A separate system will possibly create system integration challenges to commercial and public health efforts to take full advantage of sharing information and basing treatment decisions on a complete record of a patient’s health condition, posing commercial challenges to U.S. companies. As of January 1, 2016, a new agency (the Personal Information Protection Commission) was established to handle personal information including the “My Number” system. Regulations currently are also in effect regarding mobile technologies and population health.

Another factor that could inhibit increased uptake of Health IT in Japan is the lack 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 an advocate for purchasing integrated systems. In Japan, often there is no hospital point-of-contact available (or aware) to advocate for installation of these systems. In addition, most Health IT systems are developed for individual hospitals, not so information can be shared between facilities.

In addition, 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, creating further challenges in finding investment opportunities.

There are several local companies active in the sector. These include Fujitsu and NEC, who are focusing on electronic medical record systems, and Softbank, a leading company in the mobile communication services, devices and software sectors (and also with business partnerships with U.S. Internet company Yahoo! and U.S. telecommunications company Sprint). Other local players include Hitachi, Panasonic and NTT Data. In January 2016, Toshiba announced their Medical Systems unit was for sale, and at the end of March 2016, Canon assumed the rights to Toshiba’s medical equipment business.¹²³

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 widespread prevalence of Internet computer connectivity (81.7 percent,¹²⁴ from the Ministry of Internal Affairs and Communications’ Statistics Bureau) may have some impact on mobile health and telehealth deployment in Japan. Mobile phone penetration and Internet usage through phones have steadily increased in recent years,¹²⁵ indicating that wider implementation of mobile health and telehealth solutions could be used for more consistent collection and measurement of vital health information and associated need to control health costs.

Finally, Article 20 of Japan's Medical Law had been ambiguous regarding the status of telemedicine, but MHLW circulated a notice on August 10, 2015¹²⁶ which clarified that delivery of telemedicine services in Japan is allowed. This follows release of a March 31, 2011 MHLW ordinance (in the aftermath of the eastern Japan earthquake and tsunami) which "accepted telemedicine under the same conditions as face-to-face treatment."¹²⁷ Revision of Article 20 was a February 2014 recommendation from the ACCJ (referenced above) to promote the growth of telemedicine in Japan.

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Canada

Type of Market: Large/Growing

The Canadian market is a promising one for Health IT products and services, with significant Health IT investment already in place. High urban population density and GDP levels, as well as a large share of aging population, support this ranking. There are some challenges, however, including limited or no interoperability of telehealth systems and a fragmented health policy structure that varies by province. One particularly salient element of the Canadian market is the strong provincial role in delivering health care services. Due to geographic proximity and long-standing relationships, U.S. companies have opportunities for greater collaboration in areas such as electronic medical records, telehealth and mobile health solutions.

Overall Rank

13

Description of Rank and Sub-score Measurements

Canada receives a high ranking in the report due to its relatively strong rankings for per capita health expenditure, widespread Internet access, density of urban population, GDP and share of aging population. In addition, given the close proximity of Canada to the United States and the likely presence of strong existing relationships between Canadian and U.S. companies, there should be good opportunities available for U.S.-developed products and services to further establish themselves in Canada over time.

Opportunities for U.S. Companies

While Canada only has roughly one-tenth of the U.S. population, as of 2011 the urban population percentages in both countries are similar at about 81 percent;¹²⁸ meanwhile, most of the remaining 19 percent of the Canadian population is in sparsely settled locations. The urban percentage of Canadians continues to increase over time; as recently as 1986, 76 percent of Canadians lived in urban areas. This ongoing urbanization is particularly noteworthy as Canada's population grew at a steady rate of just over 1 percent a year between 2001 to 2011 (year of the last Canadian census).¹²⁹

In 2015, total health expenditure in Canada was expected to reach USD \$219.1 billion, or USD \$6,105 per person. It is estimated that, overall, health spending represents 10.9 percent of Canada's gross domestic product (GDP).¹³⁰ According to the U.S. Embassy in Canada, Health IT accounts for about 2 percent (USD \$3.3 billion) of annual healthcare

spending and has remained relatively stable in recent years. A key policy focus has been to harness technology to enhance efficiencies within the health care system, with USD \$7 billion to USD \$8.6 billion¹³¹ to be invested in Health IT infrastructure across Canada in the next 8 to 10 years. According to industry sources, Canada is expected to register a compound annual growth rate (CAGR) of 7.7 percent in the overall North American Health IT market in the coming years, followed by the U.S. at 7.2 percent.¹³² Projections by Business Monitor International show a similar growth trend trajectory for overall health expenditure (see Figure 8)¹³³ with the projected share of private health spending in Canada expected to increase over time.

Canada Health Infoway (hereafter "Infoway") is an independent, not-for-profit corporation established in 2001 to accelerate the development of electronic health records and related technologies.¹³⁴ According to Infoway, Health IT is very well accepted by the general public, as well as medical professionals. More than one in five hospitals provide patients with remote monitoring services, and more than 350,000 Canadians use medical devices that capture and transmit data electronically to their healthcare provider for monitoring and support. In terms of procurement contracts, Infoway contracts with vendors to supply goods and services through a competitive bidding process on an invitation basis.¹³⁵ Infoway partners mostly with technology solution companies across Canada. As a result, it is recommended for U.S. firms to establish partnership programs with Canadian companies to enhance their chances of entering Canada's Health IT industry.¹³⁶

Since its inception, Infoway has received USD 2.1 billion through five federal government grants. These grants have been issued by Health Canada through the Canadian Economic Action Plan, a publicly funded program.¹³⁷ These funds have been used to co-invest in more than 400 projects with the provinces, territories and other partners.¹³⁸ Below are a few examples of how these investments are making a difference in Canada:

- 77 percent of primary care physicians are now using electronic medical records;
- 99.9 percent of x-rays, MRIs, CTs and similar imaging in hospitals are now digital;
- Telehealth videoconferencing is now available in 98 percent of hospitals; and
- 88 percent of lab test results are now digital.

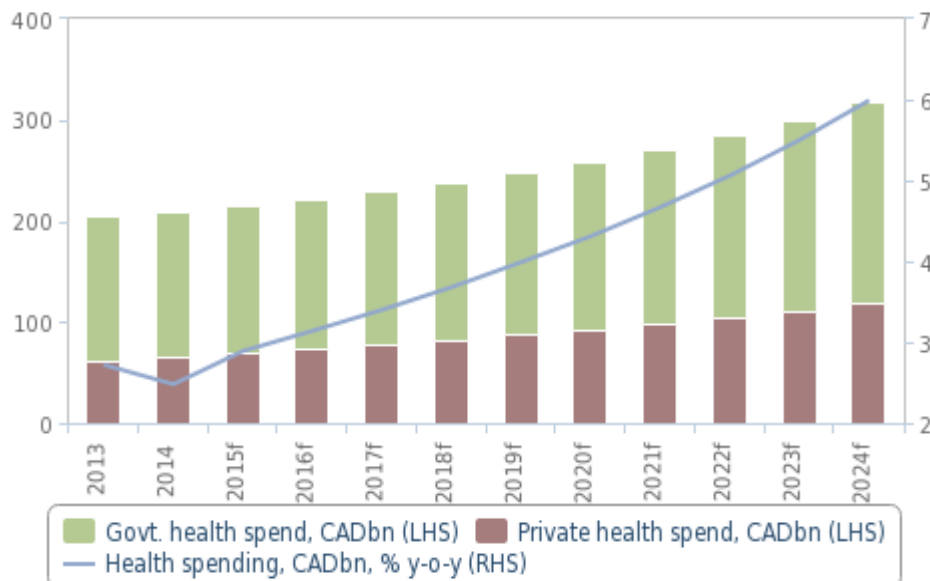
Across Canada, the delivery of clinical care via telehealth continues to expand, from 282,529 sessions in 2012 to 411,778 sessions in 2014, a growth rate of 45.7 percent during the period.¹³⁹ Since 2010, telehealth delivery has more than doubled. The delivery of healthcare services through telehealth and other forms of remote monitoring can pose tremendous market opportunities for U.S. exporters.

Infoway establishes investment approval and

investment expenditure targets for 13 investment programs every fiscal year. Delivering on performance expectations and continuing to advance Infoway’s investment programs will require investment expenditures in the range of USD 75.45 million to USD 93.42 million in 2015 to 2016.

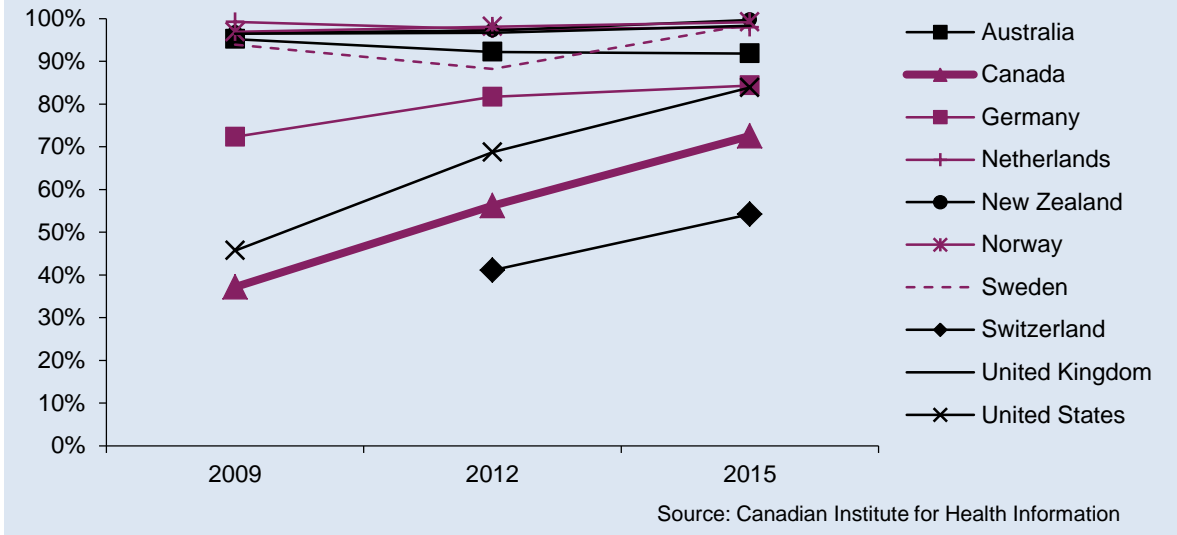
1. British Columbia Healthcare System (<http://www2.gov.bc.ca/gov/content/health/ab-out-bc-s-health-care-system>)
2. Alberta Health Services (<http://albertahealthservices.ca>) and Alberta Netcare EHR (<http://www.albertanetcare.ca/>)
3. eHealth Saskatchewan (<http://www.ehealthsask.ca/HealthRegistries/Pages/apply-for-health-card.aspx>)
4. Manitoba Health (<http://www.gov.mb.ca/health/>)
5. Ontario Ministry of Health and Long-Term Care (<http://www.health.gov.on.ca/en/>)
6. Quebec Health Insurance (<http://www.ramq.gouv.qc.ca/en/citizens/health-insurance/Pages/health-insurance.aspx>)
7. New Brunswick Health Department (<http://www2.gnb.ca/content/gnb/en/departments/health.html>)
8. Nova Scotia Department of Health and Wellness (<http://novascotia.ca/dhw/>)
9. Prince Edward Island Health PEI (<http://www.healthpei.ca/>)

Figure 8: Accelerating Growth Canada: Healthcare Market Forecast



f = BMI forecast. Source: World Health Organization (WHO), BMI

Figure 9: Use of EMRs has more than doubled since 2009, but Canada is still below the international average



10. Newfoundland and Labrador Department of Health and Community Services (<http://www.health.gov.nl.ca/health/>)
11. Yukon Health and Social Services (<http://www.hss.gov.yk.ca/>)
12. Northwest Territories Health and Social Services (<http://www.hss.gov.nt.ca/>)
13. Nunavut Department of Health (<http://www.gov.nu.ca/health/information/nunavut-health-care-plan>)

Separately, the Canada home healthcare market was valued at USD 10.5 billion in 2013 and is estimated to reach USD 18.9 billion by 2020, growing at a CAGR of 8.9 percent.¹⁴⁰

According to Transparency Market Research,¹⁴¹ home healthcare devices and services are commonly used for the diagnosis and mitigation of chronic diseases. The home healthcare market is witnessing positive growth in Canada due to the rising incidence of chronic diseases such as diabetes, cancer and hypertension. According to the Public Health Agency of Canada, three individuals out of five¹⁴² aged 20

years and above suffer from chronic diseases such as diabetes, cancer, mental illness and cardiovascular diseases in Canada, and four out of five are at risk of developing chronic conditions.

Geographically, the Canada home healthcare market is segmented¹⁴³ as Ontario, Quebec, Alberta and Rest of Canada. Ontario and Rest of Canada together account for almost 70 percent share of the total Canada home healthcare market in 2013. Key growth attributors for the Ontario home healthcare market include favorable government initiatives to improve and strengthen patient centered home and community care services. A large population base, coupled with rising prevalence of chronic diseases in Quebec, is projected to help this province grow with the highest CAGR for home healthcare during the forecast period of 2014 to 2020.

Separately, use of electronic medical records (EMRs) to manage patient care is lower in Canada than the international average, but uptake is increasing. Measuring the performance of primary care is still not standard practice in Canada.¹⁴⁴

Figure 10: With the exception of a few Western provinces, the adoption of patient EMRs is below the international average in Canada

Source: Canadian Institute for Health Information; CMWF (Commonwealth Fund)

	B.C.	Alta.	Sask.	Man.	Ont.	Que.	N.B.	N.S.	N.L.	Can.	CMWF avg.
Proportion of primary care doctors who use patient EMRs in their practices (not including billing systems)	82%	85%	83%	73%	78%	60%	40%	71%	36%	73%	88%

Figure 11: Only a small fraction of Canadian practices offer electronic communication with patients

Source: Canadian Institute for Health Information

	B.C.	Alta.	Sask.	Man.	Ont.	Que.	N.B.	N.S.	N.L.	Can.
Proportion of practices that offer the following means of electronic communication with patients:										
Request appointments or referrals online	10%	18%	14%	11%	12%	9%	5%	7%	4%	11%
Request refills for prescriptions online	3%	7%	15%	10%	10%	6%	3%	5%	2%	7%
View test results on a secure website	36%	22%	22%	17%	13%	11%	12%	11%	21%	18%

Fewer Canadian primary care doctors use EMRs compared with the international average (see Figure 10). Uptake has doubled in Canada since 2009, however, when the rate was 37 percent.

- Of those who have EMRs, Canadian doctors are less likely to use them to understand the health of their patients or to help make decisions to care for them.
- Canadian primary care doctors are considerably less likely than doctors in other countries to routinely review surveys on patient satisfaction and patient experiences. For example, in British Columbia, only 3 percent of practices request refills for prescriptions online, and 10 percent of practices request appointments or referrals online (17 percent vs. 47 percent) or to compare their performance with that of other primary care practices (17 percent vs. 37 percent). Figures in Figure 11 above may give some indications by province as to Health IT subsectors that may be promising for U.S. Health IT vendors.

Given Canada’s relatively lower adoption rate of EMRs, U.S. exporters may seek investment opportunities in this area. It is apparent that the Canada Health IT sector is continuing to evolve, and many gaps exist which may encourage foreign partnership to co-develop and cooperate in the sector. We can expect more advanced Health IT technologies to disrupt the broader healthcare sector, and Canadian companies will consequently be looking for global partners to be better prepared for the upcoming challenges to the health sector.

As strong allies, the United States and Canada could and should work together to improve health in both nations. An example occurred in November 2015, when more than 100 senior healthcare stakeholders—government officials, health professionals, academics and patient advocates—

gathered in Washington, D.C., to participate in the inaugural Canada-U.S. Health Summit, a meeting dedicated to sharing information and building cross-border collaborations around common health priorities. One overarching conclusion from the Summit is that both countries face similar obstacles to improving healthcare, including the challenges brought by aging populations and cost pressures on the health system. Healthcare innovation examples from both countries demonstrated the translatable nature of innovation beyond national borders.¹⁴⁵

Challenges in the Market

Canada is a highly decentralized federation with a mixed model of public and private healthcare delivery. Provincial/territorial (P/T) ministries of health delegate considerable administrative decision-making to quasi-public Regional Health Authorities (RHAs) in several provinces. Additionally, the delivery of most primary health services is private and therefore decentralized. As a result, many family physicians are profit-making professional contractors and are not directly employed by either the RHAs or P/T ministries of health. While hospitals are divided in ownership (some are owned by RHAs while others remain private) and are largely non-profit corporations, specialist physicians who provide acute services are usually private, independent contractors. Such a structure may create challenges for U.S. companies venturing into the market, particularly in the areas of interoperability of electronic health records and exchange of health information.

Unequal population distribution and language variances by region are two additional considerations when deploying Health IT in Canada, as more than 80 percent of the population lives in urban areas. In addition, many regions in Canada are

Location	Population	Percent	Language Policy
Canada	33,476,688	100%	Varies by Provence
Ontario	12,851,821	38%	Regionalized language policy: English and French
Quebec	7,903,001	24%	Officially French with support for English
British Columbia	4,400,057	13%	Officially English
Alberta	3,645,257	11%	Officially English with support for French
Manitoba	1,208,268	4%	Officially bilingual: English and French
Saskatchewan	1,033,381	3%	Officially English with support for French
Nova Scotia	921,727	3%	Officially English with support for French
New Brunswick	751,171	2%	Officially bilingual: English and French
Newfoundland and Labrador	514,536	2%	Officially English
Prince Edward Island	140,204	0%	Officially English with support for French
Northwest Territories	41,462	0%	Officially multilingual: English/French and others
Yukon	33,897	0%	Officially bilingual: English and French
Nunavut	31,906	0%	Officially multilingual: English/French and others

Sources: Canada Province Population 2011 Census -Retrieved February 7, 2016, <http://www12.statcan.gc.ca>; Language Policy, (https://en.wikipedia.org/wiki/Language_policies_of_Canada%27s_provinces_and_territories) Retrieved February 7, 2016.

bilingual or multilingual.¹⁴⁶ These challenges can be mitigated by developing pilot projects for entering the market and building bilingual/multilingual language platforms.

The health policy structure is very fragmented and varied by region, lacking a coherent governance and management structure featuring shared funding for Health IT. While healthcare in Canada is commonly referred to as "the Canadian Healthcare system", there are 14 single-payer, universal and public systems, including 10 provinces, three northern territories and the federal government, which deliver primary and supplementary health services to select populations.¹⁴⁷ Here are several issues that show the decentralized and fragmented nature of the Canadian Health IT system:¹⁴⁸

- Uncoordinated licensure, qualifications and privileging across (and sometimes within) telehealth networks/programs;

- Limited/no interoperability of telehealth systems with EMRs, EHRs and other digital solutions;
- Telehealth technology being unavailable at key times/places during a patient and family's journey through the healthcare system (e.g., lack of integrated scheduling across health authorities in a given jurisdiction);
- Multiple, confusing fee codes and reimbursement schedules;
- Burdensome scheduling and booking processes;
- Uncertainty about which organizations should play the lead role in supporting and serving First Nations, Metis and Inuit depending on the location (urban, rural or remote).

The challenges articulated above may potentially provide opportunities for U.S. companies to enter and offer information on international best practices to local partners and policy makers, shaping the Health IT industry in Canada over time.

South Korea

Type of Market: Large/Challenging

South Korea has a sizable Health IT market (\$1.8 billion in 2014, according to official statistics) but is currently focused on select industry subsectors. In addition, South Korea ranks well because of its extensive ICT infrastructure and emphasis on supporting innovation in next generation technology. 4G service and broadband Internet cover the entire population, with plans to upgrade some services to 5G in preparation for the 2018 Winter Olympics. Additionally, hospitals have begun to implement electronic systems, such as electronic medical records. South Korea, however, has severe restrictions on mobile health or telehealth solutions, only allowing activity involving a few remote parts of the country. South Korea's primary challenge is addressing the policy and cultural barriers that sharply limit current use of mobile health and telehealth solutions.

Overall Rank

21

Description of Rank and Sub-score Measurements

South Korea receives good ratings in the Health IT Top Market Report particularly because its aging population will account for an increasing share of the country's demographics over time, heavily urbanized population, and well established ICT infrastructure. Korea also ranks fourth in the World Bank's "Ease of Doing Business" report¹⁴⁹ and first in the International Telecommunications Union's "ICT Development Index" for 2015.¹⁵⁰

Opportunities for U.S. Companies

Official statistics from South Korea's Health Industry Development Institute (KHIDI) show that Health IT already has a well-established foothold in the country. 2014 data showed the sector size at \$1.8 billion, and it is estimated to triple to \$5.6 billion by 2020. In addition, the Korean government has signaled their intention to increase investment in the medical and healthcare sectors by more than \$100 million in the next two years.¹⁵¹ As discussed below, however, most of this activity appears to be concentrated in areas related to administrative simplification, claims adjustment/adjudication and electronic health records, not in mobile health and telehealth.

The Organization for Economic Cooperation and Development (OECD) predicts that Korea's population over 65 will increase from 11 percent of

the population in 2010 to 37 percent by 2050,¹⁵² due in part to a low fertility rate. Korea's population also has a high burden of non-communicable disease, 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 was estimated at 7.1 percent of GDP in 2014,¹⁵³ one of the lowest in the OECD, but that number is growing quickly,¹⁵⁴ due primarily to costs of hospital services. Hospitals average 9.2 beds per 1,000 persons, which is high for Asia.¹⁵⁵ The physician density is unusually low, however, 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).

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 and have more services but are very expensive.^{156,157} 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. Among OECD countries, Koreans visited doctors most frequently in 2013 (14.6 visits/person annually), more than twice the OECD average of 6.7 visits.¹⁵⁸ Readily available telehealth and mobile health solutions likely would lower this figure and lead to more efficient care delivery, but current policies (see below) sharply limit these options.

Additional outpatient resources, such as rehabilitation and long-term care, cannot keep up with demand. With high quality medical services available, South Korea has become a destination for medical travel from Asia and Europe. More than 266,000 patients received medical treatment in Korea in 2014, a four-fold increase since 2009.¹⁵⁹ This trend is likely to accelerate further after December 2015 passage of medical travel promotion legislation that could bring Korea more than 500,000 additional patients annually by 2017.¹⁶⁰

Korea has a compulsory national health insurance with high quality healthcare available. The government health insurance plan puts much of the financial burden on individuals through high co-payments (up to 40 percent of costs). This results in approximately 45 percent of healthcare spending coming from the private sector.¹⁶¹ Cost reduction technologies, particularly those geared towards consumers directly, may have a large market.

Korea has long had a strong interest in innovation, particularly in technology. In healthcare, the government has supported research and development through establishment of High-tech Medical Clusters, one of which (Daegu-Gyeongbuk) has an ICT focus.¹⁶² While expenditures support domestic research, U.S. companies also have an opportunity to collaborate 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 (115 percent) or Internet (84 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.

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 should consider partnering with local firms or have a long-term 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. Interconnected electronic systems, however, are not widespread in Korea at present, and many reports are still on paper. Therefore, there is a ready market for many Health IT solutions and systems.

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. Five different agencies currently have jurisdiction over aspects of Health IT, however, making coordination between agencies and updating current ICT regulations challenging.

Historically, availability of telehealth services in Korea has been extremely restricted (limited to a 2009 pilot program further explained below), as medical laws forced patients to see doctors in person, effectively precluding a market for telehealth products and services.

Remote regions in Korea would especially benefit from increased access to telehealth services. In 2009, a telemedicine pilot program was set up in three remote counties and saw 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.¹⁶³

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 patients remotely, which then went to the legislature for approval. Upon completion of this pilot, other pilot programs were launched which expanded areas of coverage and program objectives. Legislation to allow telehealth is still pending at the National Assembly, however. If

the pilot programs are successful, telehealth legislation will be considered after Korea's local election in April 2016.¹⁶⁴ Other existing laws will need to be reviewed and amended (if needed) to further expand the presence of telehealth in Korea, and policymakers will 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 not only covers healthcare services but also lifestyle needs, such as cooking and nursing.¹⁶⁵ 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 sector¹⁶⁶ 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. Although telehealth options are currently limited in Korea, Korean firms have the technology, as evidenced by the September 2015 signing of 15 Memorandums of Understanding with medical institutions and pharmaceutical companies in China to deliver telehealth services.¹⁶⁷

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Saudi Arabia

Type of Market: Moderate/Developing

Saudi Arabia has made noteworthy strides in adopting Health IT into their health system. The government has a Health IT plan in place and is developing a network to connect all government-supported health facilities and hospitals. Saudi Arabia has also created a favorable environment to promote entry of companies into the Health IT market and currently relies on imported technologies and healthcare workers. Short-term reductions in healthcare budgetary expenditures may slow down Health IT adoption, but long-term trends still look strong.

Overall Rank

34

Description of Rank and Sub-score Measurements

Saudi Arabia has a solid mid-level ranking in this Report (NOTE: the methodology used to rank countries has changed from the 2015 Report, so rankings are not directly comparable between years), primarily due to robust use of mobile phones (approximately 35 million customers) and Internet connections (about 16 million customers, about 60 percent of the adult population), as well as many citizens living in urban areas. Saudi Arabia's preference for importing the vast majority of its health care products and services also supports this ranking. These solid technology usage points are offset by a low rating for unhealthy life expectancy, particularly from an increasingly serious burden of non-communicable diseases among its citizenry (more data on this below), making the need for widespread deployment of Health IT products and services even more important.

Opportunities for U.S. Companies

The Saudi Health IT market is relatively open. Since products and services are typically imported, there is no significant local competition, 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 should be able to implement products or services at a national scale.

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-10,¹⁶⁸ making it easier for U.S. companies to provide products and services for the Saudi health system. The Saudi Ministry of Health (MOH) has taken the lead role in adopting standards so that the nodes throughout the network can easily communicate with each other.

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 MOH operates a procurement process for about 10 to 15 percent of Health IT purchases and has pre-qualified three global consortia to provide a connected Health IT network for all the public facilities and hospitals. In addition, the Saudi Arabia General Investment Authority (SAGIA), the government investment promotion entity, is reviewing policies and regulations to facilitate foreign investment in the country and allow for branches of foreign companies to set up business without a Saudi partner.

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. Health services are in high demand because the population has increased nearly 50 percent over the past decade and is becoming more urbanized. In addition, non-communicable diseases, such as cardiovascular disease, diabetes and cancer, are becoming more prevalent due to a sedentary

lifestyle and high smoking rate (22 percent, accounting for 71 percent of mortality). This incidence is even more noteworthy because the Saudi population is generally quite young, with 30 percent under age 15. By 2030, about 21 percent of the population is expected to be 60 years of age or older. The Saudi population is young, fast-growing and well-connected to mobile technology, providing a strong consumer base for uptake of mobile health technologies. The MOH has also implemented educational and prevention programs through the Center for Non-Communicable Disease to promote healthy lifestyles.

The government plans 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 number of healthcare workers and facilities, including providing adequate training and support systems. Currently, the healthcare system is dependent on importing healthcare workers, but the government is starting to develop education programs to increase the domestically trained workforce. In addition, Saudi Arabia is one of the first countries to adopt the AHIMA global curriculum for health information management education.

About 67 percent of health expenditures in 2010 were free services through government support. Total healthcare spending is approximately 5 percent of GDP. Private health insurance is perceived to be expensive with high out-of-pocket costs. There were 26 different health insurance companies in 2015, causing system fragmentation and increased inefficiency and cost; however, only about 30 percent (3.1 million) of the Saudi population is covered by health insurance.¹⁶⁹ The Saudi government plans to get involved in streamlining reimbursement processes. The Council for Cooperative Health Insurance regulates health insurance spending and is trying to implement a scheme to reduce the financial burden.

In the meantime, strategies for increasing healthcare sector efficiency 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 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 commercial opportunities in the rest of the region.

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

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. Projects under a Memorandum of Understanding (MOU) between MOH and Saudi company Elm (www.elm.sa, see below) should offer additional procurement opportunities for U.S. Health IT companies.

The MOH recently announced that their IT department would split into two divisions, one covering Operations and reporting to the Vice Minister of Health and the other for eHealth and New Projects, reporting to the Minister of Health. This development should give a higher profile to Health IT initiatives in Saudi Arabia.

The MOH-Elm MOU calls for Elm to oversee and administer all new eHealth projects, including Enterprise Resource Planning, Picture Archiving and Communications System, infrastructure projects and the building of 500 Primary Health Centers (PHCs); the procurement for the PHCs was issued recently. Elm has released a tender for consultancy firms to review the MOH eHealth strategy and make recommendations on possible initiatives. Elm has started to pre-qualify potential companies and various providers but has not yet officially signed a contract with MOH. All of these initiatives are expected to launch by August 2016.

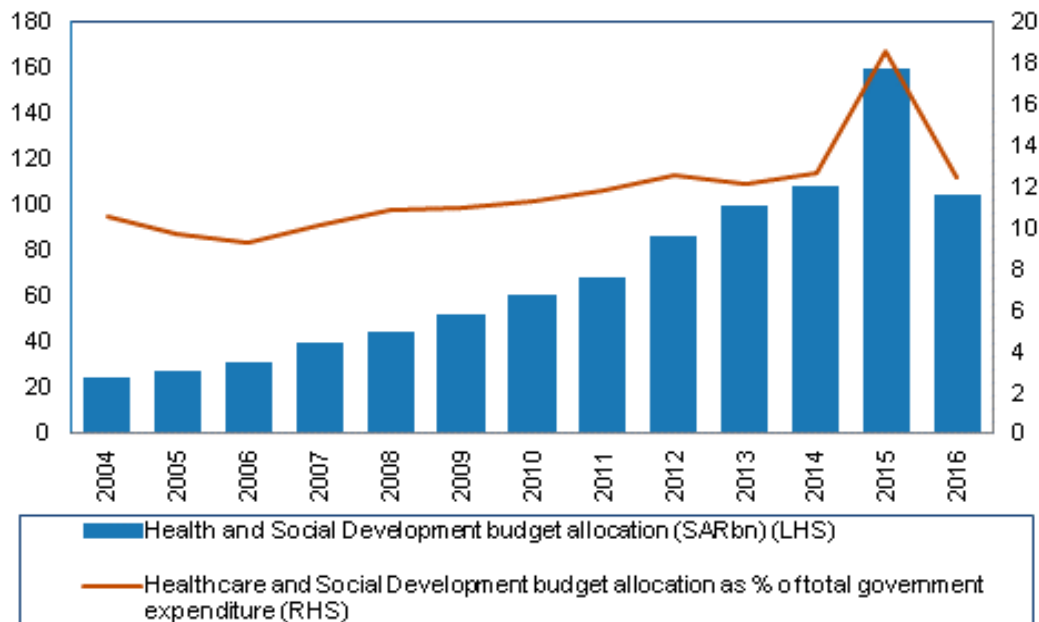
The Saudi government has made progress in combating illiteracy. Additional investments in ICT systems would also bridge the gap between physicians and their patients, as the latter are increasingly using the Internet to find health care information and engage with other patients and providers through social media. As Saudi healthcare officials adopt global best practices, increasing the functional health literacy of its citizens will be crucial in improving patient engagement and treatment. Engaging the family caregiver is a cornerstone of patient engagement in Saudi Arabia.

Challenges in the Market

The size of the Saudi Arabian Health IT market is in a range between \$150 million and \$200 million, a notable decline from 2014 estimates of \$500 million to \$1 billion. This decrease can be primarily explained by an approximately 20 percent decline in overall 2015 healthcare expenditures to \$22 billion, a result of lower crude oil prices. Expenditures for the Ministry of Health and Social Development expenditures are budgeted to decrease from \$42.6 billion in 2015 to \$27.9 billion in 2016 (see Figure 13), a decline of more than a third.¹⁷⁰ The healthcare expenditure figure is still the highest in the Gulf region, and the Saudi government has long prioritized healthcare spending in their budgetary plans, so expectations are that Health IT spending will rebound in the near future. In the immediate future, however, some previously announced projects (including healthcare facilities) are likely to be delayed or cancelled.

The Saudi mobile communications market is saturated by three main network operators (Saudi Telecommunications Company, Mobily and Zain),

Figure 13: Austerity In Wake Of Lower Oil Prices
Saudi Arabia Government Budget For Health And Social Development



Source: Saudi Ministry of Finance

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

with three others (Virgin Mobile, Elm and Lebara) recently joining the market. As a result, most mobile service providers are seeing revenue declines.

Consumers often have more than one mobile phone plan (179 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 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.

Brazil

Type of Market: Large/Emerging

Brazil's Health IT sector prospects have taken a discernible hit recently, as the Brazilian economy has fallen into recession. The long-term potential for U.S. Health IT companies remains positive: the sector remains in an early development stage; there is little domestic competition; ICT infrastructure is good; and regulations are minimal. There are still important unknowns, as the Brazilian government has not signaled near-term plans to introduce a Health IT deployment strategy. There are significant regional differences in healthcare provision, and an increasing percentage of healthcare services are being offered through the public sector at a time of very tight budget resources. Therefore, it is currently difficult to know what Brazilian government priorities will be for Health IT, but the large potential market for products and services make Brazil a long-term strong prospect for U.S. companies.

Overall Rank

38

Description of Rank and Sub-score Measurements

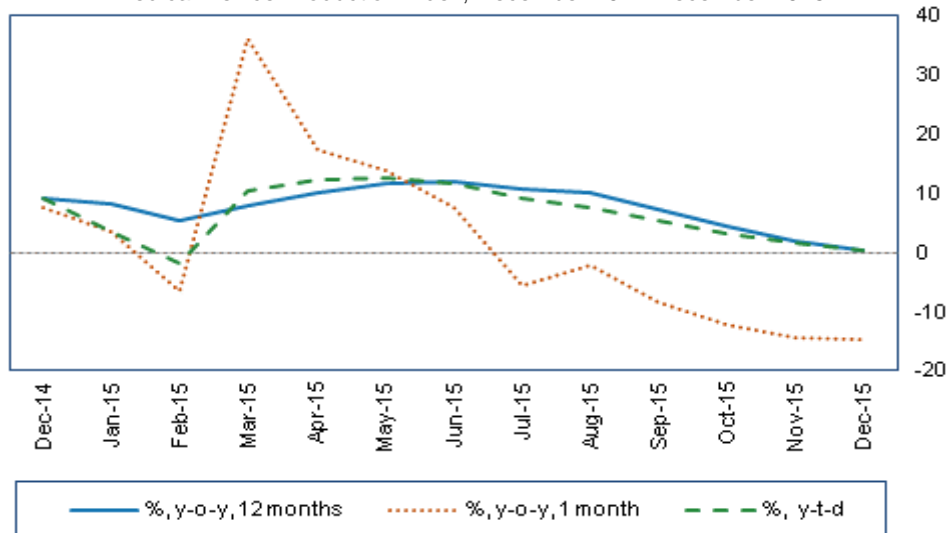
Brazil received a mid-level ranking in the Report due to relatively modest scores on most metrics, combined with low scores on ICT market development and per capita health expenditures. Brazil, however, has the world's sixth largest GDP, the fourth highest population among the countries ranked and a fairly high growth rate in the over-60 population over the next 15 years, indicating that a huge potential market exists for Health IT 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.

Opportunities for U.S. Companies

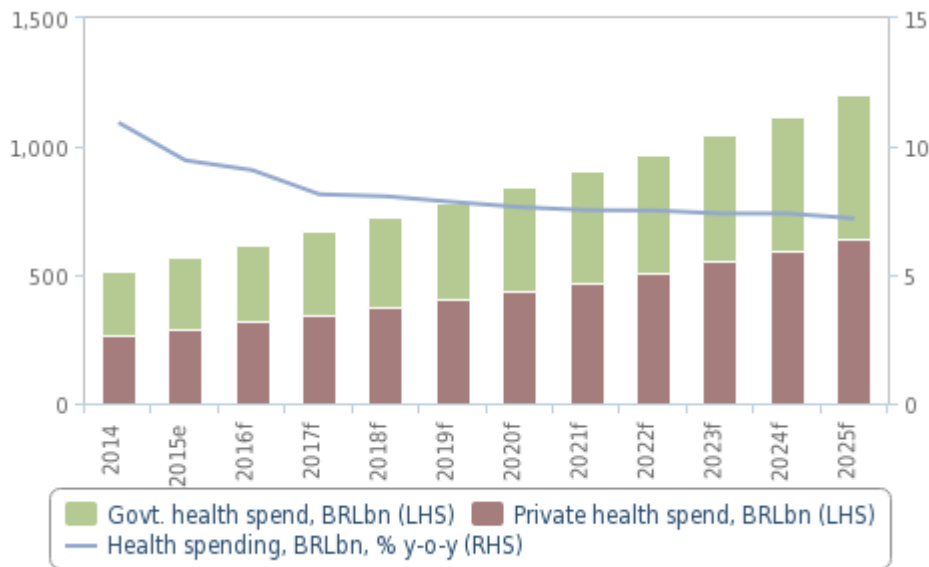
Determining market opportunities and potential with interested stakeholders (both public and private sector) will be an important aspect of a company's effort to enter the Brazilian market. Most notably, Brazil has no regulations related to Health IT at present, and the government has made little discernible progress in developing a national strategy for the sector. This is both a challenge and opportunity, as Brazil is highly dependent on foreign

Figure 14: Domestic Manufacturing Industry Underperforms in H215
Medical Device Production Index, December 2014-December 2015



Source: IBGE, BMI

Figure 15: Private Sector Will Contract in Real Terms In 2016
Brazil: Healthcare Expenditure Forecast



f = BMI forecast. Source: BMI/World Health Organization (WHO) ¹

technology and innovation to jumpstart this sector. Government and private sector stakeholder priorities for the rollout of Health IT are unclear at present.

Healthcare spending as a percentage of GDP is expected to remain around 9.6 percent over the coming years,¹⁷¹ even with recessionary pressures in place for the short-term. Brazil has one of the world's highest GDP figures, so a high level of healthcare spending reflects strong long-term opportunities for Health IT investment.

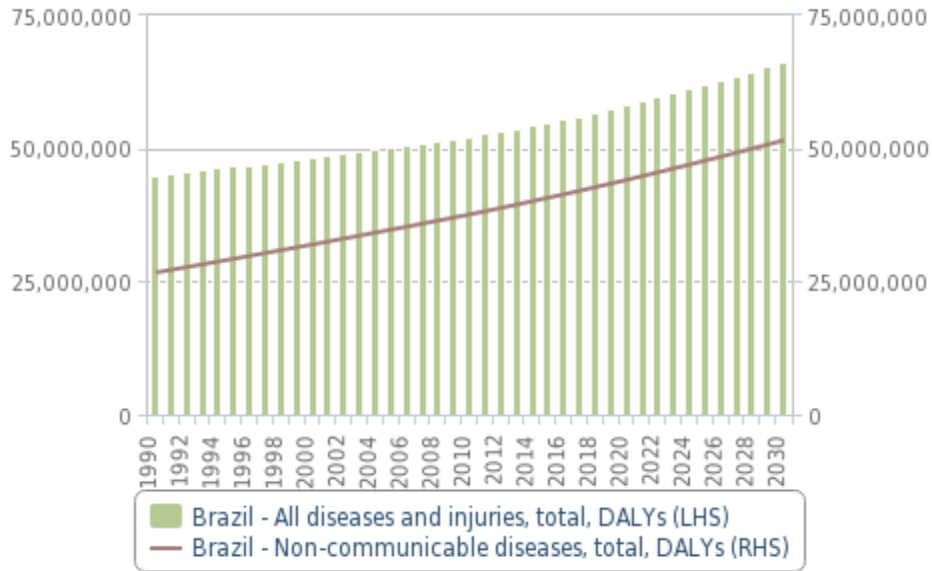
The recession has had a severe impact on Brazilian manufacturers, as evidenced by Figure 14 showing 2015 medical device production and exports. The difficult economic conditions may result in opportunities for U.S. healthcare and Health IT companies with innovative technologies to take advantage of the situation and establish or expand upon their current position in the Brazilian market.

Brazil's private healthcare market, although smaller than the public sector, will also be impacted by the recession. In local currency terms, the private market is expected to grow 7 percent (from 292 billion to 321 billion Brazilian reais) but is expected to drop 6.2 percent in U.S. dollars (from \$87.5 billion to \$82.1 billion). In local currency terms, the future

growth rate of the segment is expected to slow from 10.1 percent (from 2010 to 2015) to 7.6 percent (from 2016 to 2020).¹⁷² Even with the expected decline in private healthcare participation due to the recession and increasing unemployment (see Figure 15), strategic investments by U.S. firms may be possible (and even desirable) during this turbulent period.

The economic burden of non-communicable diseases in Brazil is set to rise in coming years (see Figure 16), 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 11.6 million diabetics, the highest number in Latin America. The IDF also notes there are 3.2 million undiagnosed cases of diabetes, while diabetes has an 8.7 percent national prevalence among the population. Brazil had approximately 116,383 diabetes-related deaths in 2014, giving Brazil the largest number of diabetes-related deaths in Latin America and the sixth highest number in the world, behind India, China, the United States, Indonesia and Russia. According to the IDF, the annual cost of living with diabetes in 2014 was \$1,578.¹⁷³

Figure 16: Increasing Noncommunicable Disease Burden
Brazil: Burden of Disease Projection



Source: World Health Organization (WHO)/BMI¹

The presence of the Zika virus in Brazil may also result in some opportunities for Health IT companies to develop apps and other interventions to assist patients. Possible diversion of health resources to address the Zika virus may also impact Health IT market development in the near-term.

Major investors in the telecommunications market recognize the Health IT potential in Brazil, particularly for telehealth. For instance, Telefónica Digital, the digital development arm of regional company Telefónica, acquired Brazilian chronic care management company Axismed in February 2013. The acquisition allowed Telefónica's Vivo unit to provide Health Monitoring services that also have Outpatient Care and Self Care applications to 180,000 Axismed patients by integrating Axismed into Vivo's infrastructure to contact and monitor patients using mobile apps, SMS and video streams to cover biometric data around glucose levels and blood pressure. The development of Axismed's service offering will see Telefónica Digital enable the transmission of biometric data through connected devices in patients' homes.¹⁷⁴

The U.S. Commercial Service Brazil has promoted and organized two U.S. Health IT trade missions to Brazil that comprised a series of activities that put participants in contact with Brazilian thought leaders; government officials from federal, state and

municipal levels; high level private hospitals; roundtables with medical associations; health insurance plans; laboratories; networking receptions and speakers/moderators on panels to discuss the transformation of healthcare through Health IT. In 2014 and 2015, 22 different U.S. companies joined programs in Sao Paulo, Porto Alegre and Rio de Janeiro. An ITA-organized Health IT trade mission to Brazil has been announced and will take place September 26 to 30, 2016. A link to the mission flyer can be found here: http://export.gov/brazil/build/groups/public/@eg_br/documents/webcontent/eg_br_098336.pdf.

Recent research by PwC suggested that the health app market in Brazil would 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.¹⁷⁵

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. In January 2015, the Brazilian government began enforcing the new Brazilian Health Sector Law, known formally as Brazilian Federal Law 13,097/2015. The Brazilian Health Sector Law upheld 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.” The amendment aims to attract new foreign investment within the healthcare sector.

As one of the world's largest emerging markets, encouraging foreign investment could 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 Group 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.¹⁷⁶ In December 2015, United Health announced that it would purchase Hospital Samaritano in Sao Paulo for a reported \$350 million, adding to United's 31 hospitals in Brazil.¹⁷⁷ In connection with the transaction, the company's Chief Financial Officer noted that “We're becoming more of a healthcare delivery business in Brazil with an insurance arm.”¹⁷⁸

Challenges in the Market

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

The most immediate is an economic recession, which Brazil entered in 2015 and is expected to last at least through 2016. Real GDP declined by 3.1 percent in 2015 and is forecast to drop another 3.4 percent in 2016.¹⁷⁹ In November 2015, the Brazilian government budget proposal sent to Congress proposed cutting healthcare spending by \$6.4 billion

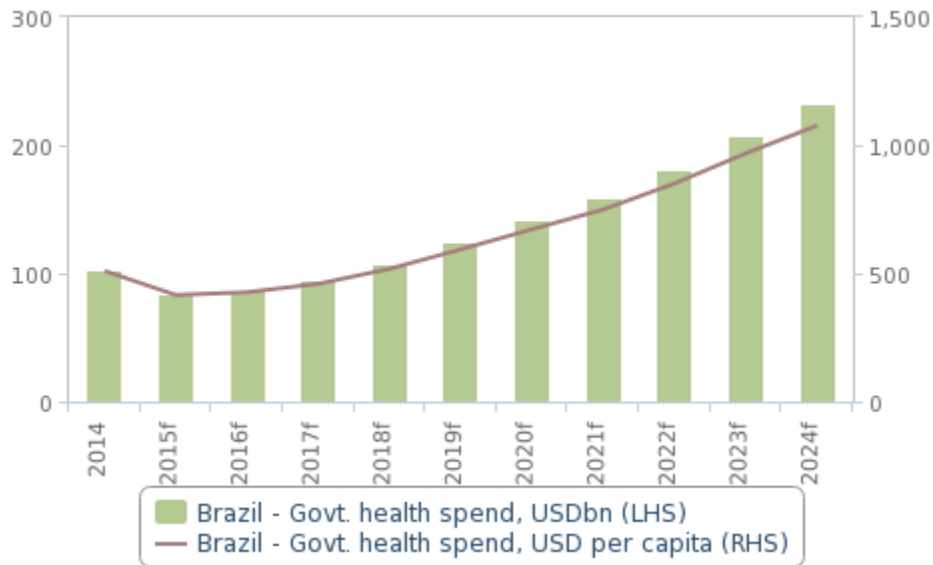
in 2016 to \$29 billion from an originally proposed level of \$35.3 billion. The originally proposed 9.6 percent increase (over the 2015 level of \$32.2 billion) will instead be a 10 percent cut. Long-term health expenditure trends, however, are still positive, as evidenced by the March 2016 decision by Brazil's Chamber of Deputies to increase federal healthcare expenditure to \$38 billion by 2023.¹⁸⁰

The 2015 healthcare cuts are part of a larger reduction in the public sector budget of 6.3 percent, or \$23 billion. Despite limited spending, the Brazilian government announced its commitment to two health programs: Mais Medicos, which is used to recruit and increase the presence of doctors, and Farmacia Popular, a federal program aimed at ensuring easy access to pharmaceuticals. Those were the only two programs granted financial guarantees.¹⁸¹ The proposed budget cuts are expected to adversely impact the health situation and important healthcare programs in Brazil, and are also expected to aggravate the underfunding of the sector and satisfaction of Brazilians with the country's healthcare services.¹⁸²

In November 2015, the budget situation resulted in Marcelo Castro, the Minister of Health, delaying transfer of 50 percent of funds for care in emergency rooms, surgeries and examinations to hospitals and programs (such as People's Pharmacy) from November 2015 until January 2016. Castro further noted the health funding calculation model approved by the Congress in 2015 should result in a deficit of at least \$1.99 billion in resources in 2016.¹⁸³

Another indication of the difficult financial situation faced by the Ministry of Health is their debt burden to suppliers and service providers, which reached \$236.91 million in late 2015, more than half of the \$426 million total that the state owes all its creditors, according to a financial monitoring system survey. The government's debt to the PróSaúde service, responsible for the management of a network of eight major health facilities, was particularly significant, at \$72.65 million.¹⁸⁴ Combining these factors together, it would not be a wise strategy for U.S. companies to approach the Brazilian public health system with the idea of new investments in the short or medium-term.

Figure 17: Growing Demand
Brazil: Public Healthcare Market Forecast



f = BMI forecast. Source: World Health Organization (WHO), BMI¹

In 2014, the Brazilian public health market was valued at \$103 billion, accounting for 48 percent of total health expenditure. By 2024, this figure is estimated to rise to \$233 billion, accounting for 54 percent of total market spending and equating to a compound annual growth rate (CAGR) of 8.5 percent in U.S. dollar terms.¹⁸⁵ Continued engagement and outreach to Brazilian government officials to meet their Health IT needs should remain a critical part of a U.S. company’s long-term strategy in Brazil because of the large size of the public sector, even if negotiation on per-unit amounts might currently yield small profit margins. Once the short-term challenges abate, Brazilian public sector officials will likely augment purchases of Health IT products and services to meet their long-term needs. This also means that the private sector will account for a sizable amount of medical spending in Brazil, which according to World Bank data requires nearly 60 percent of out-of-pocket spending by individuals.

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 Telesau de 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.

BMI estimates that, over the next 10 years, per capita public health spending will grow from \$821 to \$1,403 (see Figure 17).¹⁸⁶ It is worth noting that a 2014 Datafolha poll indicated that 92 percent of Brazilians use the public health system, making the 2015 proposed budget cuts far-reaching among the Brazilian population.¹⁸⁷

In addition, because the unemployment rate has jumped sharply recently (7.6 percent in January 2016 from 6.9 percent in December 2015; see Figure 18), more citizens have moved into the public healthcare system since they have lost their jobs, putting significant pressure on the public system at a time of reduced spending, likely leading to some cost containment measures.¹⁸⁸ According to the Institute of Supplementary Health Studies (IESS), the costs of Brazil’s private health plans increased by 12.2 percent in 2015, which is the biggest rise recorded. Between June 2014 and June 2015, the cost of healthcare services increased by 17.1 percent, mainly due to increasing hospital expenditures. In addition, the health insurance market lost more than 450,000 users in 2015 due to the country’s growing unemployment rate.¹⁸⁹ Although the rate and level of Health IT expenditures has likely declined in the

short-term, this may be an opportune time for U.S. companies to promote the advantages of digital health to Brazilian officials so that they can more efficiently spend their future public system funding.

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

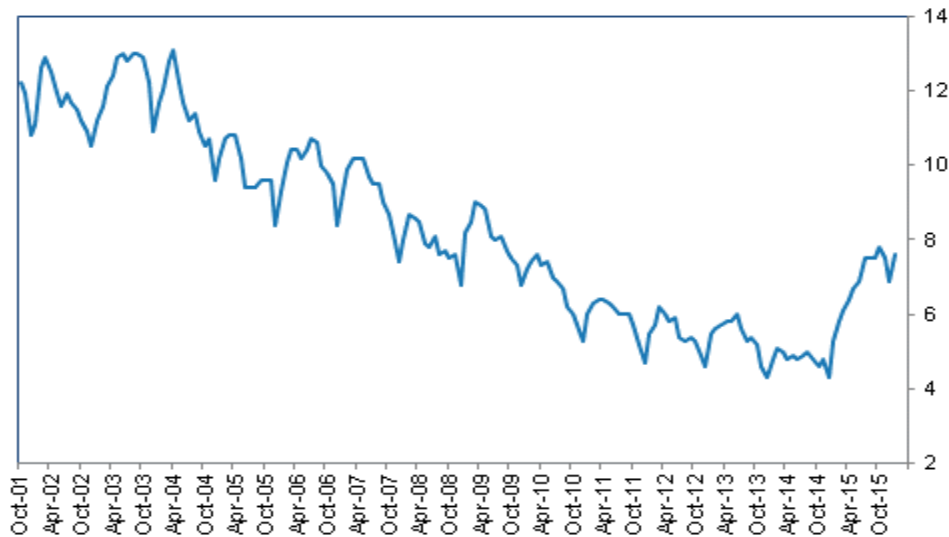


Figure 18: Sharp Uptick in Unemployment
Brazil - Unemployment Rate, %

Source: Bloomberg⁷

There are significant regional differences in healthcare spending 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 (Para', \$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 south-east 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 south-east (\$463) regions. Below

export strategies.¹⁹⁰

Almost 92 percent of Brazilians had access to 3G mobile connections in mid-2015, particularly in the south and south-east regions (where coverage is close to 100 percent), but availability in the central-west, north and north-east regions of Brazil remains below 85 percent, similar to 2014. In addition, Brazil has had an extremely slow rollout of 4G LTE (Long Term Evolution) services, reaching only 7.7 million 4G LTE mobile connections as of January 2015, according to figures from the country's telecoms regulator Agência Nacional de Telecomunicações (Anatel). As of January 2015, 147 municipalities, including the 23 state capitals and the Federal District, have 4G LTE, covering 41.8 percent of the country's population. Compared to other countries, as of January 2015, Brazil 4G has relatively low capacity and is not of high quality,¹⁹¹ and due to the focus on providing service to specific municipalities, coverage can be rather intermittent outside of the upgraded areas.

As of September 2015, Brazil had 275 million active mobile telephone lines, covering 91.1 percent of the Brazilian population, according to SindiTelebrasil. 56.3 percent of households claimed that mobile phones were their only form of telecommunication.¹⁹² Until there is wider

availability of 4G service, less advanced mobile health and telehealth technologies would seem to be more appropriate for the Brazilian market.

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 IT workforce totals around 250,000, lower both nominally and as a percentage of overall population than other Latin American countries, such as Mexico.¹⁹³ Not all of these professionals are working in the health sector, which may also constrain the expansion of Health IT in Brazil.

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Turkey

Type of Market: Moderate/Growing

Turkey is a moderate-sized Health IT market that has already set a solid foundation for their national Health IT system, particularly in the areas of Electronic Health Records (EHRs) and Hospital Information Systems (HIS). Turkey, however, has not done much to date in the areas of mobile health/telehealth, clinical decision support and data analytics, which offer significant potential to U.S. firms. A large public-private partnership project to build more than two dozen large hospital campuses will also be of interest to Health IT sector stakeholders.

Overall Rank

52

Description of Rank and Sub-score Measurements

Turkey received a modest ranking in this Report due to comparatively low levels of healthcare expenditures and mobile and Internet subscriptions by consumers. As described below, however, Turkey has laid much of the foundation for a potentially strong Health IT sector in the future due to logical policy decisions and existing infrastructure.

Opportunities for U.S. Companies

Turkey has made progress in establishing a central Health IT infrastructure, starting with the structured collection of patient health records. Turkey now would like to make this data accessible so that patients can make good decisions about their individual health and businesses can develop analytic tools so that hospitals and health systems can make sound business decisions.¹⁹⁴

Turkey's Ministry of Health (MOH) is the largest provider of healthcare services and serves as the lead government body to plan and implement healthcare and Health IT-related projects. Local software companies also play a significant role in providing specific Health IT solutions, including EHRs and HIS, which are widely used in Turkish hospitals.

In 2003, MOH launched an aggressive "Healthcare Transformation Program (HTP)", an initiative to restructure delivery of healthcare and to increase access of citizens to these services. The HTP is a long-term project with many elements still in progress. Integration of Health IT systems into this program was identified as a very critical factor for its success. The following actions were initially taken at the primary care level but which now can be found at all hospitals in Turkey:

- Keeping patient records in a structured manner and using EHR software that has the capability to transfer data to MOH;
- Mandating hospitals to use HIS in order to increase their management efficiency and quality of medical services delivered; and
- Merging different reimbursement systems used by different social security systems.

The introduction of the HTP coincided with a period of sustained economic growth, which enabled the government to increase health expenditures at an average annual rate of 9.1 percent. Turkey's public-sector funding as a percentage of total health expenditures increased from 63.0 percent in 2000 to 75.2 percent in 2010, while health expenditures rose from 4.1 percent of the gross domestic product in 2002 to 6.1 percent in 2010.¹⁹⁵

The MOH established a Healthcare Informatics Department to design the Health IT system called the "National Health Information System (NHIS)." NHIS was designed to receive and store electronic health records of all patients, which is now accessible to citizens on a mobile portal. Health record collection starts at the prenatal stage and continues into all stages of that person's life. The NHIS has a communication backbone covering the whole country and allows transfer of medical images. It is also possible to record human capital and all types of assets in the healthcare system into this portal. NHIS consists of the following elements:¹⁹⁶

1. Health-NET (Saglik-Net)

Health-NET is an integrated and expandable information system which aims to improve the efficiency and quality of healthcare services. Health-

NET uses patient data collected from various healthcare system stakeholders, and MOH determines policies related to public health. Health-NET has three primary components: National Health Data Standards (400 data elements, more than 60 datasets); a Health Coding Reference Server that brings together health information standards and coding systems such as ICD-10; and Internet services to take data from the field and enter it into Health-NET.

2. Telemedicine

Telemedicine is still not a common diagnostics method in Turkey, but MOH is doing some pilot projects. Priority is given to telemedicine use in the analyses of results from radiology, pathology, biochemistry and electrocardiogram (ECG) tests. In instances where telemedicine is used, medical images are transferred to the evaluation point using Digital Imaging and Communications in Medicine (DICOM)¹⁹⁷ standards.

3. Electronic Health Records (EHRs)

As collection of healthcare information on every patient is a key feature in establishing a nationwide health IT system, MOH first mandated the use of EHR software by every family physician and, at later stages, by all medical doctors working at public hospitals. Data collected from each patient is transferred to central servers kept by MOH. Every Turkish citizen has a national ID number for creating their health record. This health record is connected to that person throughout their life. Collection of patient health data will also make it possible for MOH to forecast healthcare related trends and to manage chronic illnesses.

Many Turkish Health IT software companies have developed EHR software which family physicians and hospitals use across the country. Healthcare entities can only use EHR software that have been developed according to MOH technical standards and that can transfer patient data to MOH servers.

4. Central Hospital Appointment System

Through a web portal, everyone can arrange their appointments with the doctors they prefer. There is also a call center that supports this website.

5. E-Prescription

Hard-copy prescriptions are no longer issued by medical doctors, but an e-prescription code is given so that a patient can fill their drug prescription at pharmacies. Pharmacies use an online payment system connected to the Social Security Institute (SSI) reimbursement system so that patients only pay the proper contribution amount.

6. E-Pulse

MOH launched the E-Pulse mobile health portal (www.enabiz.gov.tr) in 2015. Any Turkish citizen with a national ID has access to this portal, and they can see their health history, diagnostics, medical images, treatment plan and drugs prescribed. As long as the patient does not limit access to their records, medical doctors working at any public hospital can access this information. This application works on iPhone, Android and Windows phones, as well on the Internet.

E-Pulse was also created with the intention of sending data obtained through remote monitoring and wearable devices to the person's health record. Patients will also be able to access their clinical lab results and radiological images on this system, which is designed to prevent repeat orders of the same tests from the same patient by different doctors. There is a 112¹⁹⁸ button embedded in this system, which makes it possible for the user to call an ambulance in emergency situations.

Further, Turkey plans to build as many as 29 large healthcare campuses across the country in the coming years, with each one having between 500 and 3,000 beds. These campuses will be built under a public-private partnership (PPP) model whereby the private sector will invest in the construction of these healthcare facilities and will operate them for 25 years in return for annual lease payments to be paid by MOH. These new health campuses will require advanced HIS hardware and software systems, which may be of interest to Health IT integrators and companies with cutting-edge technologies.

Separately, there is a strong base of Turkish software developers, especially in the EHR sector. As MOH mandates use of EHRs by family physicians and public hospitals, a large market exists for these companies. Some of these companies are also active in development of partial or full HIS software. In

these specific two areas, Turkish companies dominate the market. Regarding analysis of “Big Data” collected, datamining and implementation of clinical support systems,¹⁹⁹ however, the knowledge base of Turkish companies is comparatively limited, and U.S. companies may be valuable partners with these domestic companies.

In December 2012, MOH released a Strategic Plan,²⁰⁰ detailing healthcare priorities in Turkey between 2013 and 2017. Some of the key features of the Strategic Plan as they relate to Health IT include:

- Have the Turkish HIS collect health data in a joint database and share data in a safe environment (including integration of physicians and hospitals and ensure use of an e-prescription system);
- Establish data warehouses for decision support system information;
- Develop an EHR portal to collect, monitor and provide safe access to, and to share, personal health information (possibly through Health-Net);
- Have more Turkish stakeholders adopt Health IT standards (including health datasets, codes and classification systems, and promote interoperability);
- Ensure integration of health information systems into Health-Net (including rollout of telehealth and mobile health services and e-appointment services);
- Improve quality and security standards for people and institutions using health data (including procurement, hardware and software standards);

- Register and certify companies and health information systems; and
- Identify and implement confidentiality, privacy and security principles for the management of health information (this will require legislation).

Challenges in the Market

The biggest challenge for the Turkish healthcare system currently is developing a structured way to analyze patient health data so that MOH can make public health-related decisions and use the data to make projections. Healthcare facilities also need business intelligence solutions to better assess the efficiency of their systems and make necessary improvements. Medical doctors also need a consistent, nationwide clinical support system that guides medical doctors during diagnosis of illnesses and treatment of their patients. Introduction of such systems will reduce clinical mistakes and, consequently, overall healthcare costs.

Additionally, only some of Turkey’s approximately 900 public hospitals have HIS, and these often are unable to communicate with each other. This situation results in a lack of interoperability throughout the health system and means that patient data are sometimes not available when and where they are needed. In order to adopt and fully utilize HIS at individual hospitals, MOH has been cooperating with the Health Information and Management Systems Society (HIMSS) to increase the awareness level of hospital administrators of Health IT solutions and to encourage public hospitals to participate in HIMSS’s survey of Turkish hospitals to determine how far they have progressed toward having a paperless healthcare environment.

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Mexico

Type of Market: Moderate/Growing

Mexico continues to represent a good Health IT market opportunity for U.S. companies, with a sizable market, the absence of regulations inhibiting innovation and market expansion, and two recent Commerce Department-organized trade missions demonstrating interest in U.S. products and services by Mexican public and private sector stakeholders. The market, however, does have challenges: no Health IT roadmap or work plan in place, incomplete availability of 3G and 4G mobile technologies, and several agencies playing a potential role in overseeing the sector, meaning policy coordination may become an issue as regulations and procedures are promulgated. Engagement with Mexican public and private sector officials on their Health IT plans and offering to assist as appropriate can go a long way to create strong market opportunities for U.S. Health IT companies in the future.

Overall Rank

57

Description of Rank and Sub-score Measurements

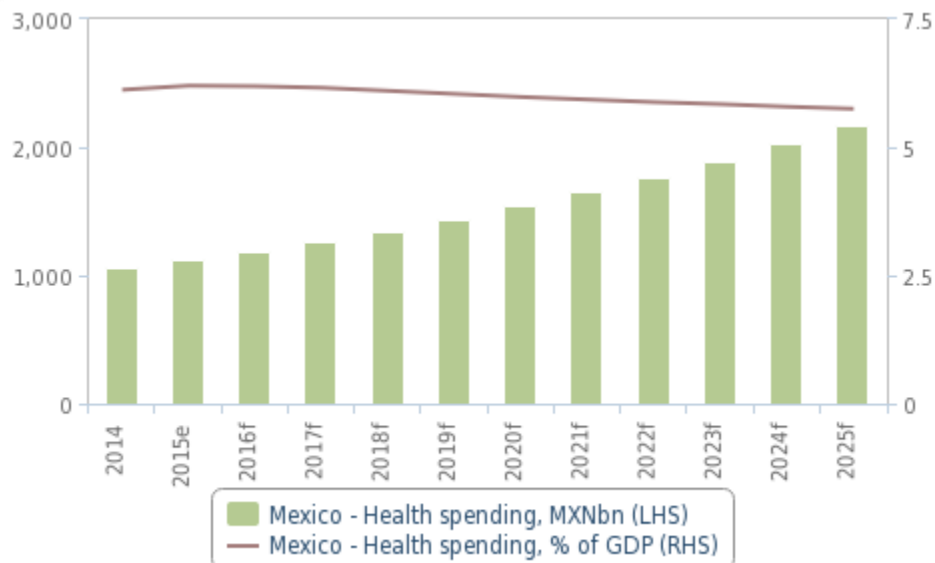
The Mexican Health IT market is currently estimated at more than \$200 million, not as large as some markets included in this Report (such as Brazil, Korea and Japan), but it is one with significant potential for U.S. companies. Mexico's standing in the middle of the countries ranked is influenced by low healthcare expenditure, a relatively low percentage of aging population and modest levels of mobile phone and Internet subscriptions. It should be noted, however, that by 2030, the percentage of Mexico's population at least 60 years of age is expected to increase 18

percent compared to 2015 levels.

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 get 98 percent of all Mexicans online. According to surveys, however, cost is the main barrier for households not owning a personal computer, with 60 percent saying that they were unable to afford one. Survey data from 2014 shows that 44.4 percent of the population six years old and above had an Internet-connected

Figure 19: Low Percentage of GDP
Mexico: Healthcare Expenditure Forecast



f = BMI forecast. Source: BMI/World Health Organization (WHO)¹

device, and 34 percent of households had an Internet connection.²⁰¹

Mexico's 6.4 percent rate of healthcare spending as a percentage of GDP in 2014 (see Figure 19) is among the lowest found in Organisation for Economic Cooperation and Development (OECD) countries, lower than the regional average of 7.3 percent and that of Latin American countries Brazil (9.2 percent) and Chile (7.7 percent). It is anticipated, however, that the oil sector's liberalization will lead to an increase in absolute health sector spending over the medium to long-term.²⁰²

Mexican government spending at all levels on IT stands at about 20 percent of total expenditure, a relatively low figure. In addition, only about a third of this expenditure occurs at the regional and local government levels. Increasing central and regional/local government spending on IT systems (incorporating Health IT as appropriate) could play a sizable role in spurring Health IT expenditures in Mexico.²⁰³ 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. The domestic healthcare software market is estimated to be in the region of \$20 million and is expected to grow rapidly.²⁰⁴

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 long-term conditions financially catastrophic for households. Non-communicable 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, the

financial requirements for treating diabetes increased by a third.

According to the International Diabetes Federation (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, and that 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 2035.²⁰⁵ Other reports show these figures to be much higher, with as many as 22 million Mexican citizens over the age of 20 already suffering from diabetes.²⁰⁶

In 2012 and 2013, the International Trade Administration (ITA) organized two healthcare and medical trade missions to Mexico, with Health IT as a featured sector in both missions. Comments by companies and ITA specialists from both missions indicated a significant opportunity for the 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 market entry and/or increased exports due to the two trade missions. Greater progress on policies to promote Health IT, mobile health and telehealth will certainly be welcomed by U.S. companies seeking to enter or increase their presence in Mexico.

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 considering market entry into Mexico.

One consideration is the still-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 working in committees to develop the legal framework and to coordinate their activities, but policy jurisdiction and coordination could become issues as this process continues. In addition, the Instituto Federal de Telecomunicaciones (IFETEL) replaced the Comisión Federal de

Figure 20: Five Digital Strategy Pillars	
Pillar	Description
Connectivity	Developed network and increased deployment of better infrastructure in the country, expanding capacity of the existing networks and the development of competition in the Information and Communication Technologies (ICT) sector to encourage lower prices.
Inclusion and digital skills	Equitable development of skills to operate technologies and gender equality.
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, therefore improving public services and creating more accountability.
Source: BMI, President's Office[i]	

Telecomunicaciones as Mexico's telecoms regulator in September 2013.

In a separate but related initiative, President Enrique Peña Nieto announced Mexico's National Digital Strategy ("Strategy," see Figure 20) 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. 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 third to second in export of IT services;
- Double the number of IT companies to more than 8,000;
- Develop five additional IT hubs (existing hubs are in Mexico City, Monterey and Guadalajara);
- Move 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; and
- Increase SME broadband coverage to 85 percent, reaching the OECD average.²⁰⁷

The Mexican market has fairly widespread coverage of 2G and 3G ICT service, along with mobile broadband, so a readily available market exists for basic and moderately advanced mobile health and telehealth services. 4G service, however, can only be presently found in large cities. In January 2016, a tender was issued for a national broadband 4G Long-Term Evolution (LTE) network that is expected to cover 98 percent of the Mexican population once installed, which should expand the range of possible mobile health and telehealth services available.

Mobile phone subscriptions are at a moderate level and have increased in recent years. Mexico, however, has low penetration in relation to other countries, meaning that not all Mexicans are currently able to access to mobile health and telehealth services, and affordability issues (see above in relation to personal computers) may also occur with mobile phones.

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Addendum: Resources for U.S. Exporters

The U.S. Government has numerous resources available to help U.S. exporters: from additional market research, to guides to export financing, to overseas trade missions, to staff around the country and the world. A few key resources are highlighted below. For additional information about services from the International Trade Administration (ITA), please visit www.export.gov.

Country Commercial Guides

<http://export.gov/ccg/>

Written by U.S. Embassy trade experts worldwide, the Country Commercial Guides provide an excellent starting point for what you need to know about exporting and doing business in a foreign market. The reports include sections addressing: market overview, challenges, opportunities, and entry strategies; political environment; selling U.S. products and services; trade regulations, customs, and standards; and much more.

Basic Guide to Exporting

<http://export.gov/basicguide/>

A Basic Guide to Exporting addresses virtually every issue a company looking to export might face. Numerous sections, charts, lists and definitions throughout the book's 19 chapters provide in-depth information and solid advice about the key activities and issues relevant to any prospective exporter.

Trade Finance Guide: A Quick Reference for U.S. Exporters

<http://www.export.gov/tradefinanceguide/index.asp>

Trade Finance Guide: A Quick Reference for U.S. Exporters is designed to help U.S. companies, especially small and medium-sized enterprises, learn the basics of trade finance so that they can turn their export opportunities into actual sales and achieve the ultimate goal of getting paid—especially on time—for those sales. Concise, two-page chapters offer the basics of numerous financing techniques, from open accounts, to forfaiting, to government assisted foreign-buyer financing.

Trade Missions

<http://www.export.gov/trademissions/>

Department of Commerce trade missions are overseas programs for U.S. firms that wish to explore and pursue export opportunities by meeting directly with potential clients in their markets.

Trade missions include, among other activities: one-to-one meetings with foreign industry executives and government officials that are pre-screened to match specific business objectives.

There are currently two trade missions scheduled that have Health IT as a focus subsector:

- Brazil Health IT Trade Mission, September 26 to 30, 2016:
http://export.gov/brazil/build/groups/public/@eg_br/documents/webcontent/eg_br_098336.pdf.
- China Healthcare Business Development Mission, October 16 to 21, 2016:
<http://export.gov/china/healthcaretrademission>.

Certified Trade Fairs

http://www.export.gov/eac/show_short_trade_events.asp?CountryName=null&StateName=null&IndustryName=null&TypeName=International%20Trade%20Fair&StartDate=null&EndDate=null

The Department of Commerce's trade fair certification program endorses overseas trade shows that are a reliable venue and a good market for U.S. firms to sell their products and services abroad. These shows serve as a vital access vehicle for U.S. firms to enter and

expand to foreign markets. The certified show/U.S. pavilion ensures a high-quality, multi-faceted opportunity for American companies to successfully market overseas. Among other benefits, certified trade fairs provide U.S. exhibitors with help facilitating contacts, market information, counseling, and other services to enhance their marketing efforts.

International Buyer Program

<http://export.gov/ibp/>

The International Buyer Program (IBP) brings thousands of international buyers to the United States for business-to-business matchmaking with U.S. firms exhibiting at major industry trade shows. Every year, the International Buyer Program results in millions of dollars in new business for U.S. companies by bringing pre-screened international buyers, representatives and distributors to selected shows. U.S. country and industry experts are on site at IBP shows to provide hands-on export counseling, market analysis, and matchmaking services. Each IBP show also has an International Business Center where U.S. companies can meet privately with prospective international buyers, prospective sales representatives, and business partners and obtain assistance from experienced ITA staff.

The Advocacy Center

<http://www.export.gov/advocacy/>

The Advocacy Center coordinates U.S. government interagency advocacy efforts on behalf of U.S. exporters bidding on public-sector contracts with overseas governments and government agencies. The Advocacy Center helps to ensure that sales of U.S. products and services have the best possible chance to

compete abroad. Advocacy assistance is wide and varied but often involves companies that want the U.S. government to communicate a message to foreign governments or government-owned corporations on behalf of their commercial interest, typically in a competitive bid contest.

U.S. Commercial Service

<http://www.export.gov/usoffices/index.asp>

With offices throughout the United States and in U.S. Embassies and consulates in nearly 80 countries, the U.S. Commercial Service utilizes its global network of trade professionals to connect U.S. companies with international buyers worldwide. Whether looking to make their first export sale or expand to additional international markets, companies will find the expertise they need to tap into lucrative opportunities and increase their bottom line, including: trade counseling, actionable market intelligence, business matchmaking, and commercial diplomacy.

Within the U.S. Commercial Service (CS) *Global Health Team*, there is an Industry Focus Group on Health IT, consisting of about 20 domestic CS specialists who have counseled many companies and have also attended Health IT shows in the past, primarily the Health Information and Management Systems Society (HIMSS) Annual Conference and Exhibition. There also are more than a dozen foreign-based CS specialists with a strong interest in the Health IT sector who have worked with U.S.-based companies in their respective countries, and have attended the HIMSS Annual Conference and/or eHealth Week, the major European Health IT industry and policy conference.

Appendix 1: Methodology

Proxy indicators were used for many of the metrics to rank the countries in this report. For the purposes of this report, five categories of metrics were chosen that might influence the overall Health IT market: infrastructure (health and Information and Communication Technologies, or ICT); demographics; health status of the population; quality of life and wellbeing of older people; and macroeconomic indicators.

Besides the absence of a consensus definition of Health IT, finding sector-specific data is also very difficult at this time. There are virtually no 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 (HTS) lines for Health IT products or services, making accurate measurement of the market size for individual countries challenging, as well as determining import/export levels and a corresponding trade balance. In addition, government datasets do not adequately address the large services component of Health IT (for example, healthcare services and services for data storage and exchange), as is often the case with service industries.

For each category, a list of potentially useful metrics was generated. Those metrics with extensive datasets for at least one year from 2010 to 2014 were used. Other potential metrics either did not have current enough publicly reported data or did not have data covering a majority of countries to be included in the methodology.

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 (WHO) Global Health Observatory (GHO), World Bank, Global Age Watch and the International Telecommunication Union. Additional data was collected from WHO regional reports,²⁰⁸ other organization/industry reports and U.S. Department of Commerce Commercial 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 100 countries, which were ranked in the final analysis.

Categories and metrics used to determine country ranks

1. Infrastructure

The Health IT infrastructure metrics consist primarily of health services and Information and Communication Technologies (ICT) services. The level of infrastructure in place in a country will determine the appropriate level of mobile and telemedicine products and services to implement. The infrastructure metrics 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 2015;](#)
- c. [Confirmed and updated with GSM world coverage stats http://www.worldtimezone.com/gsm.html.](#)

2. 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 time series showing the relative rate of aging gives a sense of how quickly a country's population is aging in comparison to other countries and also is indicative of how likely increased healthcare delivery and provision will be needed in a country during the foreseeable future. This ratio is useful because an older population is likely in greater need of cutting-edge, cost-saving 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 tablets, smartphones and more sophisticated, mobile-based tools. In comparison to the 2015 Top Market Report (when a point-in-time ratio was used), the 2015 level of over-60 population in each country and the percentage rate of increase in the over-60 population from 2015 to 2030 were used to measure this aspect of future Health IT uptake.

Demographics are measured by:

- Percent of population that is urban: <http://apps.who.int/gho/data/view.main.100015>;
- Over-60 population, and 2015 to 2030 time-series data: <http://wdi.worldbank.org/table/2.1>

3. Health status of the population

The average number of years that a person aged 60 can expect to live in “full health” was assessed by taking into account years lived in less than full health due to disease and/or injury. The proportion of people over 50 who answered “yes” to the question “Do you feel your life has an important purpose or meaning?” was expressed as the percentage of people aged 50-plus who answered “yes” to this question divided by the percentage of people aged 35 to 49 who answered “yes”.

Health status of the population is measured by:

- Unhealthy life expectancy: <http://apps.who.int/gho/data/node.main.688?lang=en>;
- Relative psychological wellbeing: <https://worldview.gallup.com/>

4. Quality of life and wellbeing of older people

The indicators chosen for the Index have a number of important features; namely, they are all outcome indicators and are neither process indicators (such as legislation, for example, to protect specific rights in older age) nor input indicators that measure efforts to deliver a desired outcome (such as social protection expenditures). Most of them are absolute-level indicators, measuring quality of life and wellbeing of older people that is not relative to the rest of the society. The used data is from publicly available international databases (including the International Labor Organization, World Bank and World Health Organization, through the Global HelpAge Index)²⁰⁹.

Quality of life and wellbeing of older people is measured by:

- Old age poverty rate, relative to median: <http://www.helpage.org/resources/ageing-data/>
- Relative welfare of the elderly: <http://www.helpage.org/resources/ageing-data/>

5. Macroeconomic Indicators

Macroeconomic indicators are important to include in any commercial market analysis. While not specific to Health Information Technology (Health IT), these indicators provide guidance about the market opportunity 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 used to develop the methodology for the Health IT Top Market Report.

As an additional source, the U.S. Department of Commerce’s International Trade Administration Commercial Service specialists were asked to complete a survey for Health IT 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 10 Country Case Studies. Twenty-two 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 they directly influence Health IT. Values for each metric were normalized so that the country with the top score received 100. All metrics used rankings based on absolute scores, except for the “Old Age Poverty Rate,” relative to median, which was inversely correlated with score such that the country with the lowest rate received a score of 100. 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.

Appendix 2: Full Country Rankings

Rank	Country	Rank	Country	Rank	Country
1	Luxembourg	35	Slovenia	69	Paraguay
2	Norway	36	Argentina	70	Maldives
3	Netherlands	37	Latvia	71	Vietnam
4	Denmark	38	Brazil	72	Thailand
5	Singapore	39	Poland	73	Nicaragua
6	Iceland	40	Russia	74	Republic of Moldova
7	Germany	41	Montenegro	75	Indonesia
8	Finland	42	Colombia	76	Ecuador
9	Japan	43	Lithuania	77	Bhutan
10	Sweden	44	Belarus	78	Honduras
11	Belgium	45	Romania	79	India
12	France	46	Bulgaria	80	Kyrgyzstan
13	Canada	47	Costa Rica	81	Guatemala
14	Switzerland	48	Dominican Republic	82	Iraq
15	United Kingdom	49	Ukraine	83	Philippines
16	Austria	50	Croatia	84	Bolivia
17	Malta	51	Jordan	85	Laos
18	New Zealand	52	Turkey	86	Afghanistan
19	Italy	53	Albania	87	Pakistan
20	Spain	54	Panama	88	Sri Lanka
21	Republic of Korea	55	Mauritius	89	Bangladesh
22	Greece	56	Serbia	90	Ghana
23	Ireland	57	Mexico	91	Tajikistan
24	Czech Republic	58	Cambodia	92	East Timor
25	Australia	59	Morocco	93	Nigeria
26	Portugal	60	Mongolia	94	Zambia
27	Uruguay	61	Peru	95	Rwanda
28	Estonia	62	Venezuela	96	Nepal
29	Chile	63	Georgia	97	Mozambique
30	Cyprus	64	China	98	Tanzania
31	Hungary	65	Armenia	99	Malawi
32	Israel	66	Bosnia-Herzegovina	100	Uganda
33	Slovakia	67	El Salvador		
34	Saudi Arabia	68	South Africa		

Appendix 3: Survey Sent to U.S. Commercial Service Staff in Country

“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 primarily focusing our study’s scope to mobile health and telehealth products and services. The answers you provide on this survey will help determine the key strategic takeaways of the report, as well as the countries chosen for more in-depth case studies.”

1. What is the approximate size of the health IT market in your country (\$USD)?*

Is this amount likely to increase, stay the same, or decrease over the next year?*

Over the next 3 years?*

Do you have any statistics showing the amount of change during each period? If yes, please provide below. (Insert text box)

Is grant based funding a significant portion of this total (more than 25 percent)?*

Yes

No

2) How easy is it for foreign (U.S.) businesses to work within your country’s Health IT policy and regulatory environment (easy, moderate, difficult)?*

Please provide some rationale for your answer. (Insert text box)

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. (yes/no)*

If yes, for each policy, provide its name, which agency is in charge, the date it was implemented or last updated, and any other agencies involved. (Insert text box)

4) Has government proposed/implemented regulations in these areas that may affect commercial opportunities in the Health IT sector?*

No Regulations
1

Discussing Regulations
2

Regulations Implemented
3

Health IT

Population Health

Patient-oriented Health

Medical Devices

Telecommunications

Mobile Technology

Privacy and Security

Data Storage

If yes, please list key regulations, which agencies are in charge of their implementation, and date it was implemented or last updated. (Insert text box)

5) Does the government purchase Health IT through a procurement process?*

Yes

No

If yes, provide the percentage of purchases that go through procurement, describe the process and what aspects of health IT are subject to procurement, noting which agencies are involved. (Insert text box)

6) Are there local manufacturers/service providers (including telecom) planning to invest in the Health IT market? If so, please list major companies.* (Insert text box)

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, for what products/services? (Insert text box)

8) What types of mobile and internet networks are available in your country?*

Big Cities

Rural Areas

Big Cities and Rural Areas

1

2

3

Not Available

Mobile: Broadband

2G

3G

4G

Internet: Broadband <256 kbps

Broadband 256 kbps to 2 Mbps

Broadband 2 Mbps to 10 Mbps

Broadband >10 Mbps

Cable

Satellite

Wi-Fi

If available, list network and penetration rates (%) (Insert text box)

Have any network upgrade plans been announced?* If so, please describe below. (Insert text box)

9) What does the R & D environment look like over the next three years (%GDP)?*

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)²¹⁰ are used in this glossary (unless otherwise noted) to minimize confusion and in an effort to present a coherent understanding of the interrelations 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 www.HealthIT.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.

EHealth: Used interchangeably with Health IT. EHealth is the preferred term in Europe and WHO, and WHO uses the above definition for Health IT to define eHealth. The sector is also sometimes referred to as “connected health” or “digital health.”

Interoperability (Institute for Electrical and Electronics Engineering—IEEE—Standards Computer Dictionary): “The ability of two or more systems or components to exchange information and to use the information that has been exchanged.”

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 194 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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