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RESEARCH LAB

MENA'S HEALTH STARTUPS

Unlocking the path to scale &
the future of healthcare

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The Wamda Research Lab (WRL) is Wamda's research program that produces studies on entrepreneurship in MENA and seeks to foster thought leadership in this field. WRL's agenda is to inform investors, policymakers, and other stakeholders on the challenges faced by entrepreneurs in the MENA region, and offer potential solutions for overcoming them. Visit us at **research.wamda.com**

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METHODOLOGY

We define health startups as for-profit enterprises that seek to improve the quality, increase the access, and lower the costs of healthcare. We define the startup health ecosystem as the collection of stakeholders supporting the region's health startups, including publically and privately funded organizations.

Startups that are 'scaling' are those who have: obtained a product-market fit, refined a repeatable customer acquisition model, and attracted some mix of follow-on investment, new partnerships, employees, and cross-border growth.

This study is based on interviews with health startups in the following sectors: Health IT (HIT) and digital hospitals, Connected Health (cHealth), Digital Therapeutics (DT), Mobile Health (mHealth), Health2.0, Data & Analytics (D&A), and 3D Printing and Hardware.

We identified companies by conducting a regional mapping of institutions supporting health entrepreneurs in MENA, and through Wamda's media arm and events. WRL interviewed 120 stakeholders in MENA's startup health ecosystem: entrepreneurs (76), thought leaders [1] (27), investors (14), incubators & accelerators (3). After collecting the data, we selected 61 startups as the sample for analysis in this report based on their focus on improving the quality, increasing the access, and lowering the costs of healthcare.

Our primary interview questions were based on:

- The status of health entrepreneurship in MENA, and globally
- Starting and scaling a private health company in MENA
- Access to relevant talent, mentors and finance
- The role of universities, corporations, and governments in achieving scale
- Marketing startup health solutions in MENA

As there is no official figure for the total number of health startups in MENA, the findings discussed in this report are representative at the sample level only. However, *this report represents the largest collection of information on health startups and their supporting ecosystem in the region to date,* which provides strong insights for the level of activity and the challenges inhibiting the growth of these companies in MENA.

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[1] *Thought leaders represent individuals from NGOs, corporations, and university professors with specialized understanding to support the growth of healthcare and entrepreneurship in MENA.*

EXECUTIVE SUMMARY

The Middle East and North Africa (MENA) faces daunting health and economic challenges, but a growing health entrepreneurship movement and ever-wider presence of ICT (information and communication technologies) is pushing the region to create and adopt advanced digital healthcare solutions.

This report is based on a series of 120 interviews with key players and entrepreneurs in MENA's healthcare ecosystem, conducted by the Wamda Research Lab. It highlights the startups and stakeholders within it and the challenges they face, and proposes practical first steps to grow the impact of private healthcare companies in MENA.

If the region's startup health ecosystem is sufficiently developed, those companies could provide innovative health and economic solutions adapted to a local context; maximizing the region's capacity for generating and adopting advanced healthcare, and creating jobs that contribute to the formation of a knowledge-based economy.

Healthcare innovations improve the quality, increase the access, and lower the costs of healthcare by incentivizing and enabling people to take on more responsibility for their own health. This includes the ability to access and act on accurate medical intelligence in order to live a healthy life before complications occur, and to seek, weigh, and obtain the best possible care when it is needed.

A mix of technology and market factors has triggered growth in private health companies. Government mandates for universal healthcare, cross-industry partnerships, increasingly digitized hospitals, an emphasis on connectivity, and hardware and software developments related to Big Data, machine learning, artificial intelligence, and the Internet of Things (IoT) are paving the way for innovations in healthcare. The global digital health market was valued at USD 61 billion in 2013 and is expected to increase nearly 300% to USD 233 billion by 2020.[2]

In tandem, healthcare systems around the world are experiencing similar challenges and MENA faces the worst of these burdens. By 2030, supply and demand imbalances and the rising cost of healthcare in MENA, driven by population growth and rising affluence, more elderly patients, and a near endemic prevalence of obesity and non-communicable diseases will all be intensified. Also, MENA has one of the highest unemployment rates in the world at 10%, and nearly a quarter of those without jobs are youths aged 15 to 24.[3] In theory, health startups can create jobs and simultaneously foster better health in the region.

Government spending on healthcare in MENA has undergone massive growth and is projected to hit USD 141 billion in 2020,[4] outpacing global growth at 8.7% through 2018.[5] MENA's public health sector is addressing the region's health challenges by mandating universal healthcare, controlling prices, and nudging providers to adopt smart healthcare initiatives like further digitizing the region's healthcare infrastructure. These strategies also include leveraging international best-in-class healthcare brands via public-private partnerships such as the Abu Dhabi public healthcare operator SEHA's partnerships with blue-chip health brands Johns Hopkins and Cleveland Clinic.[6] Planned hospital infrastructure investments are also expected to increase the supply of health providers and spending per person in the region. All of these developments are expected to further expand the market for private health companies in MENA, and create opportunities for them to streamline the industry by enabling access to high-quality care at a lower cost to improve patients' outcomes.

Health startups exist at the center of three nested support ecosystems: the startup tech-ecosystem provides direct support in the form of incubation and acceleration, mentorship, and funding; the healthcare industry ecosystem offers support that enables testing for validating ideas and proving concepts; and the wider healthcare market and regulatory environment create the conditions under which health startups can operate and grow.

MENA's startup health ecosystem is in its early stages, but themes are forming:

- Egypt and the UAE have the most startup health activity in MENA, followed by Palestine, Lebanon, Jordan, and Saudi Arabia, respectively.

- mHealth (Mobile Health) and cHealth (Connected Health) solutions are the most prevalent forms of digital health activity coming from startups in the region to date. This is followed by Health IT (HIT) and digital hospitals, Digital Therapeutics (DT), Health2.0, Data & Analytics (D&A), and 3D Printing and Hardware, respectively.

- Most of MENA's health startups are focused on offering greater transparency and access to information for consumers, and startups are in the very early stages of enabling patients and providers to remotely capture health and wellness insights from wearable devices and personal data.

- Nearly half (48%), of the startups in this study have the potential to serve people around the world. These companies address universal healthcare problems in quality, access, and costs. They also explicitly indicated that they are targeting a market that is spread over multiple continents, and are also linguistically and/or culturally inclusive.

The arrival of new technologies is not going unnoticed by consumers who are demanding better healthcare. Of MENA's digitally active young people (ages 15 to 35), 48% say that ICT should be used to improve quality, access, and costs in the region's healthcare systems. Notably, MENA's mobile internet penetration growth and average use rates are among the highest in the world, and the proportion of new internet users has grown in the last 10 years to outpace the world's average. [7] Health startups can be catalysts for introducing ICT technologies into MENA's healthcare systems. [8]

For health startups to thrive, they must navigate a unique path to scale. The steps for developing the idea, prototyping, testing, launching, sustaining, and finally scaling each require dedicated support (funding, mentorship, etc.) to pass to the next phase. Additionally, health startups require support for unique steps that include (but are not limited to): conducting clinical trials, obtaining licenses, and fitting into reimbursement plans.

Right now, MENA is growing its first generation of health entrepreneurs. Of the companies interviewed for this study, 90% were created in the last five years, 55% launched in the last three years, and 30% are in their first year of operation.

Health startup entrepreneurs who manage to grow their companies create jobs. The 61 startups sampled for this study employ roughly 600 people in the region, and 16% indicated plans to hire more in 2016.

As health startups in MENA mature, a small yet growing population of venture capitalists and angel investors are also investing in private health companies. Of the startups in our sample, 49% obtained investment with 21% backed by venture capital, 15% have obtained follow-on funding rounds, and 11% have raised over USD 1 million. New venture funds like the USD 30 million investment from Jordan's Hikma Pharmaceuticals (the only digital health focused corporate VC in the region) are poised to help catalyze growth in MENA's digital health startups.

Still, MENA's health entrepreneurs rely on more informal sources of capital. Personal funds, family money, friends' money, and grants (45%) over any other funding sources, especially for early-stage capital.

Entrepreneurs can help catalyze advanced healthcare solutions in MENA, provided that stakeholders in the region can colaborate and implement proper support mechanisms for boosting the effective fusion of entrepreneurship, innovation, and modern medicine. Yet, current levels of targeted support are not adequate.

[2] *Statista. Value of global digital health market by segment 2013-2020. 2016*
[3] *Ahmed Masood. Youth Unemployment in the MENA Region: Determinants and Challenges. IMF. 2012*
[4] *MENA healthcare spending to reach Dh528 billion by 2020: Report. Monday, November 02, 2015. emirates247.com*
[5] *Deloitte. 2015 Global healthcare outlook Common goals, competing priorities. 2015*
[6] *MENA: Healthcare Sector Report Al Masah Capital Limited. 2011*
[7] *Internet Society. Global Internet Report 2015 Mobile Evolution and Development of the Internet. 2015*
[8] *Strategy & + Google. Understanding the Arab Digital Generation. 2012*

Based on our sample, we have identified the following barriers to scale as the most pressing challenges to the growth of health entrepreneurship in MENA (in order of importance):

- **Barrier 1: Small pool of interested capital:**
  80% of the startups in this study cited the limited availability of capital as a barrier to growth.

- **Barrier 2: Minimal testing resources:**
  41% have difficulty testing and conducting clinical trials to prove their concept.

- **Barrier 3: Difficulty forming partnerships:**
  74% experience challenges to forming mutually beneficial partnerships in the region, especially with payers and providers.

- **Barrier 4: Technical talent gaps:**
  77% experience difficulties finding the right people to hire, especially those with experience in healthcare coupled with business and technical skills.

- **Barrier 5: Lack of compliance clarity:**
  57% are adversely affected by opaque health regulations that create excessive risks that in turn hold back greater involvement in the industry from potential investors and partners.

- **Barrier 6: Low consumer buy-in:**
  69% of the startups in this study cited low consumer buy-in, specifically for digital health solutions as a barrier to growth.

If ecosystem gaps go unchecked the region misses an opportunity to solve rising public health challenges. To help fill these gaps and accelerate the growth and impact of health entrepreneurship in MENA, we offer recommendations for potential partnerships, five practical opportunities and first steps, as well as predictions for the future.

The potential for partnerships with MENA's health Startups is high. We identify stakeholders that can capitalize on these promising partnerships as well as the challenges that startups face in securing viable business relationships in the region. They are:

- **Providers**
  Providers can be digital health catalysts, but startups often can't get the right data to satisfy physicians.

- **Corporations**
  Companies with large market share can be both collaborators and investors but startups are often seen as competitors.

- **Payers**
  Startups can tackle payers' needs for cost reduction and efficiency, but many say they need a provider's initial blessing despite the fact that many providers actually say payers are in control.

- **Governments**
  Startups can improve public health, but government priorities (though often aligned on paper) get lost in execution, and regulations around innovative healthcare technologies are underdeveloped or nonexistent.

- **Universities**
  Startups have a desire to commercialize academic research, but often they can't access findings.

This report also identifies five practical opportunities and first steps where existing stakeholders in MENA's healthcare industry, as well as institutions that work directly with startups, can capitalize on a first-mover advantage by working more closely with young digital health companies. Those stakeholders and corresponding opportunities are:

- **Corporations**
  Enlist financial and in-kind resources for growing strategically aligned health startups.

- **Hospitals and clinics**
  Offer an entrepreneurial space for prototyping, testing, validating, and commercializing healthcare breakthroughs.

- **Crowdfunding platform**
  Create a physician-curated crowdfunding platform for seed-funding MENA's health startups.

- **Incubators and accelerators**
  Enable entrepreneurs to partner for iterating and refining concepts and models, early.

- **Medical schools**
  Equip physicians to communicate the benefits of digital health to their patients.

Filling ecosystem gaps will result in enhanced capabilities to support testing and trials, a pool of talent that is large and qualified enough to drive innovation, regulation that allows for innovation and is clear and specific to digital health, increased consumer adoption, viable investment and exit opportunities, and most importantly healthier people.

We offer the following predictions to serve as guiding forces for what could come next:

- Rising public health issues, especially non-communicable diseases (NCDs) will pressure MENA's leaders to champion new ways of delivering high-quality and low-cost healthcare.

- MENA's established healthcare players will begin to see the benefits of sourcing innovation at the margins by partnering with young private health companies.

- Advancements in 3D printing, materials sciences, and quantum computing will lower the barriers to entry for inventors and entrepreneurs who are seeking to create advanced healthcare solutions.

- mHealth is coming-of-age in MENA and the rest of the world could soon note the region's ability to foster dispersed, practical methods for delivering widespread advancements in healthcare.

In this report you will find a promising group of health entrepreneurs already working in this field. Though many of the region's successful health Startups are still young, these entrepreneurs have started building the foundations to scale advanced digital healthcare solutions in MENA. Any efforts to understand and improve conditions for developing this field should begin by working with this cohort of entrepreneurs.

"Generally, healthcare is a tough industry for a startup to penetrate. Disruption will come in many instances from young tech savvy innovators working closely with clinicians and the broader industry. Adoption will come from anyone who is not satisfied with healthcare the way it is."

– **Roland Daher** (Head of Dubai 100 Digital Health Pre-Accelerator, UAE)

CONTENTS

INTRODUCTION

Health startups are growing in impact and value

There has never been a better time for private health companies to startup in MENA: the first generation of companies is emerging and the movement is growing as governments and consumers seek options for better health.

Rising demand, an increase in disease prevalence, infrastructure improvements, and overall development drive forecasts of long-term annual healthcare spending growth of 10%.[9] Moreover, a rapidly aging and fast growing population that is increasingly coming online is providing fertile ground for the development of digital health solutions. Health startups have taken up the challenge to provide low-cost ways to expand access to health services while improving patients' outcomes.

MENA governments have undergone massive healthcare spending increases in recent years, tripling from USD 30 billion in 2003 to USD 96 billion in 2013, and are projected to grow to USD 141 billion in 2020.[10] While this should help expand the market for health startups, structural inefficiencies such as talent shortages, the nascent healthcare investment market, difficulty establishing partnerships, an early-stage regulatory environment, and significant requirements to get products to market mean health startups face real challenges to commercialize, and later to scale. But addressing these barriers carries significant benefits in the form of an overall healthier population with better access to high quality healthcare.

Global startup health trends

The global startup-health movement is fueled by the emergence of new companies, as well as mounting confidence from: venture capitalists, healthcare professionals, corporations, and consumers in the ability of technology companies to measurably improve our health. Health startups use a mix of solutions with both software and hardware components to enhance transparency and connectivity, and to improve monitoring, diagnosis, prevention, treatment, and payment. Around the world over 190 accelerators have sprung up to facilitate the growth of health startups.[11] Evidence is mounting around the idea that health startups require targeted support that is unique to the healthcare industry.

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[9]   MENA healthcare spending to reach Dh528 billion by 2020: Report. Monday, November 02, 2015. emirates247.com
[10] MENA healthcare spending to reach Dh528 billion by 2020: Report. Monday, November 02, 2015. emirates247.com
[11] Investments in Healthcare and Achieving Operational Excellence. MENA Private Equity Association. 2015.

1. Health innovations make an impact across the continuum of care

The continuum of care refers to the complete lifecycle of care that people experience in a given healthcare system. This includes but is not limited to: preventative care before complications arise, acute care after diagnosis, managed care post treatment, and paying for healthcare.

The following diagram is an illustration of how health innovations, especially digital health technologies can augment health-systems at each touch-point in the patient's path across the continuum of care.

Arguably, the two most important touch-points across the continuum of care are the home and the hospital. The home is where complications can be prevented, and the hospital is where most people receive healthcare.

Figure 1: Digital health and the continuum of care

Home

Preventative Care

Digital home-based care is a cost-effective way to incentivize wellness, improve access, and lower hospitalization rates.

Hospital

Acute Care

Hospitals with advanced digital infrastructure such as data and analytics, enhanced connectivity, and telemedicine options can see improved patients' outcomes.

Pharmacy

Managed Care

Digital tools like anti-fraud apps and point of sale solutions can help ensure the right drug treatments at affordable prices.

Insurance

Paying for Care

Online marketplaces for custom insurance plans and transparent billing mechanisms are key to patient-centric healthcare.

"In the future, the majority of care will still be in a facility, at no point will the doctor be antiquated, digital health is about how to make the doctor patient relationship more efficient and accurate."

– **Aschkan Abdul Malek** (CEO, AlemHealth, UAE and Afghanistan)

2. Big Data and the IoT are potent avenues for innovation

The volume of medical data around the world is doubling every 73 days.[12] With all this data available, sophisticated data capture and analytics capabilities that utilize machine learning and artificial intelligence promise to help providers lower healthcare costs, companies to run better clinical trials, payers to get more efficient and transparent, and consumers to better manage their health.[13]

Wearable devices and smart-sensors, and more generally the Internet of Things (IoT), have put data-backed health-intelligence into the hands of providers, patients, and health optimizing consumers.

The IoT's impact on healthcare includes: enhanced capabilities to monitor and treat illness, improved wellness options, extending healthy life spans for people with chronic conditions, and reducing the direct cost of treatments, in addition to more industrial applications with smart sensors that enable machine-to-machine networking applications in hospitals.[14]

With the IoT, physicians can continuously monitor patients and facilities and thus reduce the cost of treatment by between 10 and 20 percent.[15] The IoT could save billions of dollars in the care of congestive heart failure alone.[16] Cardio Diagnostics, a Lebanese-American startup with operations in the United States, has developed the world's first HIPAA-compliant, cloud-based cardiac management system accessible from any internet connected device.

3. Public sector support and cross-industry collaboration

Government regulation such as universal healthcare, service cost restrictions, and smart healthcare initiatives have paved the way for health innovations. For example, the US Government's EHR (electronic health records) incentive program offers USD 44,000 to providers who adopt EHR,[17] to promote healthcare information technology innovations.

The public sector is partnering with the private sector. Partnerships vary from financing arrangements to sharing non-financial resources.[18] For example, Europe's USD 3.3 Billion IMI partnership is a research and regulatory collaboration between the European Commission and the European Federation of Pharmaceutical Industries and Associations.[19]

Partnerships now exist between device manufacturers and healthcare entities (such as Samsung and Cleveland Clinic),[20] tech companies and medical device companies (such as IBM Watson Health and Medtronic)[21] and even sports brands and hospitals (Nike and Mayo Clinic).[11] Global tech firms such as Google, Apple, and Qualcomm are also making digital health a priority, via partnerships with established medical companies like Novartis and Sage Biometrics[22], boosting the technology capabilities of established health firms and extending the reach of technology companies.

[12] IBM Watson Health 2016

[13] The efficacy of Big Data in healthcare is highly dependent on the standardization of collection practices and overall 'cleanliness' of the data that is used. Additionally, for Big Data to make a big difference, healthcare systems have to first deliver the right diagnoses, treatments, and outcomes to be optimized.

[14] The opportunity for the IoT to positively impact healthcare is tremendous but first, technology providers have to overcome the issue of interoperability to communicate and share information seamlessly and agnostically across networks, and to maintain clinical relevance so that data collected from personal devices is actually useful to physicians.

[15] Bauer, Harald, Mark Patel, and Jan Veira. The Internet of Things: Sizing up the opportunity. McKinsey. 2014

[16] Ibid

[17] US Government EHR Incentive Program. An Introduction to the Medicare EHR Incentive Program for Eligible Professionals.

[18] Mitchell, Marc, M.D., M.S. An Overview of Public Private Partnerships in Health. Harvard School of Public Health.

[19] Meulien, Pierre. IMI Innovative Medicines Initiative. Efpia. 2016

[20] Dolan, Brian. Samsung reveals 24 digital health partners including Aetna, Cigna, Humana, WellDoc. MobihealthNews. 2014.

[21] Medrtonic: Medtronic And Ibm Watson Health Partner To Develop New Ways To Tackle Diabetes. 2016

[22] Pennic, Jasmine. 14 Top Hospitals Are Piloting Apple's HealthKit Platform. HIT Consultant.2015

[23] Startup Health, LLC. Startup Health Insights Q1 and mid-year reports. 2015.

4. Venture capital is seizing the opportunity

Over 7,600 health startups were in operation around the world through 2015, and the market for investing in them is bullish. [23]

In the United States, responsible for nearly 80% of all global digital health funding through 2015, [24] [25] venture funding for digital health companies topped USD 4 billion in 2014, almost equal to 2011 through 2013 combined. [26]

Nearly half (47%) of venture backed healthcare exits in 2014 were IPOs; up 30% from the previous two years. [27]
In 2015 alone, five venture-backed health startups went public. [28]

Figure 2: Global digital health investment trends: deals and dollars are up

Digital Health Investment-Deals 2010-14'

CAGR 38%

600
500
400
300
200
100
0

2010 — 152
2014 — 551

Deals

Digital Health Investment-Dollars 2010-14'

CAGR 57%

7
6
5
4
3
2
1
0

2010 — 1.1
2014 — 6.7

USD Bil.

(Figures are solely based on venture capital funding) Source: Startup Health Insights & CB Insights
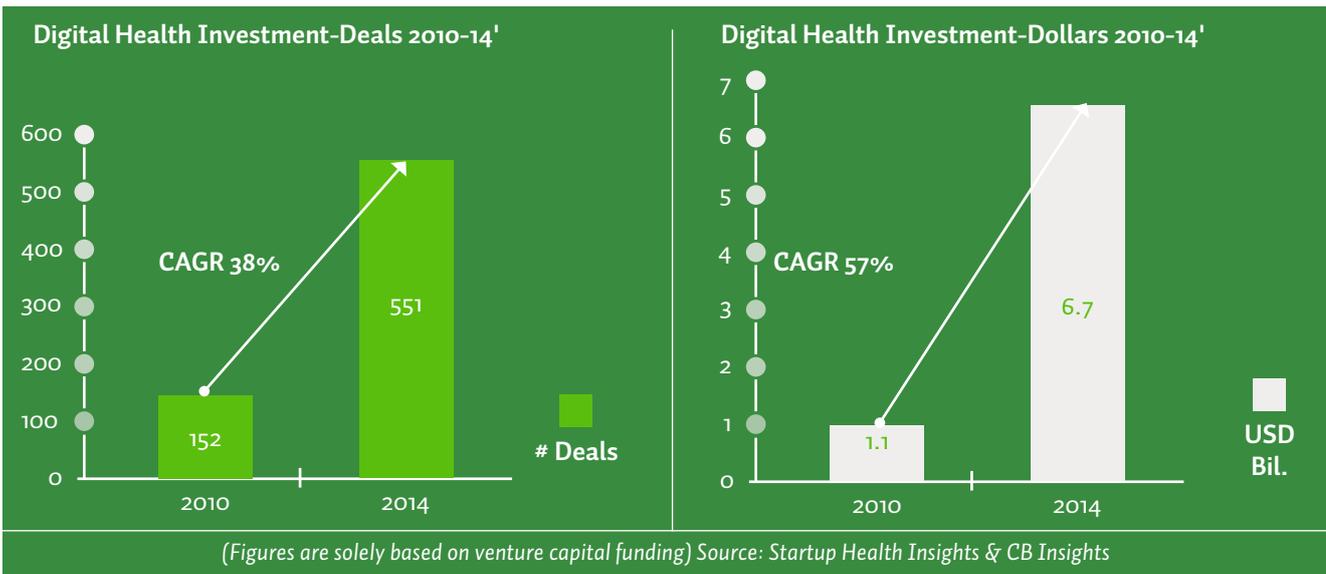
Digital health is about 7% of total venture funding now, having quadrupled to USD 4.5 billion over the last 4 years. [29] Dollars invested in the space were over six times greater in 2014 than in 2010, growing (during that time period) at a faster rate than the venture capital industry as a whole. [30]

Corporations and their venture capital arms are increasingly engaging in the startup health space, signifying the potential for value-creation through such partnerships. [31]

In fact, the year 2014 saw corporations participate in a record number of startup health funding deals. [32]

Healthcare in MENA

MENA faces critical health challenges and entrepreneurs can offer solutions.

"We have to start with incentivizing prevention; this is the future of disease management and an area where MENA's entrepreneurs can add tremendous value."

– **Ben Frank** (former CEO, Sheikh Khalifa Medical City Hospital, managed by Cleveland Clinic, UAE)

Healthcare systems around the world face mandates to lower costs and improve patients' outcomes, but MENA's health challenges are particularly severe.

1. Shifting demographics and rising disease prevalence strain MENA's healthcare systems.

- **Population growth and rising affluence:** MENA has one of the highest population growth rates at 2.7%. The region, particularly the GCC, is experiencing rising per-capita incomes, [33] energy-dense diets and low physical activity; [34] suggesting an increase in the number of patients seeking high-quality medical treatment.

- **Increase in elderly patients:** The number of elderly patients in MENA is projected double from about 10 million to 20 million by 2025; [35] increasing the need to provide specialized healthcare services for these patients.

- **Rise in obesity and non-communicable diseases (NCDs):** By 2030, NCDs will account for 87% of all deaths in the GCC and 81% in MENA countries outside the GCC. [36] Obesity is a leading factor for the NCDs that make up 47% of the region's disease prevalence, linked to high recurring treatment costs, such as USD 1,605 annual per capita spending in the UAE [37] and USD 116 in lower-income Egypt. [38]

The predicted increase in the number of patients and demand for quality and specialized care creates challenges in both capacity and costs:

- **Demand outpacing supply:** MENA has 38 skilled health workers per 10,000 people, less than every other region except South Asia and Sub-Saharan Africa. [39] The region will require an additional 360,000 hospital beds and 150,000 new physicians to satisfy demand for healthcare by 2020. [40]

- **Increasing costs:** Treatment costs in MENA are already higher than in other regions, [41] and at 46% out-of-pocket-payments account for nearly half of total healthcare spending in MENA versus a global average of 19%. [42] This places a significant burden on both the public sector and patients, and further increases could trigger an increase in poverty rates of up to 20%. [43]

2. The public sector's legislative and budgetary arms are prioritizing healthcare

The regulatory infrastructure underpinning health innovation in MENA is still underdeveloped, but moves are being made to develop it. Formative regulation is being made in key areas that are designed to improve public health:

- **Universal healthcare:** Several MENA governments have mandated universal healthcare, including the UAE (Dubai and Abu Dhabi), Bahrain, and Saudi Arabia. [44] This will both increase the demand for healthcare services as well as potentially aid in better prevention and monitoring of chronic diseases.

- **Price restrictions:** Countries such as Saudi Arabia and the UAE have caps or restrictions on healthcare service price increases [45]. As a result, providers (and insurers) will likely look for lower-cost treatment and care options, paving the way for solutions in cHealth and mHealth in particular.

- **Smart healthcare and digital hospitals:** MENA governments are encouraging healthcare providers to adopt digital solutions. The Dubai Health Authority's Smart Healthcare Model offers guidelines for providers to become more automated and 'paperless' in operations. [46] One example is the Dr. Suleiman Habib Hospital, a partnership with GE to improve diagnostics, productivity, and cost-containment. Patient data like biometrics is collected and stored electronically, and Emergency Medical Technicians (EMT) use Google Glass to communicate with on-site doctors. [47]

[24] *Startup Health, LLC. Startup Health Insights Q1 and mid-year reports. 2015.*
[25] *GP.Bullhound. Digital Healthcare-Local Challenges, Global Opportunities. 2015.*
[26] *Hathaway, Ian and Jonathan Rockwell. A cure for healthcare inefficiency?. Brookings, 2015.*
[27] *Startup Health Insights. Digital Health Funding Rankings- 2015 Mid Year Report. 2015.*
[28] *CB Insights. Healthcare Startup Boom: 2015 Could See More Than $12B Invested Into VC-Backed Companies. 2015.*
[29] *Rock Health. Digital Health Funding: 2015 Year in Review.*
[30] *Rock Health. Digital Health Funding: 2015 Year in Review.*
[31] *Hathaway, Ian and Jonathan Rockwell. A cure for healthcare inefficiency?. Brookings, 2015.*
[32] *According to CB Insights, corporate VC deals rose 25% in 2014 and funding rose 76%. Also, 54 different corporate VCs had at least one seed VC round in the USA in 2014, compared to just 10 rounds in 2010. Also, The Startup Health Network shows over 100 active corporate VCs with digital health investments (https://www.Startuphealth.com/tag/company_type/corporate+vc).*
[33] *CB Insights. Corporate Investment into Digital Health & Health IT Industry Hits Record Level. 2014*
[34] *Becker, Joachim and Lisa Klautzer and Soeren Mattke. The curse of wealth – Middle Eastern countries need to address the rapidly rising burden of diabetes. Int J Health Policy Manag. 2014*
[35] *World Diabetes Foundation. Obesity and Diabetes-Emerging Major Health Care Challenges in the Eastern Mediterranean Region. 2015*
[36] *Al Masah Capital Management Limited. MENA Healthcare Sector. 2011*
[37] *The World Bank. Scaling Up Universal Health Coverage and Containing Non-Communicable Diseases in the Middle East and North Africa: Challenges, Linkages and Strategies. 2015*
[38] *Sherif, Shalaby and Sumpio, Bauer E. Economic development and diabetes prevalence in MENA countries: Egypt and Saudi Arabia comparison. World Journal of Diabetes.2015.*
[39] *Sherif, Shalaby and Sumpio, Bauer E. Economic development and diabetes prevalence in MENA countries: Egypt and Saudi Arabia comparison. World Journal of Diabetes.2015.*
[40] *World Health Organization. Skilled Health Workers per 10,000 People, Global Regions 2010. 2013*
[41] *Al Masah Capital Management Limited. MENA Healthcare Sector. 2014*
[42] *World Bank Healthcare Expenditure data*
[43] *World Bank Healthcare Expenditure data*
[44] *The World Bank. Fairness and Accountability: Engaging in Health Systems in the Middle East and North Africa. 2013*
[45] *Saudi Healthcare Sector Healthcare –Industrial. Al Rahji Capital. May 2015*
[46] *Saudi Healthcare Sector Healthcare –Industrial. Al Rahji Capital. May 2015*
[47] *More Dubai Hospitals Going Digital. Gulf News. February 2014.*
[48] *Setting a Model for Digital Hospitals of the Future, Arab Health*

MENA's Startup health innovations

Health innovations span a wide range of underlying technologies, combinations, and applications. WRL has identified seven main areas of innovative activity for MENA's health startups:
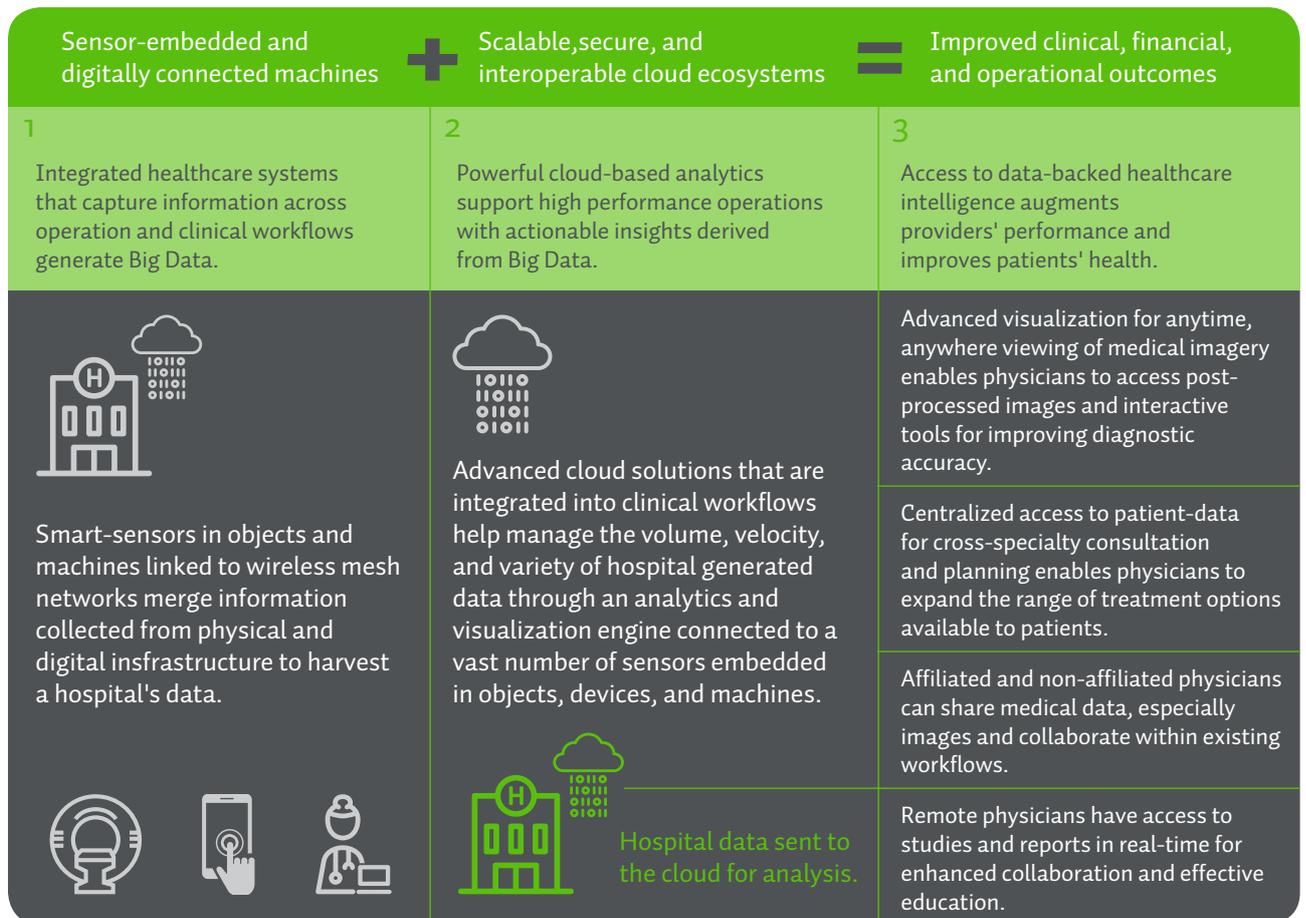
1. Health Information Technology (HIT) and the digital hospital

HIT and digital hospital startups are solving challenges in the institutional care setting. This includes streamlining workflows and processes for physicians and healthcare professionals, securely connecting providers with each other, and implementing evidence-based decision-making tools to improve diagnoses and treatments. [48] Over half (60%) of the HIT startups in our sample offer solutions that contribute to the digitization and portability of patients' EHR (electronic health records). For example, Winex is an Egyptian healthcare IT company offering solutions for helping providers manage patients' EHR. Egyptian holistic medico-social platform NabdaCare is breaking ground in this space with operations in Egypt, Kuwait, the USA, and the UK. And Emirati integrated medical services company Ver2 Digital Medicine is at the forefront the region's healthcare innovation with its teletraining for physicians and enhanced connectivity for the region's medical facilities.

"Across MENA, there is very little continuity of care when it comes to medical records. The region needs systems that enable doctors to access a patient's history and unique needs. This will lead to a higher quality of care, and save costs."

– Rami Adwan (former CEO, Electronic Health Solutions, Jordan)

Figure 3: Health IT, Big Data, and the digital hospital

Sensor-embedded and digitally connected machines **+**	Scalable, secure, and interoperable cloud ecosystems **=**	Improved clinical, financial, and operational outcomes
1	**2**	**3**
Integrated healthcare systems that capture information across operation and clinical workflows generate Big Data.	Powerful cloud-based analytics support high performance operations with actionable insights derived from Big Data.	Access to data-backed healthcare intelligence augments providers' performance and improves patients' health.
Smart-sensors in objects and machines linked to wireless mesh networks merge information collected from physical and digital insfrastructure to harvest a hospital's data.	Advanced cloud solutions that are integrated into clinical workflows help manage the volume, velocity, and variety of hospital generated data through an analytics and visualization engine connected to a vast number of sensors embedded in objects, devices, and machines.	Advanced visualization for anytime, anywhere viewing of medical imagery enables physicians to access post-processed images and interactive tools for improving diagnostic accuracy.
		Centralized access to patient-data for cross-specialty consultation and planning enables physicians to expand the range of treatment options available to patients.
		Affiliated and non-affiliated physicians can share medical data, especially images and collaborate within existing workflows.
	Hospital data sent to the cloud for analysis.	Remote physicians have access to studies and reports in real-time for enhanced collaboration and effective education.

2. cHealth (Connected Health)

MENA's cHealth startups offer online services and websites to connect patients and providers for quality and cost comparison, appointment booking, education, and secure messaging for consultations. Altibbi is a Jordanian startup offering an interactive online Arabic health portal that enables people to connect directly with top medical experts in the region.

cHealth startups in MENA offering telehealth solutions that utilize video and image transfer between patients and providers for remote diagnosis are rare (7%). AlemHealth is a UAE-based startup with teleradiology operations in Afghanistan connecting hospitals and clinics in low-resource environments with a global network of top healthcare practitioners for timely and accurate diagnosis. One at-home solution is Saudi startup iRehab, offering online home-based rehabilitation videos for children with special needs.

"There are a number of startup health initiatives in almost every MENA country that are similar. For example, connecting patients and doctors together; at least one startup is doing this in each country."

- Henri Asseily (managing partner, Leap Ventures, Lebanon)

3. Digital Therapeutics (DT)

Startups that are engaged in DT offer solutions to counter (and manage) lifestyles associated with chronic medical conditions.

Of the DT startups in this study, most (88%) target diabetes in MENA, by using digital technology and behavioral science techniques to nudge individuals toward ideal lifestyles for disease prevention or management. Junnah is a Saudi Arabian startup with an online platform for social networking with wearable devices and mobile apps to monitor and share health data with peers. MedsConnect, based in the UAE, offers a personalized mobile health management application for adhering to medications and keeping appointments. Another DT company is the Canadian startup Timez5, with their operations center in the UAE. The company offers the world's first NASA certified, advanced physiological prayer mat and a mobile-app for Muslim physiology, to help prevent and relieve chronic body pain.

"Patients with chronic diseases shouldn't need to go to the hospital regularly after the diagnosis. Instead, healthcare should be thought of as a continuous process, from prevention to therapeutic treatment, instead of a single point of contact for care."

- Thomas Zeltner (former Health Secretary of Switzerland)

4. mHealth (Mobile Health)

mHealth startups (60% of our sample) offer mobile apps with a mix of remote access to health-information and management/monitoring of their personal data for lifestyle and health reasons. Prominent uses for mHealth technology around the world include: vital signs monitoring, emergency detection, care navigation, physical fitness and diet optimization, social engagement, behavioral and emotional health insights, medical device management. Mobitstine, a Palestinian startup with operations in the United States, creates interactive mobile health apps in English and Arabic, including apps like GraviLog for assisting prenatal care.

"Smartphones have the potential to be a personal laboratory in your pocket. Companies are developing ways to take the results from your personal lab into the doctor's office to help solve your unique health issues."

- Husni Abu Samrah (CEO, GraviLog and MobiStine Apps, Palestine)

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[49] *Notably, in MENA, EHR platforms have not fully advanced toward systems that are capable of integrating patients' out-of-hospital data (from personal devices etc.), leaving open territory for new entrants globally.*

5. Health 2.0

Health 2.0 startups capitalize on MENA's growing internet/mobile usage and high social media adoption to disseminate Arabic health content via Web 2.0 platforms like social media and search data, and to collect unstructured crowdsourced information on health-related topics. [49] Web Teb from Palestine offers online Arabic health and lifestyle content, a doctor-index, daily articles, a symptoms checker, and more.

Health 2.0 has the potential to leverage ever-present social media channels and wider mobile/internet penetration to generate and spread reliable health information, and in turn play a significant role in healthcare education in the region.

"Historically there has been a shortage of digital Arabic content, especially around reliable health information."

- Mahmoud Kaiyal (former CEO, WebTeb, Palestine)

6. Data & Analytics (D&A)

D&A health startups capture and analyze Big Data - large amounts of complex health information - to facilitate accurate diagnoses, evidence-based treatment, and better patient outcomes through optimized systems and processes. [50] There are few startups in MENA that offer robust D&A solutions. White Lab, out of Lebanon and the UK offers indoor air quality analysis in homes and hospitals alongside a proprietary algorithm for reducing exposure to airborne allergens and irritants.

"There is immense potential for combining Big Data services, IoT solutions, predictive analytics, and personalized medicine to create healthier living environments."

- Cyrille Najjar (CEO, White Lab, Lebanon and UK)

7. 3D printing and hardware

3D printing is becoming a disruptive force in healthcare. The technology has been used to quickly and cheaply make custom prosthetics, implants, surgical guides, and to engineer and print human tissue. Refugee Open Ware (ROW) in Jordan, and Glia in Palestine both utilize computer aided design software and additive manufacturing technology to rapidly prototype and manufacture solutions such as prosthetics, echolocation devices, and low-cost medical supplies. Fab Lab Egypt is working with the Kasr Al Ainy School of Medicine at Cairo University to implement 3D printing for implants in reconstructive surgeries.

"We have an opportunity to capitalize on the tools of the next industrial revolution; an economic transformation that is a thousand times greater than anything that came before it. The question is: Can we match this opportunity with necessity, and can we afford not to?"

- Dave Levin (executive director, ROW, Jordan and Turkey)
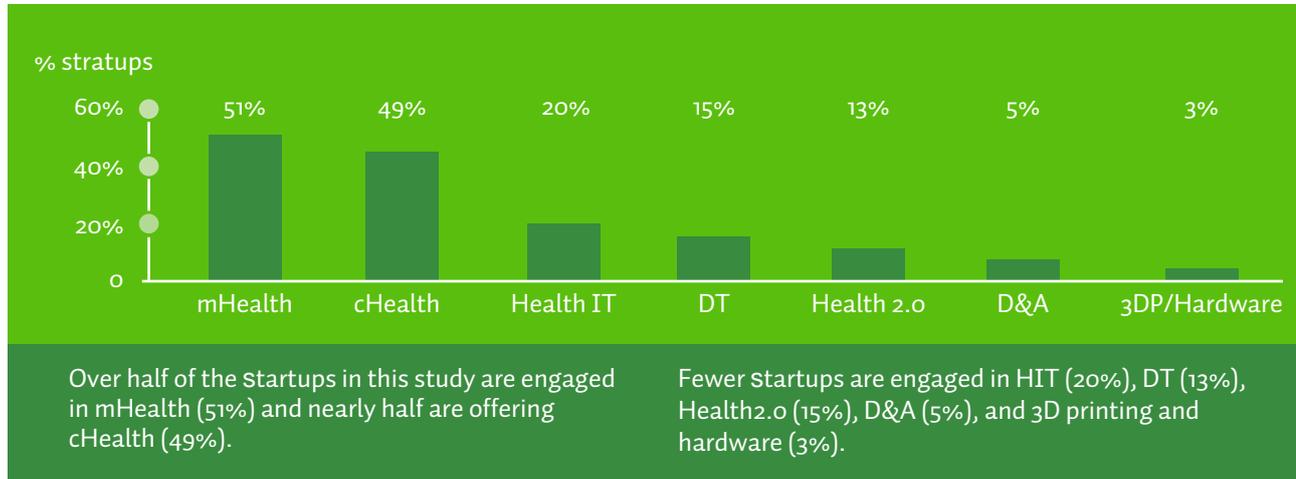
[50] *Nuviun. 2015*
[51] *Nuviun. 2015*

A NEW GENERATION OF HEALTH STARTUPS IS EMERGING

Common traits of digital health entrepreneurship are taking shape in MENA.

Of the nine countries examined in this study, Egypt is the most active MENA country for digital health startups (35%), followed by the UAE (24%), Palestine (15%), Lebanon (12%), Jordan (8%), and Saudi Arabia (5%).

Figure 4: MENA's startup health innovations

mHealth and cHealth are the most active startup health innovations in MENA.

% startups

mHealth	cHealth	Health IT	DT	Health 2.0	D&A	3DP/Hardware
51%	49%	20%	15%	13%	5%	3%

Over half of the startups in this study are engaged in mHealth (51%) and nearly half are offering cHealth (49%).

Fewer startups are engaged in HIT (20%), DT (13%), Health2.0 (15%), D&A (5%), and 3D printing and hardware (3%).

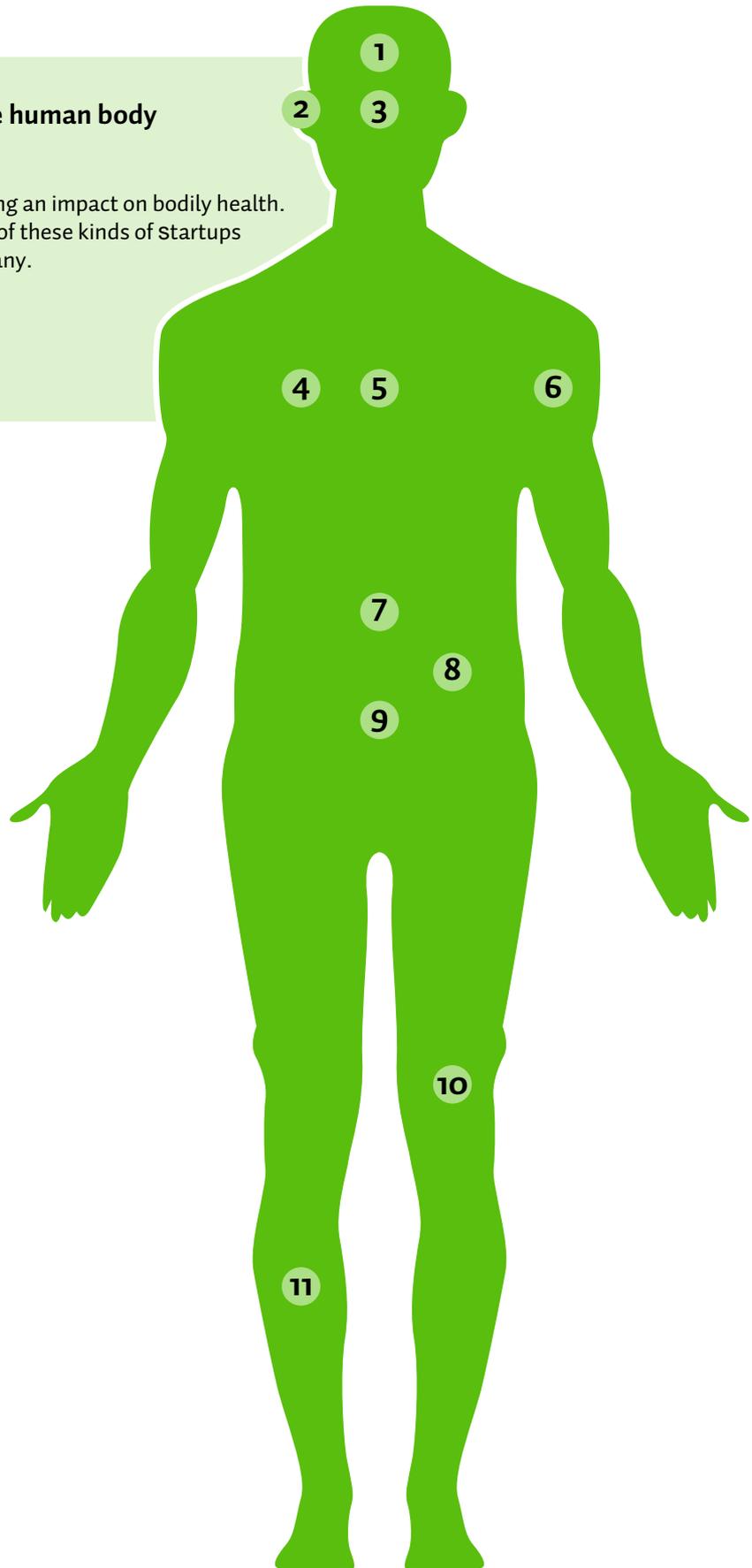(Solutions may overlap and do not total 100%)

MENA's health startups and the human body

Across MENA, health startups are having an impact on bodily health. The following diagram is an illustration of these kinds of startups and the solutions offered by each company.

Figure 5: Startups and the human body

1. Brain	**Myndlift** — Myndlift gamifies brain health with an EEG-sensing wearable device and corresponding mobile app to help improve attention levels. **iris** — Iris offers an interactive sensory environment for people with developmental and stress related disorders; such as Autism. **Shezlong** — Shezlong is an online psychotherapy platform for private and anonymous communication between patients and therapists.
2. Ears	**KinTrans** Hands Can Talk — A real-time sign language translation device aiming to make it easier for deaf people to communicate. **mimix** — Mimix offers a mobile app for users to communicate with the deaf by translating audio and text into signs through a visual-avatar.
3. Eyes	**keepvision** — Keepvision offers a mobile app eyesight checker for parents to monitor their children's vision and book appointments. **ROW** — ROW is a humanitarian innovation consortium that 3D printed an Eco-location device for the blind, and offers training for refugees. **MIH Systems** offers a wearable headset based on artificial intelligence to help blind people interact in their environment.
4. Lungs	**White Lab** offers AIR, a smart allergen tracker for indoor air quality analysis and tailored advice to help create a healthy breathing environment.
5. Heart	**CardioDiagnostics** — The world's first HIPAA-compliant, cloud-based cardiac management system accessible from any internet connected device.
6. Muscles	**Instabeat** — A sports technology startup offering a waterproof heads-up monitor that tracks, stores and displays real-time feedback during workouts. **inKin** — A social fitness platform for users to connect with friends, relatives and coworkers with fitness devices and apps.
7. Stomach	**Dietii** — Dietii, is a mobile app that tracks females' dietary habits and recommends middle eastern foods based on user's health goals.
8. Pancreas	**MedicSen** — A non-invasive device for continuous glucose monitoring combined with an algorithm for designing personalized therapeutic care.
9. Uterus	**MobiStine** — Interactive health app in English and Arabic, including the app GraviLog for prenatal care.
10. Knees	**timez5** — The world's first NASA certified, advanced physiological prayer mat and mobile-app tracker to prevent and relieve chronic body pain.
11. Wounds	**NanoEbers** — Develops nano-fiber based wound dressings.

MENA's health startups and the patient's experience

Across MENA, health startups are changing the way patients experience healthcare. The following diagram explores how health Startups serve patients as they navigate their way through the region's healthcare systems and across the continuum of care.

Figure 6: MENA's health startups across the continuum of care

HOME
Startups allow consumers and patients to find and manage healthcare providers, and access health information.

Stay aware, stay healthy, and prevent complications early.

TUMMY	jumpsuite	NutritionSouq
Aggregates wearables and health data to help diagnose patients and alert healthcare practitioners.	An online marketplace for mobile accessible workout programs and nutrition plans.	Nutrution Souq is an online marketplace for fitness products.

SUPERMAMA	Junnah	webteb	Sohati	3eesho
Digital Arabic and English health content about pregnancy and parenting for mothers.	Junnah is a social network utilizing wearables and mobile apps to track and analyze health data.	Digital Arabic health and lifestyle content, a doctor-index, daily articles, symptoms checker, and more.	Sohati offers digital Arabic health content on nutrition and taboo fields like sexology, dermatology, psychiatry, gynecology, etc.	3eesho is an Arabic social network and a digital magazine promoting healthy living in MENA.

Find the right doctor, compare prices and book an appointment online.

Meddy	DOCTORUNA	6abeeb	Vezeeta	Salamatak
Meddy is an online platform for patients to find and book appointments, see waiting times, read profiles, and review top doctors.	An online platform for patients to find doctors from across a broad range of specialties, compare them, and book an appointment.	6abeeb offers digital Arabic health and lifestyle content, a doctor-index, daily articles, symptoms checker, etc.	Enables patients to find doctors, book appointments, and build and store digital medical records.	The 1st online medical tourism facilitator in Dubai.

Stay home with convenient access to healthcare.

Tele-Med International	Altibbi.com	TebCare	iRehab	eTobb
Developing the largest telehealth network in the region allowing doctors and patients to connect virtually anytime, anywhere.	Altibbi is an interactive Arabic health portal that enables people to connect with top medical experts in the region.	TebCare offers convenient online text and voice consultations with physicians in the Arab world.	iRehab offers online rehabilitation resources for children with special needs.	An online service for users to ask health related questions and get answers.

HOSPITAL

Startups focus on digitizing provider processes, connecting health professionals as well as infrastructure, providing telemedicine services, and even R&D and online procurement.

Benefit from optimized systems and processes.

Faselty facilities blood donations and allows hospitals to source donors by location and blood type via SMS.	Hope is an app for compiling blood donation requests in one platform, and coordinating with donors in an emergency.	Nabda Care offers a holistic cloud based medico-social platform with a variety of digital tools.	Health IT services to integrate any software to facilitate business processes in medical facilities.

VER2	iconnect	Winex	doxunity	Doxnation
Integrated digital health solutions utilizing connectivity, evidence-based processes, and intelligent computing to overcome healthcare challenges.	SaaS for healthcare facilities and patients response call centers.	Winex offers IT solutions for the healthcare industry including helping patients and providers manage medical records and data.	A secure social network enabling physicians in MENA to collaborate with their peers.	A professional social networking tool exclusively for healthcare professionals in MENA.

Experience hospitals with quality medical equipment.

souqelhakim.com	BioBusiness
Souqelhakim is Egypt's first online healthcare products & medical supply store.	An R&D center for design, prototyping, and development of medical equipment.

Access care under harsh conditions.

AlemHealth	glia equal care	dkimia
Telemedicine for connecting hospitals and clinics even in Afghanistan, to a global network of top diagnostics health services.	Open source, low cost, locally 3D printed medical supplies in resource constrained environments like the Gaza strip.	Low-cost diagnostics solutions for Hepatitis C and a range of viral targets.

Maintain your treatment and get better.

NABED	Meds Connect
NABED is a patient education platform in Arabic to increase patient engagement and treatment plan adherence.	A personalized mobile health management app for adhering to medication and keeping appointments.

PHARMACY AND INSURANCE

Startups improve distribution of safe pharmaceuticals, and offer enhanced payer selection and analytics capabilities, in addition to mobile-insurance for the under-banked.

Get the right medication conveniently and affordably.	Aslya offers an anti-counterfeiting solution for drug manufacturers with a mobile based product verification service.	agzakhana.com is Egypt's first ecommerce pharmacy.	Medince For All collects medicine from households, companies, and hospitals, and distributes to patients in need.	A platform that enables local retailers including pharmacies to go mobile to fulfill orders on-demand.

|		
Get the best policy for you.	An online marketplace allowing individuals and companies to find, compare, buy and monitor their health insurance policies in the UAE.	The first mobile microinsurance partner in MENA, providing cutting-edge proprietary Financial Technology solutions and advisory that open the door to the underserved segments across the region.	Enterprise software for corporate health insurance.

Entrepreneurs' backgrounds

Most founder-and-CEOs of MENA's health startups come from the healthcare industry and ICT-related fields. Few were experienced in business and engineering before starting up.

Figure 7: Founder-and-CEO backgrounds
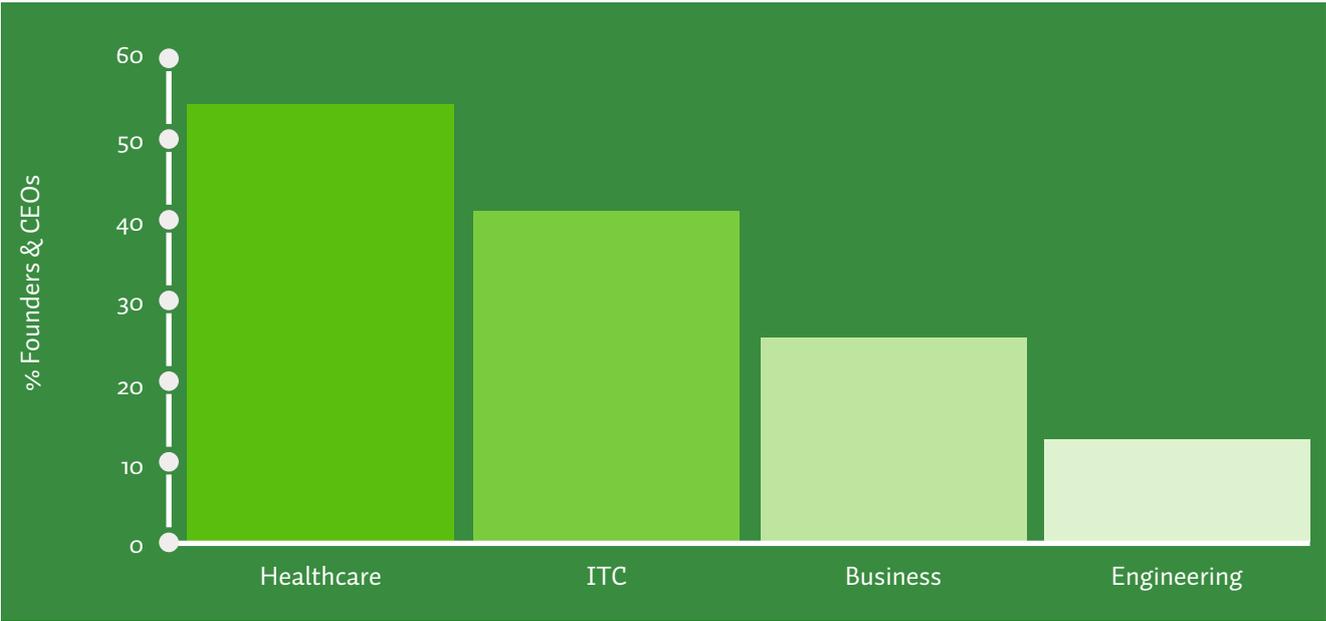
Entrepreneurs and thought leaders interviewed in this study identified important traits for health startup founders as healthcare expertise, technical experience with ICT, business acumen, and engineering skills. Every company in this study has at least one team member with a core competency in at least one of those areas.

Firsthand knowledge and experience in the healthcare industry is especially important for health entrepreneurs given the established methods and legacies across hospitals, payers, regulators, and other stakeholders.

"Healthcare is usually heavily regulated and politicized, and has strong entrenched stakeholders with lots of influence, it's also a very emotional area for people. It is by no means an easy market for an outsider to disrupt."

– Soren Mattke (senior scientist and managing director of RAND Health Advisory Services, USA)

Startups' business models

Most startups in our sample target B2C (business to consumer) and B2B (business to business) markets in tandem. Half are focused on a B2C or B2B market exclusively, and few startups are selling directly to governments in the region.

Figure 8: Business models
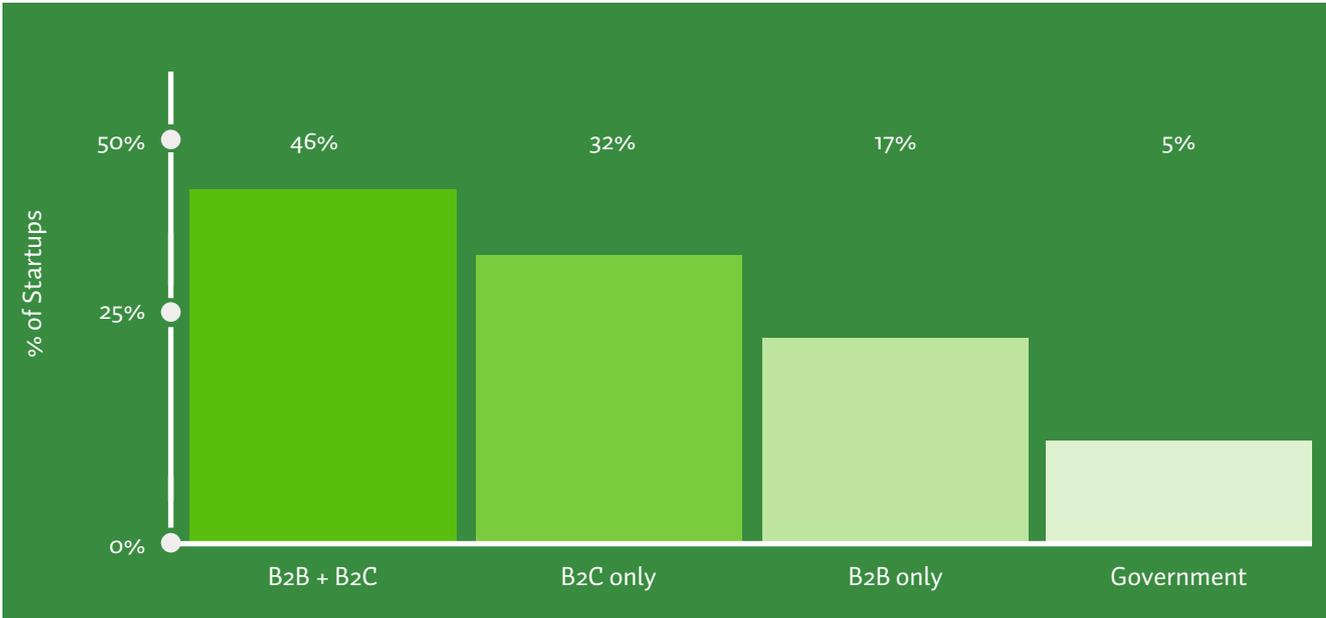
Nearly half (46%) of the startups have a dual B2B & B2C business model, characterized by selling to providers in order to serve patients or by marketing to patients in an effort to convert providers.

While some startups (32%) are B2C and focused on patient health and consumer wellness, B2B Startups (17%) are targeting healthcare facilities to improve social connectivity for physicians, data storage and secure information transfers between providers, workflows and processes enhancements, and a multitude of ways to improve measurement for tracking patients' outcomes. B2B startups are also targeting corporations and insurance companies in MENA that are interested in achieving lower premiums via group-oriented health and wellness solutions.

"As a health startup, you live and die by the sales cycle; that means targeting customers and partners with the desire to adopt your solution now, and avoiding those that are full of bureaucracy."

**- Talal Bayaa (CEO, Bayzat, UAE)**

MENA's health startups have potential for greater global impact.

98% of the entrepreneurs in this study want to grow locally and then internationally.

A few (17%) have already expanded operations in markets outside MENA, mostly in the United States and Europe (10%) but also in Asia and Africa (7%). More (23%) are already moving operations across borders in the region by acquiring new market share, opening a new office, or by engaging a new partner.

Figure 9: Current expansion trends
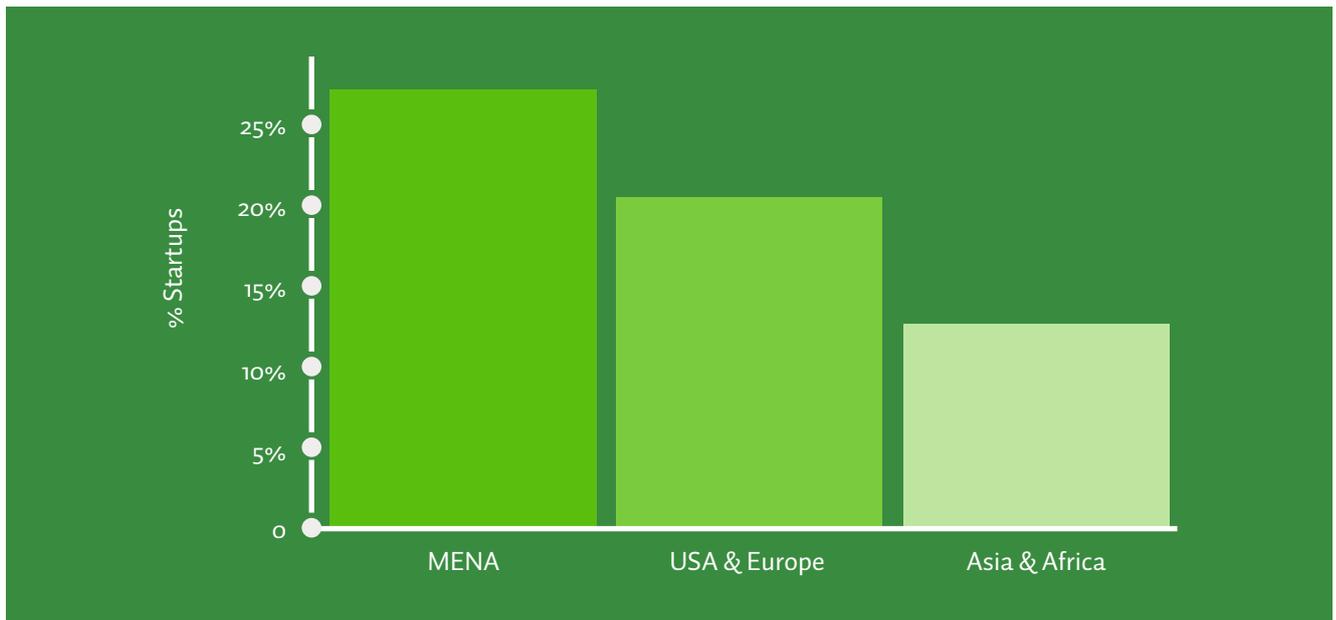
Opportunities in the United States' healthcare market
Entrepreneurs in this study frequently cited the size of the American healthcare market and high levels of regulatory transparency as reasons for wanting to open operations there. At USD 3 trillion, the United States spends more on healthcare every year than any other country. [52]

"I'm from MENA, but we are in Silicon Valley. Unlike MENA, the USA as a market is very clear and the opportunities to risk ratio is well balanced, you can set a clear roadmap and achieve your goals with transparency around you."

- Sameh Sarneh (CEO, Xtrava, USA)

Healthcare opportunities in emerging markets
Healthcare markets in Asia and Africa are growing as demand for quality healthcare rises. [53] [54] [55] Limited access to high-quality and specialty care [56] is compounded by the fact that parts of Asia and Sub-Saharan Africa experience the most severe shortages of qualified healthcare workers in the world. [57] MENA also faces a shortage of qualified healthcare professionals. [58] Quality and access gaps in emerging markets leave room for new entrants to offer affordable and reliable healthcare solutions. A majority of the startups in this study (61%) want to expand operations in Asia and Africa.

"Emerging market healthcare systems are often underdeveloped due to historic underinvestment, and many have sub-standard levels of service and quality. The silver lining for entrepreneurs is the existence of attractive white spaces for investment and development, often unencumbered by entrenched legacy systems."

- Ali Hashemi (managing partner, Avicenna Partners, UAE and USA)

[52] Berstein, Lenny. "Once again, U.S. has most expensive, least effective health care system in survey". The Washington Post, 2014.
[53] Deloitte. 2015 health care outlook Southeast Asia. 2015
[54] Das, Reenita. "Top 4 Healthcare Predictions for 2014- Asia". Forbes, 2014.
[55] Manson, Katrina. "GE and Philips scan Africa medical market". FT, 2015.
[56] WHO and The World Bank. Tracking Universal Health Coverage. 2015
[57] WHO. Global health workforce shortage to reach 12.9 million in coming decades. 2013
[58] Al Masah Capital Research. MENA Healthcare Sector. 2014

Entrepreneurs' early support

Over half of the startups in our sample (62%) accessed early support from a combination of business-plan competitions, incubators and accelerators, governments, and universities. The abundance of young companies that accessed early support in the region is an indication that MENA's entrepreneurship development institutions are open to working with young health startups. Dubai 100 has launched a pre-accelerator program designed to develop the growth of young talent in the digital health field through a unique curriculum, access to the healthcare industry and mentorship.

"I can't think of an incubator or accelerator in the region without activity in healthcare or without a desire to invest in startups that are making healthcare better for consumers."

– Ramez Mohamed (CEO, Flat6Labs, Egypt, UAE, KSA)

Figure 10: Entrepreneurs' early support institutions
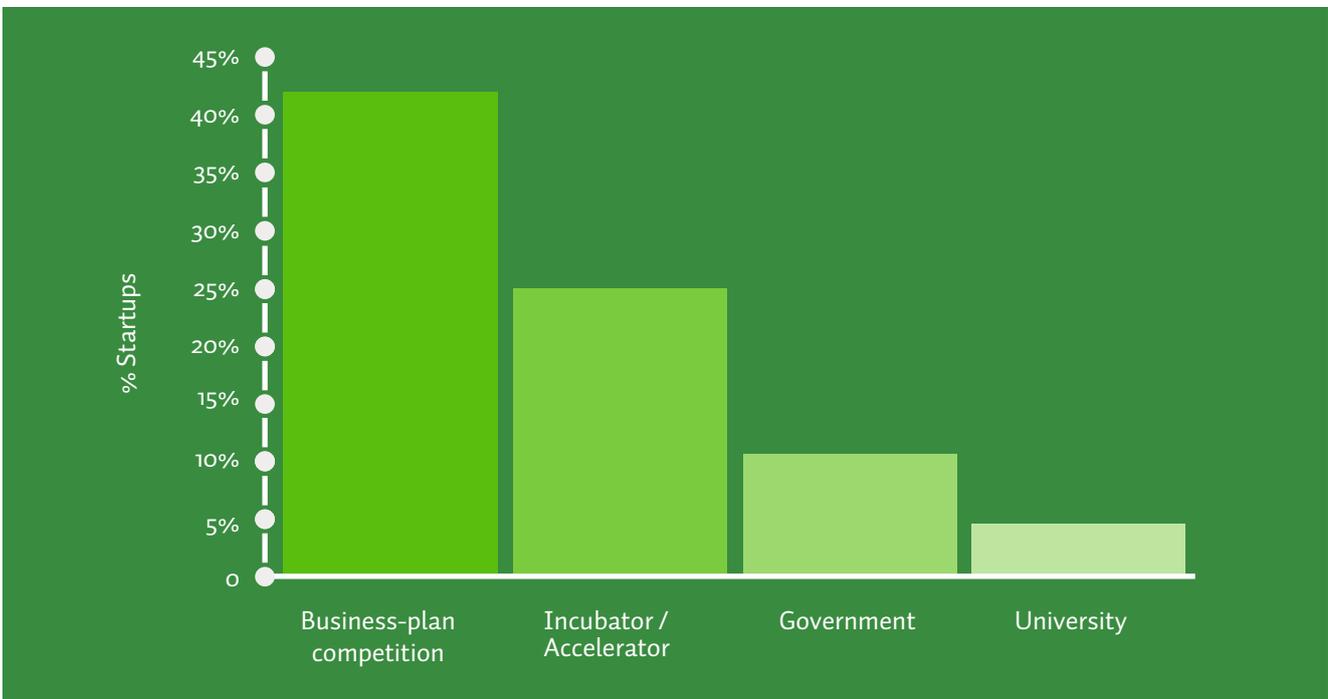
Most (42%) of the early support received by entrepreneurs in our sample came from awards in business plan competitions, and a quarter (25%) received support from an incubator or accelerator.

"Medical researchers, especially in academic medical centers can collaborate with health startups to conduct research aimed at improving healthcare."

– Marwan M. Refaat, M.D. (cardiologist and cardiac electrophysiologist, American University of Beirut Medical Center, Lebanon)

The funding landscape for health startups in MENA

Understanding and accelerating investment in health startups in MENA is of paramount importance if the region's companies are going to matter in the global race for better healthcare.

A handful of MENA's investors are capitalizing on the rising startup health movement, but their limited funding activity suggests that conditions for investing in digital health startups are underdeveloped. In fact, this industry in MENA is still extremely young, and few companies are truly ready for investment.

"At the moment, there is a shortage of experienced healthcare entrepreneurs and quality health startups that are deal-ready in the region. There are always going to be some gemstones in the rough that are developing something really cool and investment-ready, but that's rare in MENA."
- Dr. Helmut Schuehsler (CEO, TVM Capital Healthcare Partners, UAE)

Seed investments that are under USD 50 thousand and grants, dominate MENA's health funding landscape. However, more diverse types of funding such as venture capital are required to accelerate the ecosystem.

Figure 11: % of companies with investment vs. no investment
Of the startups in our sample that obtained investment (49%), the majority (85%) obtained capital from MENA, and some investments (15%) came from outside the region.

Obtained investment 49%
No investment 51%

Figure 12: Types of external funding obtained
More startups in our sample obtained grants under USD 50K (42%), over any other kind of finance, mostly in the form of awards from regional and international business plan competitions.
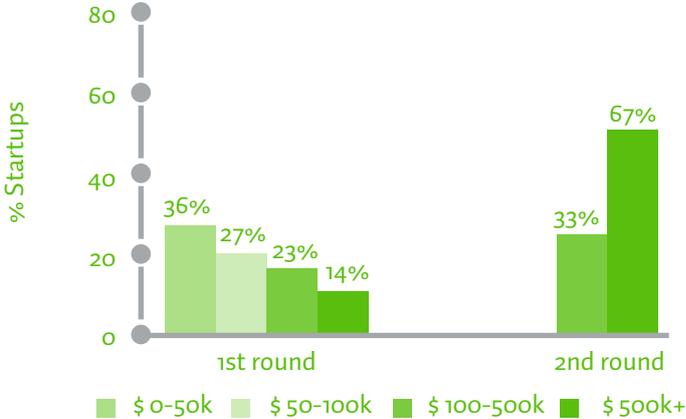
VC 21%
Grant 42%
Angel 34%

Figure 13: % breakdown of first round vs. second round investments
Health startups in MENA are obtaining 1st round investments (Seed) and most rounds are under USD 500K. Yet, a small number of relatively older startups have received larger funding sizes in a 2nd round (Series A).

% Startups

1st round: 36%, 27%, 23%, 14%
2nd round: 33%, 67%

$ 0-50k $ 50-100k $ 100-500k $ 500k+

Health Startups' path to scale

Health Startups need to test and validate their concepts and establish partnerships to grow.

The following table looks closely at the health Startups in our sample at each stage of development.
The table also highlights Startups' average age indicating the approximate amount of time it takes to move between steps.
Based on interviews with entrepreneurs and investors we also offer conservative estimates for the amount of capital
it takes a health Startup in MENA to progress at each step along the path to scale.

Figure 14: Health Startups' path to scale	Digital Health Startups' Steps on The Path to Scale					
	Idea	Prototype & Test		Launch	Sustain	Scale
	Entrepreneur has a clear idea for a scalable solution, and is honing a plan to acquire seed-funds and execute on a value proposition.	Startup has an initial prototype, and is working to establish a minimum viable product.	Startup has a minimum viable product, and is running experiments to collect data and prove the solution.	Startup has a commercialized solution and is iterating the business model based on a market feedback-loop.	Startup has clear growth-potential,and is retaining customers alongside establishing partners and recurring cash flows.	Startup has subsequent funding rounds, and is accessing new markets, recruiting talent, and executing a proven business model.
% of Startups in each	7%	46%		10%	23%	14%
Avg. Startups age(yrs)	0.25	1.0	2.0	3.5	4.0	4.5
Avg. funding rage(USD ooo's)	0-50	1-100	50-200	100-500	500-1M	500K-1M+

Rigorous testing and data collection practices are cornerstones of successful health companies.
MENA's digital health Startups are most stunted by barriers in the Prototype & Test step to scale.
In fact, nearly half (46%) of the Startups in our sample are currently locked in that stage.

"Testing or R&D is a very fundamental challenge in the healthcare business. You need money to finance your efforts to get early results and you need early results to get that money."

- Aziz Kaddan (CEO, Myndlift, Palestine and USA)

Notably, for health Startups that offer enterprise solutions, pilots can require significant attention to solve integration challenges with the legacy systems of larger organizations such as hospitals and insurers.

Roughly a quarter (23%) of the Startups in our sample are sustaining their operations as they seek the kind of partnerships that can catalyze the widespread adoption of their solution.

[59] *Cohen, Elliot. Accelerating Digital Health Innovation. MIT. 2013.*
[60] *Sung Kim, John. What's Really Killing Digital Health Startups. Techcrunch, October 30, 2015*

MENA's startup health ecosystem
Health startups rely on collaboration in the ecosystem to launch and scale.

An ecosystem of supportive stakeholders is essential for creating the necessary conditions to launch, sustain, and scale health startups.

Though the government is considered an indirect stakeholder, regulations have an outsize influence on the inception and adoption of healthcare innovations.
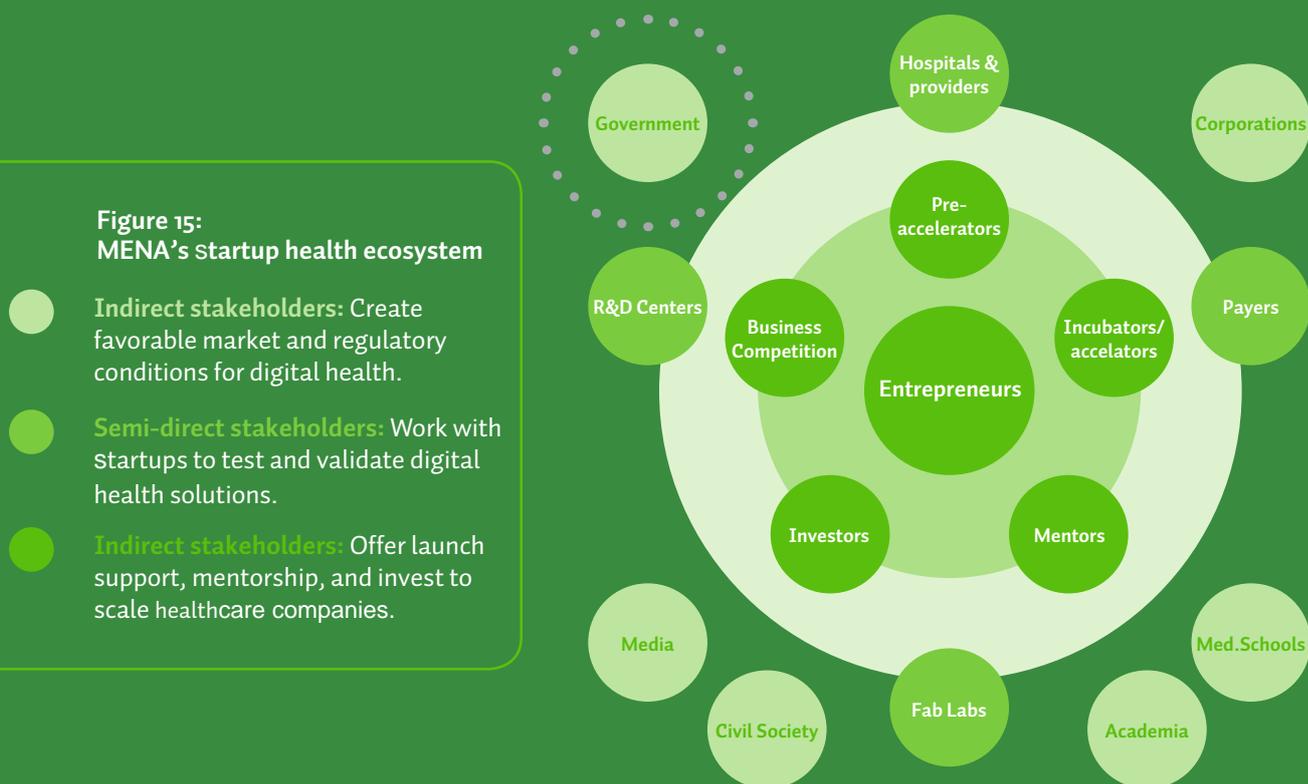

Figure 15:
MENA's startup health ecosystem

Indirect stakeholders: Create favorable market and regulatory conditions for digital health.

Semi-direct stakeholders: Work with startups to test and validate digital health solutions.

Indirect stakeholders: Offer launch support, mentorship, and invest to scale healthcare companies.

Government - Develop and implement modern regulatory systems that account for the rapid pace of innovation in healthcare.

Corporations - Enlist partnerships as well as financial and in-kind resources to grow strategically relevant startups.

Media - Highlight the value of digital health and show startup-solutions.

Civil Society - Promote awareness for the benefits of digital health.

Med. Schools - Equip physicians to communicate the benefits of digital health to patients.

Academia - Collaborate with entrepreneurs to commercialize medical research.

Hospitals & Providers - Offer innovation programs and support for startups to prototype and test under real-world conditions.

Payers - Support patients' willingness to pay for digital health solutions.

Fab Labs - Provide access to space, guidance, and tools for prototyping and testing ideas.

R&D Centers - Support the creation and testing of new technologies across the healthcare value-chain.

Pre-accelerators - Support aspiring digital health entrepreneurs with an enabling community.

Incubators/accelerators - Equip digital health entrepreneurs with business skills, mentors, investors and office space.

Mentors - Offer healthcare industry expertise and operational experience to help grow startups.

Investors - Offer capital and business development services especially for testing and through growth stages of startup development.

Business Competitions - Recognize and celebrate new ideas and offer seed funding to aspiring entrepreneurs.

EXPLORING BARRIERS TO SCALE FOR MENA'S HEALTH STARTUPS

Health entrepreneurs face barriers that are unique to the healthcare industry.
Across our sample, entrepreneurs revealed six critical barriers to achieving scale.

Barrier 1: Small pool of interested investors

80% of the startups in our sample claimed that MENA's startup health ecosystem lacks "smart capital" investors. [61]

Entrepreneurs in this study indicated their four most desired qualifications in an investor, also reflecting what it means to invest "smart capital" in a health startup.

Figure 16: Desired qualifications for investors
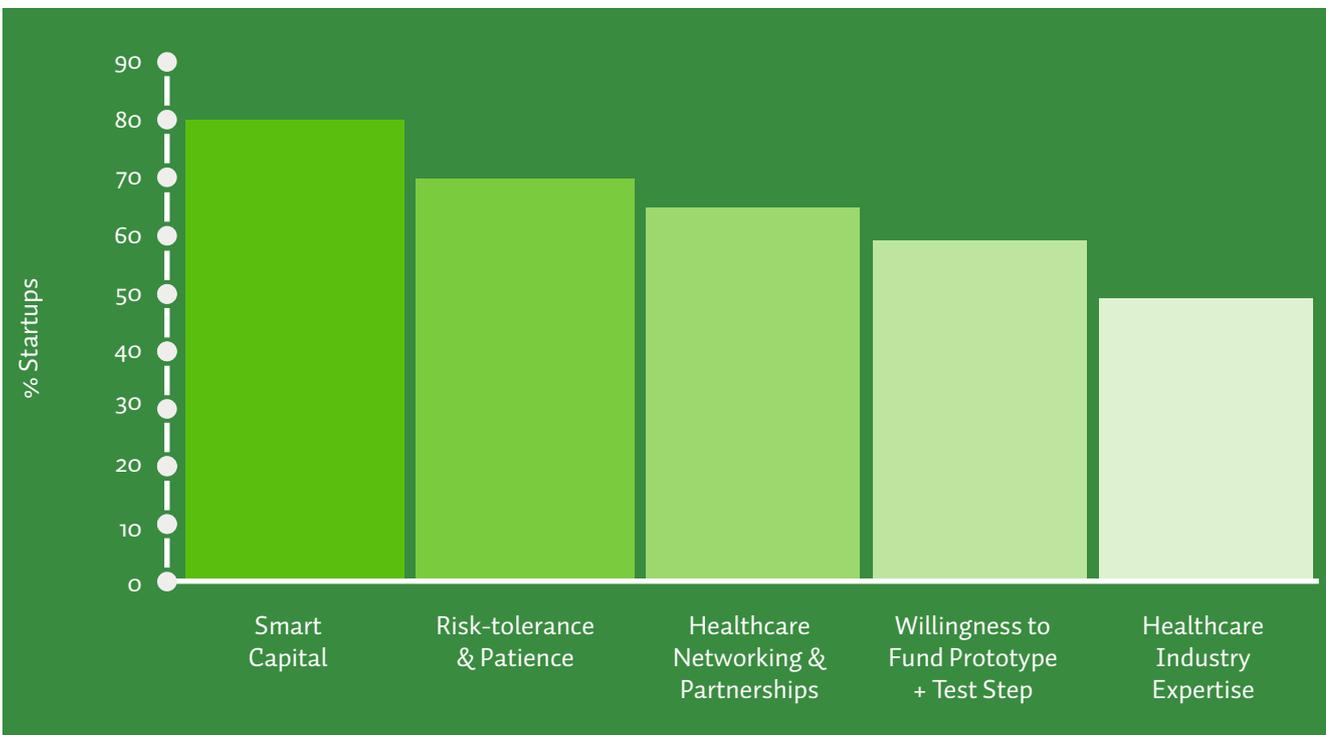
Entrepreneurs in our sample seek investors who are tolerant of the risks inherent with investing in healthcare, have the patience to fund tests, possess strong networks, have the appetite to invest early and long-term, particularly through the Prototype & Test step to scale (see figure 14), and have expertise and strategic problem solving capabilities that are unique to the healthcare industry.

Notably, of the startups that obtained a first round of funding, 87% still cited a lack of capital as a barrier to growth. Moreover, startups with a first round of funding did not obtain the investment until they were on average two years old, which is after the average age that these companies managed to complete the Prototype & Test step to scale. Venture capitalists did not typically invest in these companies until the startups were on average three years old.

All (100%) of the startups in the Prototype & Test step to scale (and over half of the startups in the Sustain step (64%) cited a lack of interested investors as a barrier to growth.

"The region lacks a flow of entrepreneurs entering the startup health space. We just don't have the ecosystem in place to support them, one that leverages high quality education in medical fields with innovation and commercialization tactics. It exists here, but not to the level of a critical mass needed to spur lots of meaningful interest from investors."

**– Ali Hashemi (managing partner, Avicenna Partners, UAE and USA)**

Barrier 2: Minimal testing resources

41% of the health startups in this study have difficulty testing to prove their concept.

Market-validation tests are achievable, as reported by the startups interviewed in this study. However, tests that prove the clinical value of a health solution are often much harder to implement.

Figure 17: Resource gaps affecting testing in MENA

Ecosystem resource gaps cited by startups in this study are indicative of the challenges that MENA's digital health companies face in testing and validating their solutions.
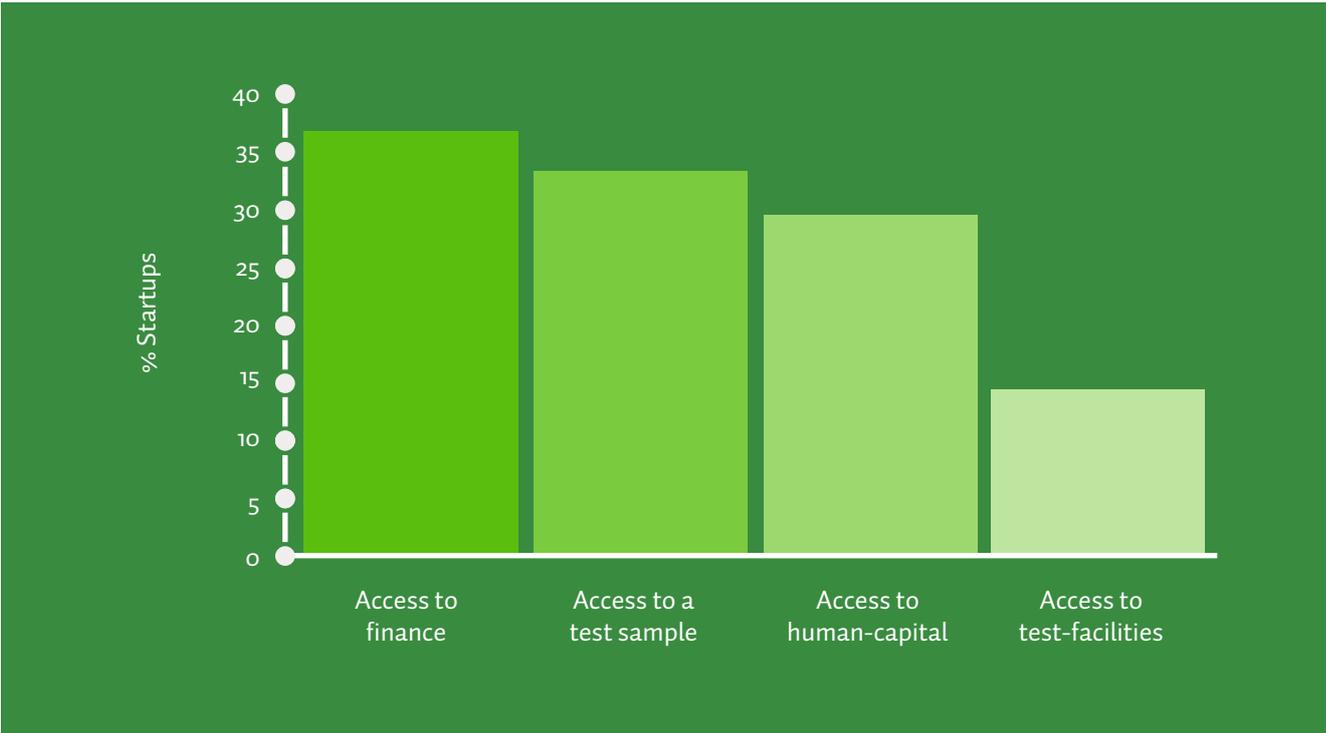
Startups in this study indicated difficulties obtaining financial resources for testing, gathering a reliable test-sample population, finding relevant human capital or employees with experience performing clinical trials, and limited access to proper testing facilities as the main challenges to validating their solutions, respectively.

"Except for space travel, there are few or no industries on earth in which you will spend more time and energy conducting tests like you have to in healthcare. Lives are at stake."

– Aschkan Abdul Malek (CEO, AlemHealth, UAE and Afghanistan)

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[61] *The average age of the companies that indicated limited "smart capital" as a barrier to growth is 3 years old, and these Startups had an average of 10 employees.*

Barrier 3: Difficulty forming partnerships

74% of the startups in this study experience challenges forming partnerships.

Health Startups need partnerships with larger, established players to create scalable, interoperable, and sustainable solutions. [62] [63] Collaborations with Startups can also benefit intuitions and organizations who want to gain efficiency and lower delivery costs especially through lean digital enhancements in care and prevention.

Figure 18: Startups' desired partnerships
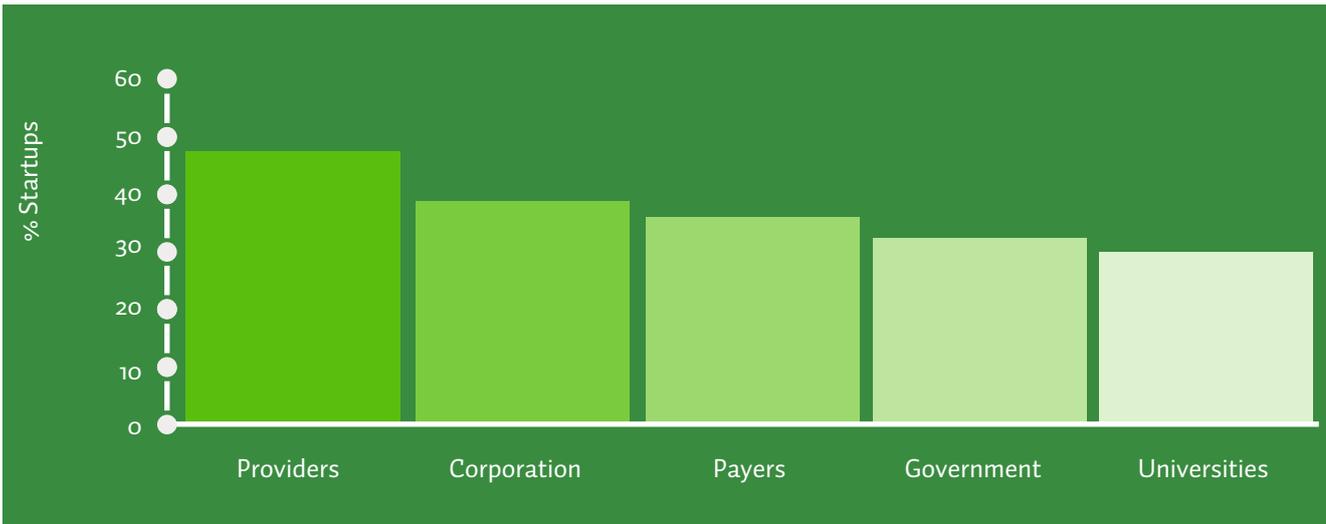
More startups in this study want to partner with providers such as hospitals and physicians over any other entities in healthcare. This can be particularly difficult as the physician's pledge prevents doctors from pursuing care options where the perceived risks outweigh the potential benefits. [64]

Other challenges include integrating with the clinician workflow, difficult-to-measure outcomes, and challenges adapting new solutions to legacy IT infrastructure. [65]

"Providers can be very resistant to change and it takes time to bring about greater awareness and appreciation for new, especially un-tested ideas."

- Fadi Mushen (CEO, Doxunity, UAE and Saudi Arabia)

[62] *Ericsson and Digital He@lth Initiative. Challenges and Opportunities in Scaling up Digital Health, 2010*
[63] *In some cases it is a legal or policy requirement to fully extend the solution, such as the prescribing physician requirement for telehealth solutions.*
[64] *Shmerling, Robert MD. First, do no harm. Harvard Health Publications, 2015*
[65] *The Entrepreneur's Guide to Hospital Partnerships, Rock Health. 2012*

Figure 19 below explores the potential for partnerships with health startups and the challenges that these entrepreneurs face in securing viable business relationships in MENA.

Figure 19: Potential partners, mutual benefits, and startups' challenges

| Potential Partners	Mutual Benefits	Startups' Challenges
Providers Providers can be digital health catalysts, but startups often can't get the right data to satisfy physicians.	Hospitals and physicians can be tremendous stimuli for the adoptation of digital health solutions that in turn enhance their ability to deliver high-quality care at lower costs.	Of the startups that stated a desire to partner with providers, many (73%) indicated that the biggest blockage was the insuffecient clarity of the data needed (to present to providers) to be taken seriously in a pitch.
Corporations Companies with large market share can be both collaborators and investors but starups are often seen as competitors.	Of the startups that want to partner with corporations, over half (65%) believe their solution is symbiotic; whereby they gain credibility and a corporation can access new innovation potential.	Many (40%) of those startups said the main blockage to securing a corporate partnership was that corporations claimed they were a competitor; nullifying the potential for a partnership.
Payers Startups can provide mutually beneficial solutions to payers, but not without providers' blessings.	Startups that stated a desire to partner with payers all believe their solution is mutually beneficial; whereby they gain customers and payers save money on payouts.	Many (41%) of those startups said payers were reluctant to cover new treatments without an initial blessing from healthcare providers.
Governments Startups can improve public health but government priorities are often not aligned.	Of the startups that indicated a desire to partner with a government institution, over half (55%) are interested in gaining access to public health records for creating preventative and predictive healthcare solutions, especially to combat the rise of NCDs.	Startups indicated that goverments in MENA are increasingly focused on building new healthcare infrastructure and not interested in partnering with young companies.
Universities Startups can commercialize academic research, but often can't access findings.	Of the startups with a desire to partner with universities, over half (58%) say they could benefit from access to university research programs and in turn help commercialize research.	Startups noted that universities in MENA are producing relevant medical research, but claimed that academic findings often stay in-house.

Barrier 4: Technical talent gaps

77% of the startups in this study experience difficulty finding the right people to hire.

Across industries in MENA, startups report limited access to talent. [66] This is due in part to the regional labor force's desire to work in corporations with brand power and in public sector jobs that offer stability over less–traditional settings like startups. [67]

Figure 20: Desired skills and experience in new hires

Startups in this study are looking to hire new employees that can offer experience in healthcare coupled with business and technical skills.
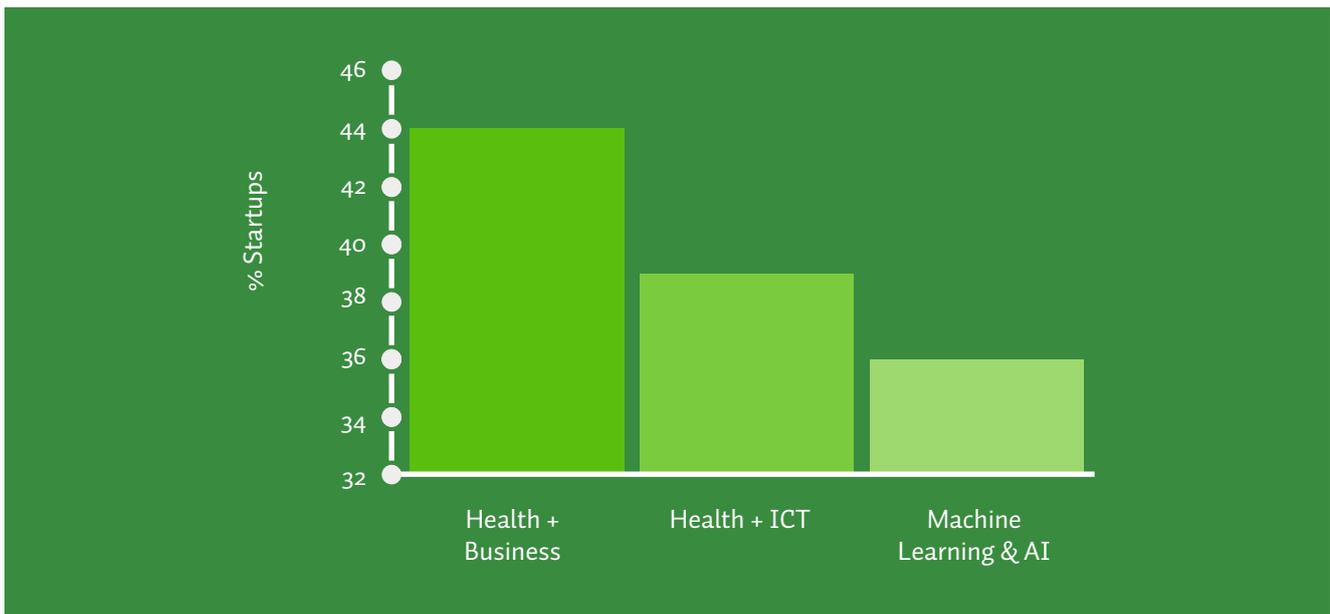
MENA's health startups are mainly looking for new employees with a mix of healthcare experience and business skills. Healthcare experiences supported by ICT skills are also valuable.

The most frequently referenced technical skills sought after by the entrepreneurs interviewed are the machine learning and artificial intelligence needed to design proprietary algorithms for large clinical datasets and solutions related to predictive medicine.

Hiring challenges for MENA's digital health startups are symptomatic of the fact that universities in the region are not adequately preparing students for the 21st century labor market. MENA countries graduate fewer students in STEM related fields annually, compared to other regions. [68]

"The knowledge infrastructure in the region is not paving the way for medical innovations to flourish. Those who want to be doctors are often bound culturally by the idea that the hospital and clinic are the only places where you go to seek opportunities in the industry."

**– Ziad Sankari (CEO, Cardio Diagnostics, Lebanon and USA)**

Barrier 5: Lack of compliance clarity

57% of the startups in this study are adversely affected by minimal or opaque compliance criteria.

Uncertainty, antiquated legislation, and/or lack of appropriate rules governing digital health are common globally and are particularly salient in MENA given the sector's rapid rise relative to regulators' typical pace of change.

Figure 21: Negative effects of minimal regulations

The underdeveloped legal environment makes health startups vulnerable to unforeseen regulatory burdens, and creates undue risk that deters greater involvement by potential investors and partners.
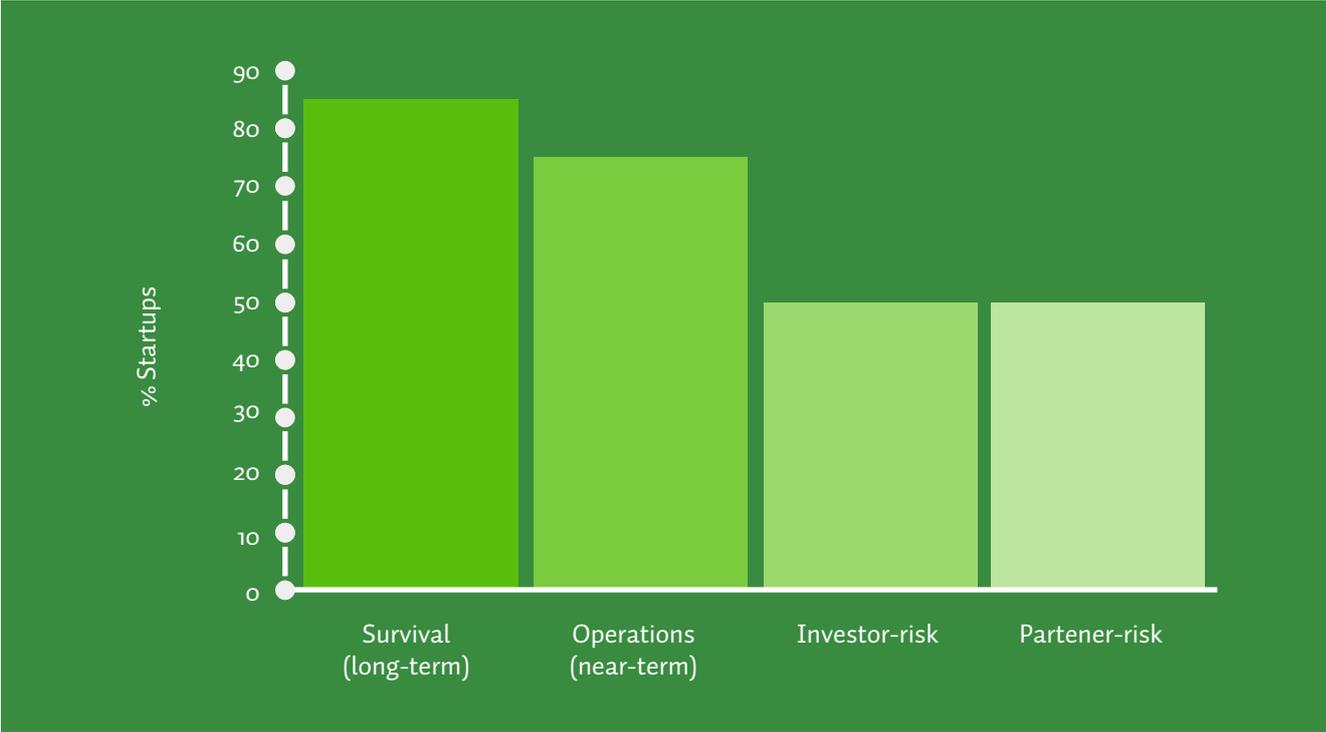
Of the startups in this study that said they were adversely affected by the current status of digital health regulation in MENA, a majority (85%) cited the underdeveloped nature of those regulations as one of the greatest risks to growth and their overall survival in the long term. Many startups (77%) also claimed that a lack of regulations pose a direct risk to the presence of their operations in the near term; in that at any time they could be arbitrarily declared in violation of the law and unfit for business.

Nearly half (47%) of these startups believe that prospective investors and partners are held back from engaging with health startups due to the risk of an unforeseen regulatory burden on the industry.

"Advances in digital health in the region will be partially determined by regulators developing appropriate data protection and information security laws, and ensuring that the legal and regulatory constraints do not impede innovation."

- Christina Sochacki (lead associate, Dubai Healthcare Practice Group Al Tamimi & Company, UAE)

[66] *Wyne, Jamil and Teeb Assaf. A2T: Access to Talent for MENA's Entrepreneurs. Wamda Research Lab. 2016*
[67] *Ibid.*
[68] *INSEAD, PWC, Human Resources Development Fund. The MENA Talent Competitiveness Index 2015. 2015*
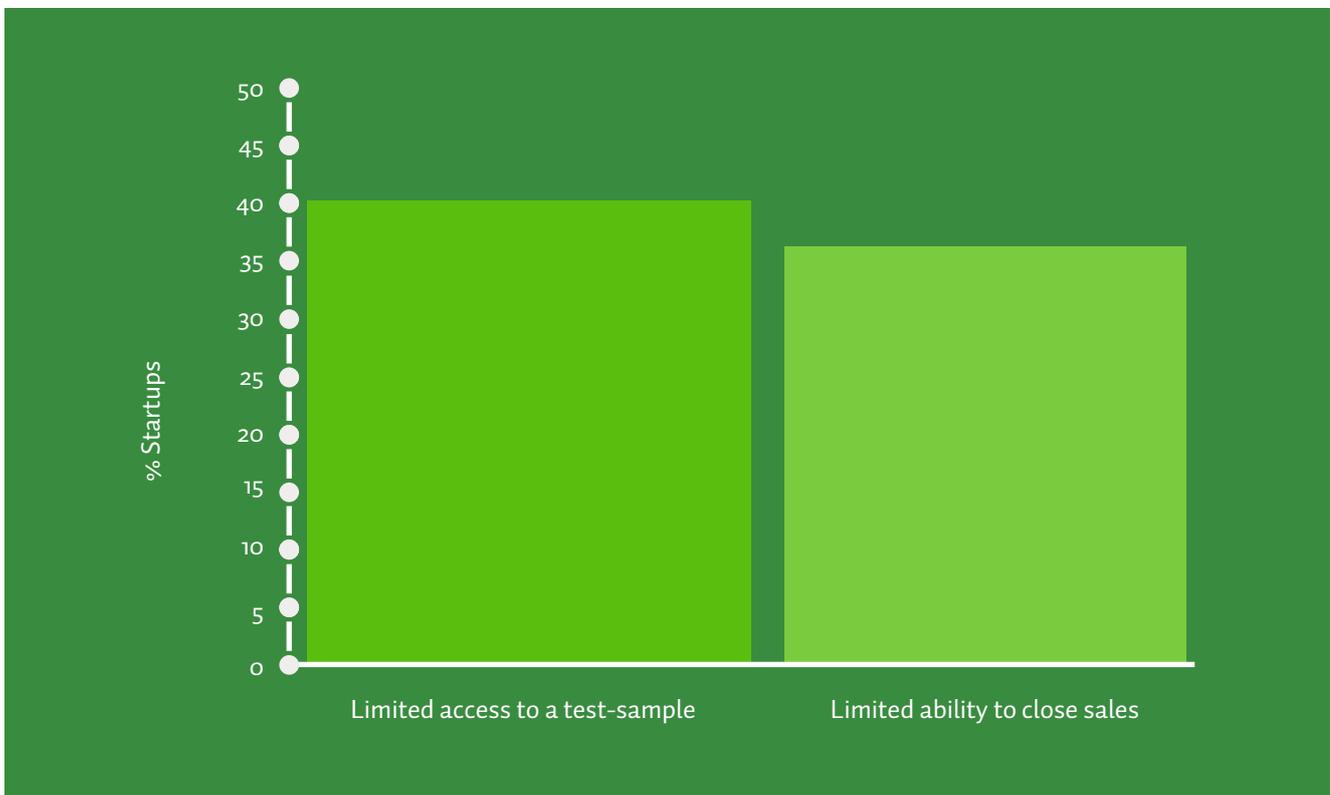
Barrier 6: Low consumer buy-in

69% of the startups in this study cited minimal consumer buy-in as a barrier to growth.

In more advanced startup health ecosystems like the United States, young, sick, internet-connected smartphone users are adopting digital health technologies more than any other demographic. [69]

In theory, this would suggest the potential for strong consumer adoption in MENA given the region's youth bulge, increasing prevalence of lifestyle related diseases, rising internet penetration and smartphone usage. In spite of these indicators though, consumers in the region are adopting digital health solutions at a relatively slower pace than could be expected.

Figure 22: Effects of low consumer buy-in

Low consumer buy-in limits startups' ability to test solutions and close sales. Notably, low consumer buy-in mostly affects the startups in this study with a B2C mHealth solution.

Of the startups in this study that experienced adverse effects from low consumer buy-in, 40% indicated the result was limited access to a reliable test-sample for conducting clinical trials. Slightly fewer startups (36%), said low consumer buy-in restricted them to targeting a niche market, and that closing sales outside a narrow community of first adopters is difficult.

Many entrepreneurs (79%) claimed they encountered "a lack of trust" for digital health solutions amongst potential customers. Fewer, (39%) said low buy-in for their solution was the result of consumers being satisfied with an existing technology.

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[69] *Gandhi Malay and Teresa Wang. Digital Health Consumer Adoption: 2015. Rock Health, 2015.*

CONCLUSION: WHERE ARE THE OPPORTUNITIES AND WHAT'S NEXT?

Countries in MENA are in dire need of public health solutions and entrepreneurs could play a significant role in subsequent health agendas. Yet, both the concept of startup health investment and the specific need for innovative health technology solutions in MENA, while known to a growing pool of stakeholders, are still nascent forces in the region.

More support is needed to increase the impact of health startups in solving MENA's health challenges. Complicating matters is the fact that the health entrepreneurship ecosystem in MENA is in its infancy. The few entrepreneurs who enter this field have minimal institutional support and face a number of barriers to scale.

This report has explored barriers to scale for MENA's health startups, and also identified a promising group of entrepreneurs who have built a foundation for scalable solutions. Any efforts to understand and improve conditions for this field should begin by working with this cohort of entrepreneurs.

Moving forward, entrepreneurs, policymakers, institutions, and thought leaders seeking to improve conditions for health startups in MENA can use the insights in this report to guide decision-making processes and in turn accelerate the region's capacity to grow, and adopt healthcare technology solutions.

Based on our research we have identified five opportunities and first steps where existing stakeholders in MENA's healthcare industry, as well as institutions, that work directly with health companies can work closer with young health startups.

Figure 23: Opportunities and first steps

Stakeholder	Opportunity	First Steps
Corporations Enlist financial and in-kind resources to grow strategically aligned startups.	Profit by bringing the newest viable digital health solutions to market, first.	**Digital health venture fund:** Investment and resources for growing digital health startups.
Hospitals and clinics Offer an entrepreneurial space for prototyping, testing, validating, and commercializing healthcare breakthroughs.	Access cutting-edge innovations that enhance healthcare delivery and patients' outcomes.	**Hospital innovation center and fab-lab:** Prototyping and testing in a real-world setting to help bring proven innovations to market.
Crowdfunding A physician-curated crowdfunding platform for startups.	Become the most successful digital health investors in MENA.	**Online-curated health angel network:** Crowdfunding by a member network of experienced healthcare professionals.
Incubators and Accelators Enable entrepreneurs to iterate and refine concepts and models, early.	Find and help grow the region's next cohort of high-impact health startups.	**Targeted early-support program:** Pooling potential partners and pairing entrepreneurs with mentors to address scaling and partnering challenges.
Medical schools Equip physicians to communicate the benefits of digital health to patients.	Educate the next generation of digital health savvy physicians.	**Certificate in digital health communication:** Skills for effective messaging campaigns applicable across digital media types and organizations.

What's Next? - The Future Of Healthcare In MENA

The pace of technological innovation and adoption in the global healthcare industry will continue to grow rapidly, while MENA's health and economic challenges will become increasingly perilous and beg change. Innovators and entrepreneurs will play a large part in un-bundling outdated systems and materializing advanced healthcare solutions. With these considerations in mind, the following predictions serve as guiding forces for what could come next.

Pursuing moonshot regional healthcare agendas

Rising public health issues, especially the endemic prevalence of NCDs will pressure MENA's leaders and decision makers to adopt new ways of envisioning healthcare delivery and public wellbeing. This means championing quantum leaps in regional health agendas that seek to modify human behavior and cure entire populations by preventing health complications before they occur.

Rapid low-cost healthcare delivery in The Fourth Industrial Revolution

Advancements in 3D printing and materials science, crowdsourcing, open source software, and cloud computing, will further take hold in MENA and lower the barriers to entry for inventors and entrepreneurs who are seeking to create healthcare-centric hardware solutions. This entails the ability to rapidly prototype, iterate, and implement solutions like custom prosthetics, sensors, wearable devices, and a multitude of beneficiary-designed solutions, especially in the region's resource-constrained environments.

Realizing the leapfrog-theory of development in healthcare [73]

Countries in MENA with ever-greater access to the Internet and rising mobile penetration rates are already incubating viable and lean crowd-enabled healthcare solutions. mHealth especially is coming-of-age in MENA; and the rest of the world could soon take note of the region's ability to foster dispersed, practical methods for delivering widespread advancements in healthcare.

Moving beyond launch-support into sustainable-partnerships for growth

Entrepreneurship support institutions are proliferating in the region and increasingly are supporting the ability of entrepreneurs to launch healthcare companies. However, the next phase of Startup support will necessitate moving past launching new ventures, and in turn champion long-term sustainability, growth, and proven outcomes. To that end, MENA's established healthcare players will begin to see the benefits of sourcing innovation at the margins by partnering with younger companies.

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[73] *Stoakes, Unity. 2016 Predictions: Digital Health's Second Wave And Thirteen Transformative Healthcare Trends. Forbes, 2016*

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RECOMMENDED READINGS

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