# Sizing the Business Potential of mHealth in the Global South:  A Practical Approach

Vital Wave Consulting

## Summary

Across the Global South, lower-income populations are in need of services such as education and health care to help meet basic human needs. As the number of mobile-service subscribers continues to skyrocket, the infrastructure and installed base for delivering services via the mobile phone continues to expand. Meanwhile, the dwindling number of new subscribers necessitates a shift of focus by the mobile communications industry to new sources of revenue. To justify the investments needed for the development and commercialization of mServices such as mHealth, it is necessary to gauge the market opportunity that exists for these services, in total and across various applications.

The *"mHealth in the Global South: Landscape Analysis"* report prepared by Vital Wave Consulting examines in detail the current mHealth landscape and provides an in-depth overview of mHealth's scope, its impact on health care and existing opportunities across developing regions. The report also analyzes critical success factors for making mHealth more widely available through sustainable implementations. mHealth programs require the participation of stakeholders from across international organizations, governments, NGOs, and private companies. To stimulate cross-sectoral participation and partnership, it is necessary to size and locate the mHealth market opportunity so that these organizations can prioritize their investments versus other strategic initiatives, align mHealth investments with other business programs, and justify these expenditures to internal and external stakeholders.

Given the nascent nature of the mHealth industry, competitive indicators needed to develop a market size from the bottom up are absent, and information about health expenditures from the top down lacks detail for most developing countries. Therefore, developing a credible market size requires approaches that maximize the use of imperfect secondary data, including additional inputs from experts in the health field in the developing world. To move toward the development of a credible market sizing, this report identifies the available secondary data and provides three possible approaches for assessing the market size.

- **Part 1 – Market Sizing Overview** examines the need for sizing the market opportunity for mHealth solutions in the Global South and the availability of reliable data to execute the sizing. Based on research for readily available data on health care expenditure and health care indicators performed for three developing countries (Turkey, Vietnam, and South Africa), Vital Wave Consulting identifies the missing pieces needed to assess the potential health care expenditure that could be shifted to mHealth.

- **Part 2 – Definitions** includes the main terms used in this paper. These definitions have been developed by Vital Wave Consulting and used in the report *"mHealth in the Global South: Landscape Analysis"* created for the UN Foundation.

- **Part 3 – Methodology Overview** describes in detail the top-down and bottom-up approaches for sizing the mHealth markets and the three methodologies proposed as the most viable for this exercise. All proposed methodologies estimate the market opportunity for each of the mHealth application areas but rely on different sets of data.

  o **Methodology 1:** Top-down from health budgets with needs-based segmentation

o **Methodology 2:** Top-down from health ICT or eHealth budgets

o **Methodology 3:** Bottom-up from health care program cost and volume potential data

In addition detailed step-by-step explanations, each of the methodologies is evaluated for its advantages and disadvantages.

- **Part 4 – Methodology Comparison** contrasts the three proposed methodologies and comments on the quality of their results.

- The **Appendix** provides an overview of the data on health care expenditures and health care systems of the three countries researched in depth—Turkey, South Africa, and Vietnam—and evaluates its quality.

This report provides professionals from across sectors and industries with methodologies for sizing the market opportunity for mHealth solutions in the Global South. As these methodologies rely on primary and secondary research, this report was prepared after thorough research for available data and identifies gaps where subject-matter experts' inputs are needed.

**Part 1 - Market Sizing Overview**

Market sizing is generally measured at two levels: *total market and addressable market*. Total market is the least granular measure of market opportunity and usually represents a large demographically or commercially identifiable group. In the mHealth context, the total market can be defined as governments and organizations around the world that are currently providing health-related services and programs. In some cases, the end user (patient or message recipient) would also pay for mHealth services, and might be considered part of the total market. The total market opportunity is thought of as the total amount of funds available from all customers for health care programs. Total market measures are normally a first step in market sizing, but they rarely are used by organizational decision makers as the total market does not reflect the number of customers who are *likely* to buy. For this, one calculates an addressable market.

 The addressable market is a subset of the total market. Put simply, it is the number of individual customers who are realistically both *willing* and *able* to purchase a product or service. The "willing" part of the definition connotes that the

solution is appropriate for fulfilling a customer's need, or set of needs. The "able" part indicates that the customer has the resources necessary to acquire and effectively use the solution. In other words, they have the requisite financial means to purchase the solution, minimum base infrastructure to use the solution, and they can acquire the solution through reasonable means.

To measure the addressable market of mHealth, one has to understand the subset of willing and able customers. The "willing" will be based on the impact of mHealth programs and how that impact compares against other potential investments. This is difficult to measure, as mHealth is currently in its infancy and very limited data is available to measure its impact. Investors today make judgments about the value of mHealth based on their own experience. This is a valid and necessary approach for all new industries or technology applications, but it poses challenges to sizing the market. Measuring the "able" part of an addressable market group is based on data illustrating how many customers also have the means. This is challenging, as data for developing countries are often incomplete, unavailable, outdated, or too limited to capture the diversity and nuance of the country environment for a particular solution. Compounding that challenge is the fact that both eHealth and mHealth are in their infancy in many developing countries, and estimates of current expenditure on such solutions are not sufficient to extrapolate the market potential. In addition, there are limited data about health spending at the sub-account level to illustrate how countries allocate budgets across specific programs, which, if available, could be related back to the mHealth solutions.

The exercise of market sizing is similarly complex, as there is no one-size-fits-all approach. Some market sizing approaches work from the top down to cut the market of a larger region or industry into smaller pieces. Other approaches work from the bottom up to extrapolate a market size for the geography or industry based on country-level or competitive data points. However, all approaches rely on credible and current data.

To inform and develop a credible methodology for mHealth market sizing, Vital Wave Consulting conducted a thorough search of available data from across international organizations, country health ministries, press and journal articles, and company and project papers and documents. The data search covered three developing countries from different regions of the world—South Africa, Turkey, and Vietnam—and included

documentation of mHealth projects implemented worldwide. The following is a summary of the available and unavailable data found in this investigation:

*Available data[1]*

- Total health expenditure (total and percent each from private, public, and external sources).

- Health workforce (e.g., the number of and geographic distribution of nurses, physicians, dentists, pharmacists, beds, hospitals, health care posts, and health care centers).

- Health service and care indicators (e.g., mortality, morbidity, disability-adjusted life years per disease, hospital admissions, HIV and TB prevalence).

- Drug expenditure (total and per drug type).

- Information on the organization of the health care systems as well as trends and the latest developments in these particular countries.

- Anecdotal, non-comprehensive information about potential savings and improved operational efficiency from implemented mHealth solutions, covering several solutions across a handful of countries.

*Limited or unavailable data*

- Health budgets at the sub-account level per function or activity (e.g., ICT, preventive and primary health care service, health care education, and behavior change campaigns).

- Health budgets and health care indicators broken down by area (urban versus rural) or by area unit (province).

- Credible systematic study of the potential impact from implemented mHealth solutions.

The data about the health care systems and expenditure in the countries researched is abundant but still very high-level, which does not aid estimation of the portion of this expenditure

that could be shifted to mHealth. Publicly available sources of information (e.g., the World Health Organization and ministries of health) and paid databases provide reliable information on those topics, but more in-depth knowledge from subject-matter experts at the country level is needed. For example, input from the latter would be critical when assessing the mHealth market opportunities for countries with great disparities in spending and availability of health care service in urban and rural areas. Such disparities determine different needs for mHealth solutions and are not always reflected in the readily available data.

Another important missing piece is credible study of the impact of mHealth solutions. Information about the benefits can be found in some of the project papers and on the Web sites of mobile phone operators and companies developing such solutions, but this information does not meaningfully substantiate impact beyond a single solution or small geography or target market, if at all. Additionally, the impact of a particular solution will not necessarily be the same in two different countries. For example, the SATELLIFE project estimates that owning a PDA device saves a medical officer in Uganda 9.37 hours per week on average.[2] The same project, if replicated in Turkey, could have a very different impact. Until comprehensive studies are done, one has to rely on subject-matter experts or field interviews to estimate the impact of the different mHealth applications.

Given the above-mentioned data limitations and challenges, Vital Wave Consulting proposes three methodologies for assessing the market opportunity for mHealth solutions within the Global South and its individual regions and countries. This report does not exhaust all possible methods for sizing the mHealth market, but instead provides an overview of the three methodologies that would give the most thorough picture of the mHealth investment opportunities.

To get around the data limitations and challenges, all three proposed methodologies rely, to different extents, on primary research in addition to secondary research. Also, given the nascence of the mHealth industry overall, the proposed methodologies concentrate on

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[1] More information about the data found and the documented sources can be found in the appendix.

[2] Evaluation of the SATELLIFE PDA Project, 2002: Testing the use of handheld computers for health care in Ghana, Uganda, and Kenya. (28 February 2003). Retrieved on June 4th, 2008 from http://www.bridges.org/files/active/1/Evltn%20rpt_SATELLIFE%20PDA%20Project_FINAL_28%20Feb%202003.pdf

estimating the future or potential spending on mHealth.

More information on the challenges and limitations of each of the proposed methodologies can be found in their respective sections of this report.

**Part 2 - Definitions**

This section includes explanations of the important terms used in this paper:

- mHealth and its distinction from eHealth and telemedicine
- mHealth application segmentation
- developing countries and the Global South

These definitions have been developed by Vital Wave Consulting and were detailed in the report *"mHealth in the Global South: Landscape Analysis"* developed for the UN Foundation. This section contains excerpts from that report.

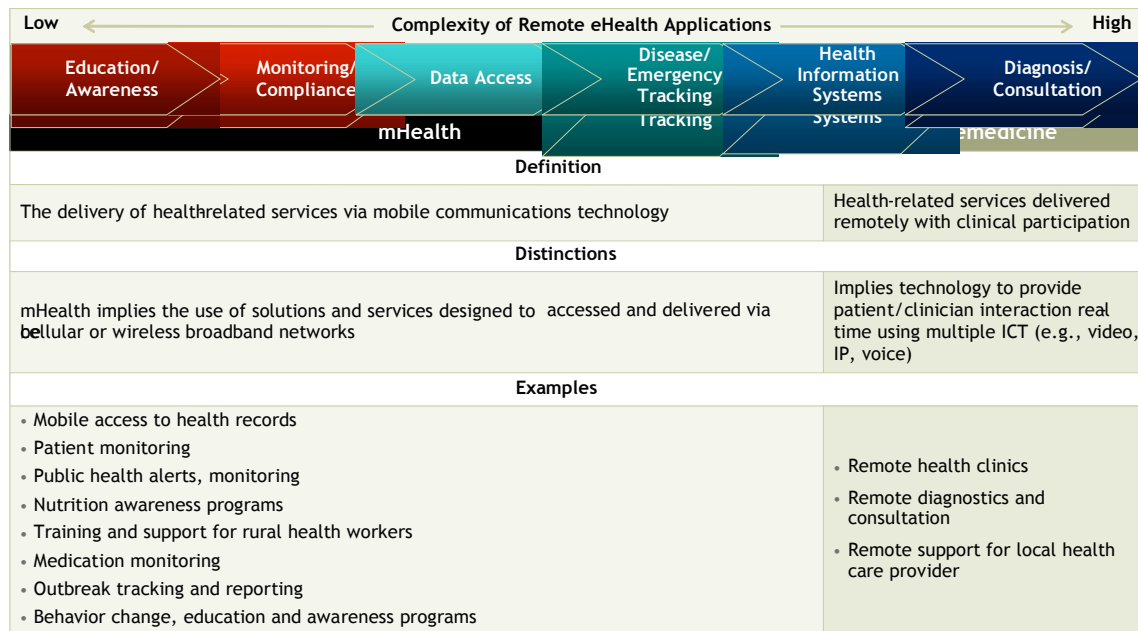**eHealth, mHealth, and Telemedicine: Definitions and Relationships**

Many and diverse definitions of the terms eHealth, mHealth and telemedicine exist. However, there is "general" agreement that eHealth represents a superset of mHealth and telemedicine as it is seen as encompassing the use of all electronic technology to provide any health service. It is independent of patient/provider proximity or the use of specific technology (Figure 1).

For the purposes of this paper, Vital Wave Consulting, relying upon the input of industry experts and research, has utilized the following definitions:

- **eHealth:** the delivery of health-related services via information and communication technology.

- **mHealth:** a subset of eHealth referring to the delivery of health-related services via mobile communications technology.

- **Telemedicine:** a subset of eHealth referring to health-related services delivered remotely with clinical participation via electronic communications. Telemedicine also has overlap with mHealth when mobile communications technologies are employed in the delivery process. (Telemedicine is often associated with the term "tele-health," which may encompass a broader definition of remote health care that does not necessarily involve clinical services.)

Figure 1 presents the terms described above in the context of the corresponding health care application segments developed by Vital Wave Consulting for the UN Foundation report *"mHealth in the Global South: Landscape Analysis."*

**Figure 1: Positioning eHealth, mHealth and Telemedicine**

| Low ← | Complexity of Remote eHealth Applications | → High | | | |
|---|---|---|---|---|---|
| Education/ Awareness | Monitoring/ Compliance | Data Access | Disease/ Emergency Tracking | Health Information Systems | Diagnosis/ Consultation |
| | | mHealth | | | Telemedicine |

| Definition | |
|---|---|
| The delivery of health-related services via mobile communications technology | Health-related services delivered remotely with clinical participation |

| Distinctions | |
|---|---|
| mHealth implies the use of solutions and services designed to  accessed and delivered via cellular or wireless broadband networks | Implies technology to provide patient/clinician interaction real time using multiple ICT (e.g., video, IP, voice) |

| Examples | |
|---|---|
| • Mobile access to health records<br>• Patient monitoring<br>• Public health alerts, monitoring<br>• Nutrition awareness programs<br>• Training and support for rural health workers<br>• Medication monitoring<br>• Outbreak tracking and reporting<br>• Behavior change, education and awareness programs | • Remote health clinics<br><br>• Remote diagnostics and consultation<br><br>• Remote support for local health care provider |

The segments shown at the top of the above table reflect the growing sophistication of application and technological requirements as they move from education and public awareness, at the left, to diagnosis and consultation on the far right. It is mobile technology's unique characteristics of portability and access that provide completely new solutions to health care needs across a broader range of health care applications.

More details about mHealth, eHealth, telemedicine and the distinction and relations among these terms can be found in the *"mHealth in the Global South: Landscape Analysis"* report.

**mHealth Application Segmentation**

Using the results of the survey of mHealth programs, initiatives, and applications, Vital Wave Consulting created an application segmentation model based on targeted health care goals. Figure 2 lists these segments, with corresponding descriptions and examples of specific mHealth programs in the Global South. Reading the list from top to bottom, the application segments have increasing technology

requirements and complexity of implementation. These application characteristics have an inverse relationship with their potential for scale. Therefore, education and awareness mHealth programs have the simplest technology requirements and implementation methods with the highest potential for scale. The opposite is true for analysis, diagnosis and consultation applications via mobile technology.

Recognizing the distinctions between these segments and understanding the characteristics of relating technologies is a critical part of being able to build applications that promise sustainability and, possibly, scale. In looking at health care applications, it is important to note that mobile technology provides a means to address some specific tasks better and faster. It also offers completely novel solutions to current needs. However, current mobile technology is not ideal for some mHealth applications that require greater bandwidth or lower costs for sustainability and effectiveness. Mobility's appropriateness to any given application is dependent upon a balance of technical performance, cost, and efficacy—conditions that will continue to evolve.

**Figure 2: Segmentation of mHealth Applications, Descriptions, and Potential Benefits and Savings**

| Application | Description | Potential Benefits & Savings Examples |
|---|---|---|
| Education and Awareness | Primarily one-way communication programs to mobile subscribers via SMS/text messaging in support of public health, behavior change campaigns. | • Improved awareness<br>• Enhanced quality of care through education<br>• Saved time and travel cost from distant learning<br>• Decreased cost per impression |
| Data, Health Record Access | Applications designed to use mobile phones, PDAs, or laptops to enter and access patient data. Some projects may also be used by patients to access their own records. | • Improved data accuracy<br>• Saved office supplies<br>• Reduced time for collecting and transcribing data by medical personnel<br>• Increased productivity within health system<br>• Enhanced quality of care |
| Monitoring/ Medication Compliance | One-way or two-way communication to patient to monitor health conditions, maintain care-giver appointments, or ensure strict medication regimen adherence. Some applications may also include inpatient and outpatient monitoring sensors for monitoring of multiple conditions (such as diabetes, vital signs, or cardiac). | • Improved medication adherence and reduced disability adjusted life years (DALYs), medication cost, general health care cost<br>• Improved service because of better monitoring<br>• Saved travel time (both doctors and patients)<br>• Reduced expense for hospital stays<br>• Saved time for doctors through access to automated medical history<br>• Saved resources from fewer missed appointments |
| Disease/ Emergency Tracking | Applications using mobile devices to send and receive data of disease incidence, outbreaks, geographic spread of public health emergencies, often in association with GPS systems and back-end applications for visualization. | • Enhanced disease surveillance and control |
| Health/ Administrative Systems | Applications developed for "back office" or central health care IT systems allowing for access by and integration with mHealth application. Such applications often tie in to regional, national or global systems. | • Reduced IT/MIS cost<br>• Reduced cost from better IT integration, reduced compatibility problems, ease of upgrades |
| Analysis, Diagnosis and Consultation | Applications developed to provide support for diagnostic and treatment activities of remote care givers through Internet access to medical information databases or to medical staff. | • Increased productivity within health system<br>• Enhanced quality of care |

More details about mHealth application segmentation as well as examples of projects in each segment can be found in the *"mHealth in the Global South: Landscape Analysis"* report.

**Developing Countries and the Global South**

Throughout this paper, the terms "developing countries" and "Global South" are used interchangeably. Vital Wave Consulting follows established World Bank economic benchmarks to define "developing countries" or "Global South" as countries that have a gross national income (GNI) of $10,725 or less per capita. In the private sector, the term "emerging markets" is frequently used interchangeably with "developing countries."

Within developing countries, Vital Wave Consulting distinguishes between three subgroups according to population size and economic status. More information about these terms and categories may be found on the Vital Wave Consulting Web site, http://www.vitalwaveconsulting.com/insights/insights.htm.

**Part 3 - Methodologies Overview**

Based on research on health care markets in developing countries performed by Vital Wave Consulting, the availability of information and the company's expertise in this area, both top-down and bottom-up approaches were found feasible for estimating the potential market size for mHealth solutions. Further, three methodologies were developed.

The two top-down approach methodologies (Methodology 1 and Methodology 2) start from the total health care or Health ICT/eHealth expenditures per country and estimate the portion of this expenditure that can be shifted to mHealth solutions. The bottom-up approach (Methodology 3) starts with the different mHealth application areas (identified in Figure 2) and estimates the potential savings from their implementation. All proposed methodologies estimate the market opportunity for each mHealth application. The addressable market size, in this case, is the sum of the market sizes per application.

Each of the methodologies is described below and a brief evaluation of its advantages and shortcomings is given. Choosing the

methodology to be used, however, depends on preferences for given approaches, geographic areas of interest, time, and budget availability.

**METHODOLOGY 1 – Top-down from Health Budgets with Needs-based Segmentation**

Methodology 1 estimates the market opportunity for mHealth solutions as a portion of total health expenditure for each application area. The total market size is equal to the size of all markets per application combined.

$$\text{Market Opportunity (by Application)} = \text{Total Health Expenditure} \times \text{\% of Health Expenditures for Application Area} \times \text{\% of Health Application Spending that Can Be Converted to mHealth}$$

Step-by-step approach:

**Step 1:** *Total Health Expenditure*

Collect information about total health expenditure per country, accessible via public sources of information, such as the World Health Organization.

**Step 2:** *Establish Geographic Segments Based on Health Need*

Segment the developing countries according to their needs for the six mHealth application areas using available secondary data (e.g., disability-adjusted life years, health expenditures per capita, land area, rural and urban populations, and number of doctors and hospitals). Determine country segments with similar need patterns (low, medium and high) for each of the applications. For instance, countries with high instances of infectious diseases and stressed health system infrastructure (e.g., nations in sub-Saharan Africa) may have greater needs for education and awareness and monitoring/medication compliance applications than countries with a lower incidence of infectious diseases and more advanced health systems (e.g., nations in Eastern Europe).

The required data can be obtained from public sources of information, such as WHO, the United Nations, and the World Bank. Information that is more specific can be found in paid databases such as Business Monitor International. Available data will be validated through and augmented by expert opinion. A sample needs-based segmentation is shown below in Figure 3.

**Figure 3: Needs-based Segmentation (sample output)**

| mHealth Application Area | Segment 1 | Segment 2 | Segment 3 |
|---|---|---|---|
| Education and Awareness | ◆◆◆ | ◆◆ | ◆ |
| Data Entry, Health Records Access | ◆ | ◆◆ | ◆◆◆ |
| Monitoring/Medication Compliance | ◆◆◆ | ◆◆ | ◆◆ |
| Disease/Emergency Tracking | ◆◆◆ | ◆◆ | ◆ |
| Health/Administrative System | ◆ | ◆ | ◆◆◆ |
| Analysis, Diagnosis and Consultation | ◆ | ◆ | ◆◆ |

◆◆◆ High Need      ◆◆ Medium Need      ◆ Low Need

*Table for illustrative purposes only.*

**Step 3:** *Determine Total Health Expenditure per Application Area (as Percentage of Total Health Expenditure)*

Using inputs from subject-matter experts across the six mHealth applications areas combined with any anecdotal data found for representative countries within the segment to validate experts' opinions, the portion of total health spending allocated to each application area for each segment can be estimated. This process is demonstrated in Figure 4 below.

**Figure 4: Portion of Total Health Expenditures for mHealth Application Area (sample output)**

| mHealth Application Area | Segment 1 | Segment 2 | Segment 3 |
|---|---|---|---|
| Education and Awareness | 0.05% | 0.30% | 0.01% |
| Data Entry, Health Records Access | 0.10% | 0.25% | 0.30% |
| Monitoring/Medication Compliance | 0.25% | 0.10% | 0.10% |
| Disease/Emergency Tracking | 0.50% | 0.30% | 0.20% |
| Health/Administrative System | 0.05% | 0.05% | 1.00% |
| Analysis, Diagnosis and Consultation | 0.90% | 0.90% | 1.50% |

High Need      Medium Need      Low Need

*Table for illustrative purposes only.*

**Step 4:** *Convert Total Health Expenditure per Application Area to mHealth-specific Expenditures*

Using inputs from subject-matter experts across the applications, one can determine the portion of total health spending by application that could be transferred to mHealth in the different geographic segments. This step incorporates a country's need and the potential impact a particular solution could have as well as the substitutability that exists between the mHealth application and the traditional service. For instance, education and awareness campaigns in sub-Saharan Africa could command a higher percent of the overall budget since mHealth message transfers could directly replace radio, print, and television campaigns. The penetration of mobile services across the population and coverage of different

geographic areas would also figure into this calculation, taking into consideration the difference in impact that a program could deliver with expanded mobile service coverage. A sample calculation of the potential impact in an application area for varying segments (such as countries or regions) is show below in Figure 5.

**Figure 5: Portion of Health Application Area Spending that is Convertible to mHealth (output)**

| mHealth Application Area | Segment 1 | Segment 2 | Segment 3 |
|---|---|---|---|
| Education and Awareness | 25% | 10% | 5% |
| Data Entry, Health Records Access | 10% | 15% | 18% |
| Monitoring/Medication Compliance | 13% | 7% | 7% |
| Disease/Emergency Tracking | 13% | 7% | 5% |
| Health/Administrative System | 5% | 5% | 8% |
| Analysis, Diagnosis and Consultation | 3% | 3% | 5% |

| High Need | Medium Need | Low Need |
|---|---|---|

*Table for illustrative purposes only.*

**Step 5:** *Calculate Market Opportunity*

Given the outcomes from the previous steps, one can calculate the market opportunity for mHealth solutions for each of the application areas per country and application. The total market size for mHealth in a given country will be the sum of these market sizes by application.

*Advantages and Disadvantages of Methodology 1*

| Advantages of Methodology 1 | Disadvantages of Methodology 1 |
|---|---|
| • Incorporates an evaluation of needs into the analysis<br><br>• Captures market opportunities beyond current/potential IT expenditure | • Spending data are directional because they are based on expert opinion<br><br>• Requires primary research resources (subject-matter experts) that are knowledgeable of health expenditures by application area and mHealth potential |

**METHODOLOGY 2 – Top-down from Health ICT or eHealth Budgets**

Similar to Methodology 1, Methodology 2 estimates the market opportunity per application as a portion of existing technology expenditures.

Market Opportunity (by Application) = Total Health ICT/eHealth Expenditure X % of Health Application Spending that Can Be Converted to mHealth

Step-by-step approach:

**Step 1:** *Total Health ICT or eHealth Expenditure*

Collect all available data for health ICT and eHealth expenditures for a cross section of countries (approximately 40 to 50 countries). Such data is available through secondary

sources such as published reports (such as those by Frost and Sullivan), press reports, government papers or speeches, and studies by academics and the international development community. Total spending for ICT in health care for the whole world is estimated at 3 percent to 4 percent of total health care spending. However, for the Global South, this percentage will be lower.

**Step 2:** *Establish Geographic Segments Based on Health Care Infrastructure*

It is possible to segment countries based on health system infrastructure and coverage profiles. Comprehensive research is needed for this segmentation because countries vary greatly, not only in the level of development of their health system infrastructure, but also in their budget sources for this infrastructure. For instance, some countries allocate higher portions of the government budget and gross domestic product to health than others, and some countries rely much more heavily on private entities for health care provision. In addition, countries have varying levels of wireless infrastructure and mobile capacity to be able to immediately utilize mHealth services. Countries with low wireless infrastructure and large populations (such as Ethiopia and Myanmar) could present a long-term market opportunity and/or require additional reforms before investments in wireless networks are made and mHealth services are enabled.

This process is similar to the segmentation outlined in Step 2 of Methodology 1, except the

supply of (and investment in) health and mobile infrastructure would be the segmentation dimension instead of the need for mHealth services.

**Step 3:** *Convert Health ICT or eHealth Expenditure to mHealth-specific Expenditure*

Using inputs from subject-matter experts across the six mHealth application areas combined with any available anecdotal data found in secondary research, identify the portion of total health ICT and eHealth spending that can be converted to mHealth solutions across application areas and segments. Countries that are investing in ICT for health and have strong mobile coverage could be better candidates to convert budget allocations to mHealth in the short term.

This is similar to the segmentation outlined in Step 3 in Methodology 1, Figure 4, except the calculation base is health ICT and eHealth spending, as opposed to estimated expenditures on mHealth-related services.

**Step 4:** *Calculate Market Opportunity*

One can calculate the market opportunity per application area and per country for those where reliable data are available. The next step is to extrapolate this process to other countries using the same coefficients for countries in the same geographic segment.

*Advantages and Disadvantages of Methodology 2*

| Advantages of Methodology 2 | Disadvantages of Methodology 2 |
| --- | --- |
| • Because ICT budgets are the likely source of funding for most mHealth programs, the market opportunity is likely to be more realistic in the short term<br><br>• Only includes one layer of coefficients on top of base data | • Non-ICT spending that could be transferable to the program (e.g., behavior change communications budgets, health education budgets) is not factored in. This could leave out a good portion of the market opportunity |

**METHODOLOGY 3: Bottom-up from Cost and Volume Data**

Following the bottom-up approach, Methodology 3 calculates the market opportunity per

application area as the product of average spending per person and the volume potential of this application.

$$\text{Market Opportunity (by Application)} = \text{Average Spending Per Person for mHealth-related Applications} \times \text{Volume Potential Per Application}$$

Step-by-step approach:

**Step 1:** *Establish Geographic Segments Based on Health Need*

As in Methodology 1, a needs-based segmentation is required. One can segment the developing countries according to their needs for the six mHealth application areas using available secondary data (such as disability-adjusted life years, health expenditures per capita, land area, rural and urban populations, and the number of doctors and hospitals). The next step is to determine country segments with similar need patterns (low, medium and high) for each application.

Further, one can select 10 to14 representative countries across the segments for deeper investigation. Later, the factors calculated for these countries can be applied to all countries in the particular segment. Illustrative output of the need-based segmentation is shown in Figure 3, above.

**Step 2:** *Identify Potential Cost Savings from mHealth Applications per Area*

Using inputs from subject-matter experts across the six mHealth application areas and any applicable anecdotal data from secondary sources, one can expand, refine and ensure the accuracy and comprehensiveness of the list of potential benefits and savings outlined in Figure 2.

**Step 3:** *Conduct Country Research*

Using secondary data from 10 to 14 countries selected from across the segments, as well as expert opinion, one can devise an average cost per unit for each of the application areas (Figure 6, below) in each geographic segment. Additionally, one can create coefficients to adjust those average costs for different segments containing countries with varying income levels and health infrastructure. For instance, South Africa and Lesotho could be in the same geographic segment according to their health needs, but costs for conducting epidemiological surveys in South Africa, with its larger rural-land area, may be more expensive per fieldworker

than in Lesotho because of the need for additional travel.

Next, one can identify the volume potential by application and by segment (such as the number of field surveyors needed per population of 1,000, the number of recipients of behavior change campaigns per population of 1,000, and the number of impressions needed to invoke behavior change in each person).

The steps above will employ both secondary research and expert opinion.[3]

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[3] This approach uses any available secondary data pertaining to cost and volume needed for different mHealth applications. Additional primary data garnered from experts will be used to augment and validate the secondary data.

**Figure 6: mHealth Per-capita Unit Cost and Volume Potential by Segment**

**mHealth Per-capita Unit Cost Base     Multiplied By     Volume Potential Base**

| Application | Segment 1 | Segment 2 | Segment 3 | | Segment 1 | Segment 2 | Segment 3 |
|---|---|---|---|---|---|---|---|
| Education and Awareness | Cost per impression; Cost per individual behavior change | Cost per impression; Cost per individual behavior change | Cost per impression; Cost per individual behavior change | | Number of impressions (per 100) | Number of impressions (per 100) | Cost per impression; Cost per individual behavior change |
| Data Entry, Health Records Access | Cost per record access | Cost per record access | Cost per record access | | Volume of record access transactions (per 100) | Volume of record access transactions (per 100) | Number of impressions (per 100) |
| Monitoring/ Medication Compliance | Cost per patient | Cost per patient | Cost per patient | **X** | Number of patients to be monitored (per 100) | Number of patients to be monitored (per 100) | Volume of record access transactions (per 100) |
| Disease/Emergency Tracking | Cost per survey | Cost per survey | Cost per survey | | Number of surveys (per 100) | Number of surveys (per 100) | Number of patients to be monitored (per 100) |
| Health/ Administrative System | Cost per 100 population | Cost per 100 population | Cost per 100 population | | Population served (per 100) | Population served (per 100) | Number of surveys (per 100) |
| Analysis, Diagnosis and Consultation | Cost per interaction | Cost per interaction | Cost per interaction | | Number of interactions (per 100) | Number of interactions (per 100) | Population served (per 100) |

High Need     Medium Need     Low Need

*Table for illustrative purposes only. Final variables to be adjusted based on precise data availability.*

**Step 4:** *Calculate the Market Potential*

Given the findings in the previous step, one can calculate the sum of the market opportunity per application area.

The benefit of this approach is that it is more comprehensive across all mHealth savings areas beyond technology. However, it also requires very knowledgeable primary sources and presents the most challenging data requirements of the three approaches.
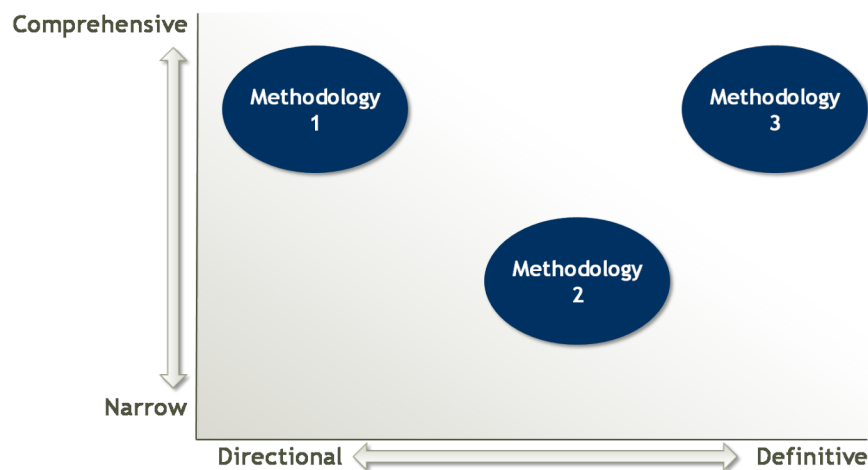
***Advantages and Disadvantages of Methodology 3***

Market Opportunity (by Application) = Average Spending Per Person for mHealth-related Applications X Volume Potential Per Application

**Part 4 - Methodology Comparison**

Each of the three methodologies presented in this paper provides a realistic and credible approach for estimating the market opportunity for mHealth solutions in the Global South. All of them include primary research and input from subject-matter experts in the data-gathering phase. For effective execution and results that gauge the market opportunity, a team of researchers and analysts working with a team of experts over several months will be needed.

**Figure 7: Methodologies Comparison**



Each methodology, however, differs in its approach toward the existing and readily available data. As discussed briefly in the advantages and disadvantages for each of the methodologies, and noted in Figure 7 above:

**Methodology 3** with its bottom-up approach provides the best combination of comprehensive and definitive results. This methodology is, however, the most time- and labor-consuming of the three. In general, bottom-up approaches are time and resource intensive and therefore challenging to implement globally.  But in a manageable set of countries, it is a compelling approach.

**Methodology 1** is more directional than definitive in its results when compared to Methodology 3. The former relies on subject-expert opinions rather than on data from global field surveys. However, this methodology is less time and cost-intensive to implement for a global market-sizing project.

**Methodology 2** is the least time- and labor-consuming among all three. The results will be more directional than with the other methodologies. This approach estimates the portion of Health ICT and eHealth budgets that could be shifted toward mHealth solutions and omits the other areas where mHealth will have impact, e.g., augmenting or replacing traditional media in awareness and behavior change campaigns.  This approach is best used in cases with limited budgets and the need for a global estimate of the market size.

All three proposed methodologies analyze either current expenditures or those that could be available to mHealth solutions through shifting budget line items (justified by cost savings resulting from mHealth services). Two other important aspects of implementing mHealth solutions are the improved efficiency and improved service that are more difficult to measure and to express in monetary terms. Undoubtedly, measuring the outcomes should be part of the market sizing as well, but credible information for this is not yet available. It is also important to note that a measurement of the results of mHealth solutions will draw additional investments in this field.

**Appendix: Available Data and Sources**

The information below represents excerpts from researched data. This demonstrates the level of detail of available data, summarizes the data, and provides guidelines for further research. This is not a comprehensive overview of the respective health care markets.

*World Health Organization Statistical Information System*

The most important source of high-level statistical data on health care per country is the database of the World Health Organization, the WHO Statistical Information System (www.who.int/whosis). WHOSIS contains historical values for many of the indicators allowing the identification of trends and forecasting. The database contains data for 164 indicators in the following six categories:

- Demographic and socioeconomic statistics

- Health service coverage

- Health systems resources

- Inequities in health care and health outcome

- Mortality and burden of disease

- Risk factors

For the developing countries, however, and for the countries researched by Vital Wave Consulting in particular, data for many of the WHOSIS 164 indicators are not available. The most relevant and available data cover the following indicators:

- Total health care expenditure in absolute value, as a percentage of GDP, per capita, in real dollars, international dollars, and national currency units.
- Breakdown of the total health care expenditure into:

    o Private spending—such as out-of-pocket payment, prepaid and risk-pooling plans, and NGOs

    o Public spending—such as Ministry of Health, social security funds, and other government spending

    o External sources—such as international donor programs.

- Health workforce and resources (nurses, midwives, physicians, dentists, pharmacists, hospitals, hospital beds)—in absolute value and per a population of 1,000.

Some of the WHOSIS indicators that would be helpful in the market assessment and for which data for the researched countries are not available are:

- Expenditure on inpatient curative care

- Expenditure on prevention and public health services

- Expenditure on hospitals

- Expenditure on human health resources

Although the WHOSIS database is probably the best source for high-level health care data per country, for some countries much more detailed and up-to-date data are available through the country's government institutions.

**Health Expenditure and Health Care Service Indicators in South Africa**

South Africa, for example, has a well-documented health care system and database with comprehensive statistical information on country and province levels. The National Department of Health (www.doh.gov.za) issues a "Department of Health Annual Report" giving details on legislative changes, departmental revenue and expenditure, strategic health programs, and progress made toward achieving established goals. The role of the National Department of Health is mainly strategic and its participation in South Africa's health care expenditure is less than 1 percent.

More detailed data about health care than that found through WHOSIS and the National Department of Health are available on the Provincial Departments of Health Web sites (available at http://www.doh.gov.za/links/index.html). These departments are responsible for the allocation of more than 95 percent of government health spending. Each of the departments issues an annual report with details on its financial spending, human resources, and the following programs:

- Program 1: Health Administration

- Program 2: District Health Services

- Program 3: Emergency Medical Services

- Program 4: Provincial Hospital Services

- Program 5: Health Sciences and Training

- Program 6: Health Care Support

- Program 7: Health Facilities Management

Besides purely quantitative information on a great number of health indicators, these reports include the qualitative information needed for a better understanding of the local health care system and an assessment of the potential benefits of mHealth solutions—an overview of the current situation, discussions of problems (such as disparities in different regions within a province) and projections for the future. The level of detail surpasses the details in a public company's annual report.

While the National and Provincial Departments of Health's documentation contain data mainly about public health expenditure and government programs, the Health System Trust (www.hst.org.za) and Statistics South Africa (www.statssa.gov.za) provide information on South Africa's health care as a whole. Health System Trust's annual report "South African Health Review 2007" (http://www.hst.org.za/publications/711) focuses on broad areas with respect to the role of the private health sector. These areas include oversight, pooling of resources, purchasing of health care, delivery of health care services and health-related indicators. Critical issues covered in the 2007 review include:

- Assessment of the stewardship role of the government in the overall transformation process of the health sector.

- Policy and legislative review on the provision and funding of private health care.

- Review and analysis of health care financing and expenditure as well as recent trends in spending in the public and private health sectors.

- Overview of health information systems and the role played by intermediaries in facilitating the flow of patient information.

- Analysis of the health status of the South African workforce and health care provision in the workplace.

- Analysis and developments in the market and regulatory environment impacting medicine pricing and access to medicines.

- Review of the impact of public-private partnerships on access to health care and health outcomes.

- Analysis of the private hospital industry with specific focus on structure, ownership, and market share per geographical region and the nature of relationships between private hospitals and providers.

- Analysis of the private sectors response for HIV/AIDS, sexually transmitted infections, and tuberculosis.

In brief, the report summarizes the most relevant data from the sources described above, and compares the health care systems across provinces on both the public and private level. See References for source data.

**Health Expenditure and Health Care Service Indicators in Vietnam**

While detailed data on health care expenditure, allocation, and indicators for South Africa are abundant, readily available and easily accessible through government agencies' or public institutions' Web sites, this is not the case for many other developing countries, such as Vietnam. For Vietnam, WHOSIS proves to be the best source for quantitative data, even though it gives data that are too high-level to be directly useful for determining how monies are spent.

The English version of the Vietamese ministry of health's Web site (www.moh.gov.vn) contains little qualitative or quantitative information, while the Health Policy and Strategy Institute (www.hspi.org.vn) refers to documents prepared by the United Nations and WHO. The Vietnamese version of the Ministry of Health's Web site contains some quantitative data, but in much less detail than the data available in the WHO Statistical Information System.

Up-to-date quantitative data on health care indicators are available on the Web site of the General Statistics Office of Vietnam (www.gso.gov.vn). However, the indicators covered largely overlap with those in the WHOSIS and give little new information. Additionally, most of the data exclude the rapidly growing private sector and are summarized at the country level.

Two additional facts make finding in-depth information in Vietnam difficult:

- Vietnam's 64 provinces have significant budget and investment autonomy.

- Private out-of-pocket spending represents as much as 80 percent of total spending on health care in Vietnam.

In brief, a systematic study on the health care expenditure in Vietnam at a level of detail that would add to the market assessment efforts is not available. Most of the external data sources (such as the United Nations, United Nations Population Fund, WHO, World Bank, International Monetary Fund, and the Asia-Pacific Action Alliance on Human Resources for Health) use the

quantitative data already available. These sources, however, contain qualitative descriptions of the organization of the health care system in Vietnam, which provides useful background. See References for source data.

***Health Expenditure and Health Care Service Indicators in Turkey***

While South Africa and Vietnam represent the extremes of readily available and easily accessible health data, Turkey provides a satisfactory, if not thorough, quantity of data. Information about the Turkish health care system is not as structured as corresponding information for South Africa, but it is still abundant and contains useful details.

Relevant and informative documentation about the health care system in Turkey is available on the Ministry of Health Web site (www.saglik.gov.tr). The "Turkey Health Transformation Program" document describes the latest developments, ongoing projects and future government plans to address topics such as health care organizations, current and future expenditures, hospitals and hospital services, human resources availability and training and geographical disparities. Turkey's profile on the WHO Web site (http://www.euro.who.int/document/e79838.pdf) adds to these topics, but data in the document are outdated.

Turkey's profile on the OECD Web site (www.oecd.org/turkey) provides basic health care indicators for Turkey in comparison to other members. OECD also breaks down details of health care expenditures (http://www.oecd.org/dataoecd/7/49/33696739.pdf) by main function, financing agent and health care provider.

| Main Function | Financing Agent | Healthcare Provider |
|---|---|---|
| • Curative Care Inpatient<br>• Curative Care Outpatient<br>• Services of Rehabilitative Care<br>• Ancillary Services<br>• Dispensing of Medical Goods<br>• Public Health Services<br>• Administration<br>• Other Functions | • Central Government<br>• Local Government<br>• Social Security Funds<br>• Private Insurance<br>• Out-of-pocket Spending<br>• Other Financing Agents | • Hospitals<br>• Ambulatory Care Providers<br>• Retail Sale and Providers of Medical Goods<br>• Provision and Administration of Public Health Programs<br>• General Health Administration and Insurance<br>• Other Health Care Provider |

Some of the quantitative data in this document is outdated, but it still gives a solid starting point for further exploration of health care expenditures in Turkey.

In brief, the public sources of information provide good documentation for one to get acquainted with the health care system and expenditure on a country level. However, quantitative data and profiles of the 81 provinces, or at least the regions with great disparities in health care spending and services, will require input from a subject-matter expert. See References for source data.

*Paid Databases for Healthcare Data*

Paid databases (e.g., ISI Emerging Markets and Business Monitor International) mainly use health care expenditure data and country profiles from WHO, the respective Ministry of Health Web sites and statistics offices and extrapolate them.

However, further breakdown of health care expenditures at a sub-account level is usually missing.

An important data point about disability-adjusted life years per disease can be found in the Business Monitor International databases. As described in Methodology 1 above, this information will be useful in segmentation of the countries in the Global South.

*Data on the Impact from mHealth Solutions*

As discussed above, a credible study of the impact of mHealth solutions is missing, and impact is a key indicator in determining the market that is "willing" to purchase. Information about the benefits can be found in some project papers and on some Web sites of mobile phone operators and companies developing such solutions, but this information is anecdotal rather than comprehensive. Subject-matter experts can

help augment the anecdotal data to a level that is quantifiable and credible for the market-sizing model. However, this would not be a rigorous impact study, but an estimation based on expert opinion.

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