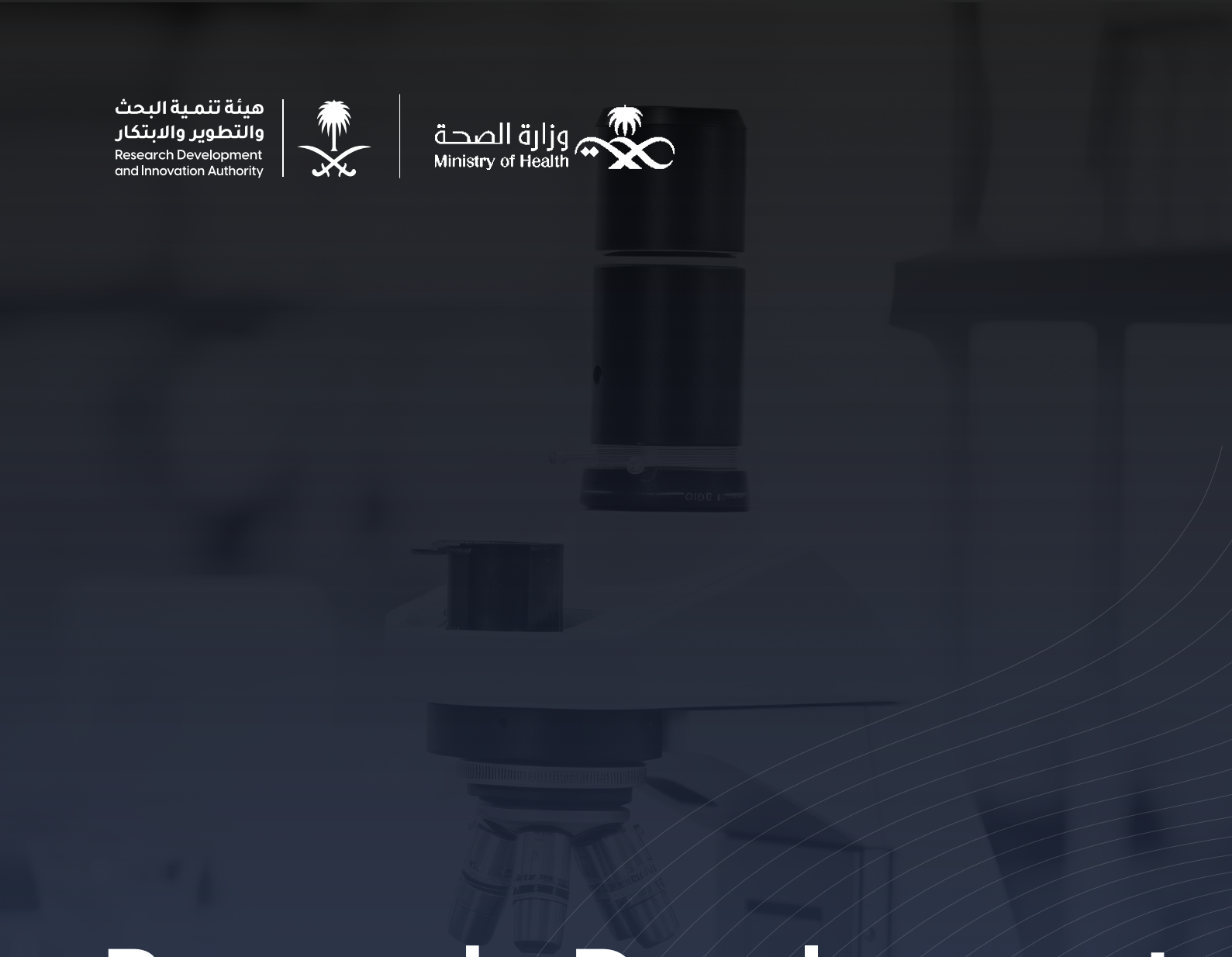
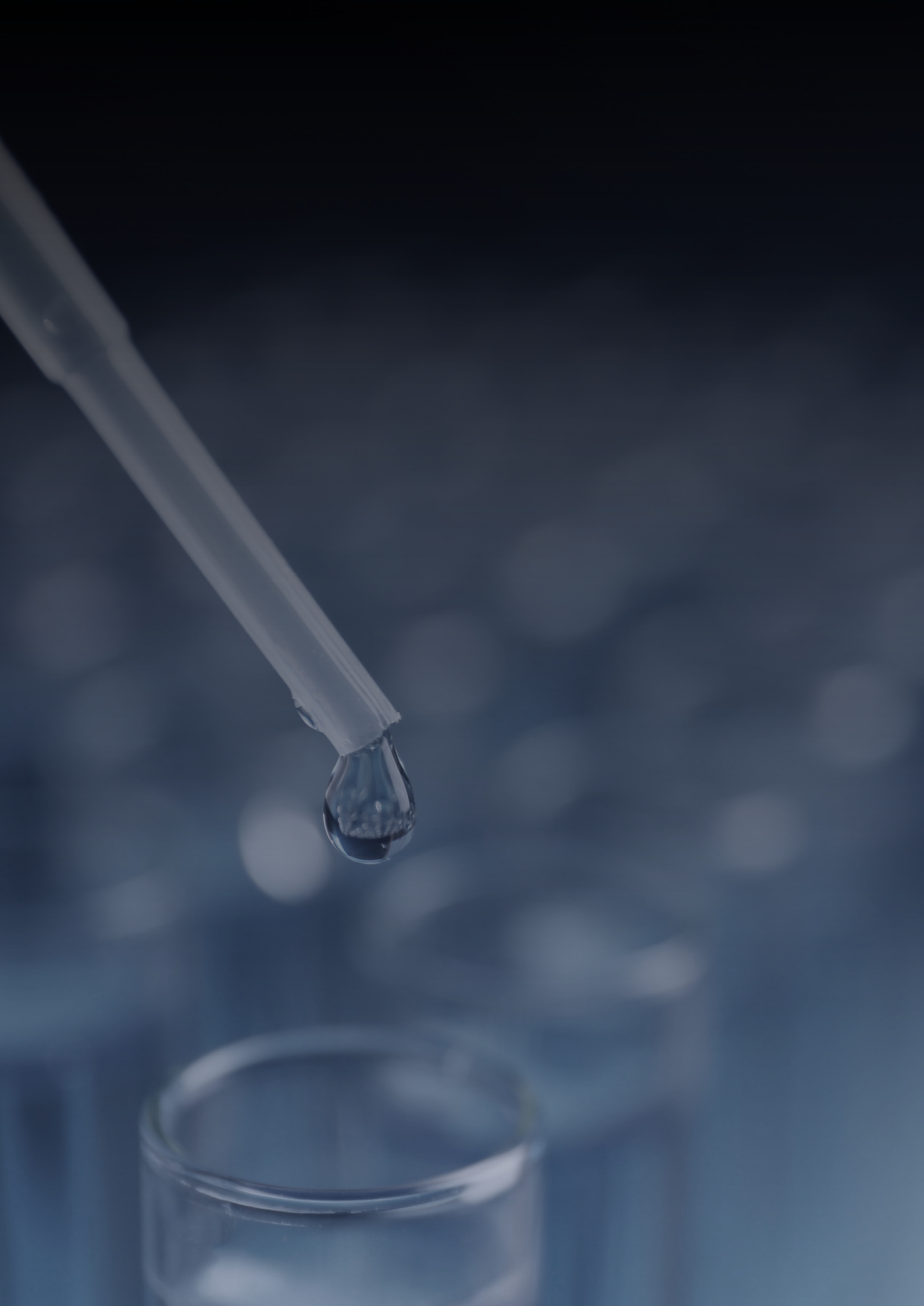
هيئة تنمية البحث
والتطوير والابتكار
Research Development
and Innovation Authority

وزارة الصحة
Ministry of Health



Research, Development and Innovation (RDI) in Health and Wellness

JOINT INNOVATION OUTLOOK



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EXECUTIVE SUMMARY

For the Kingdom of Saudi Arabia, investing in research and development to drive commercial innovation is crucial for accelerating socioeconomic progress. Guided by the Vision 2030, this strategy aims at diversifying the economy from oil revenues and enhancing global competitiveness.

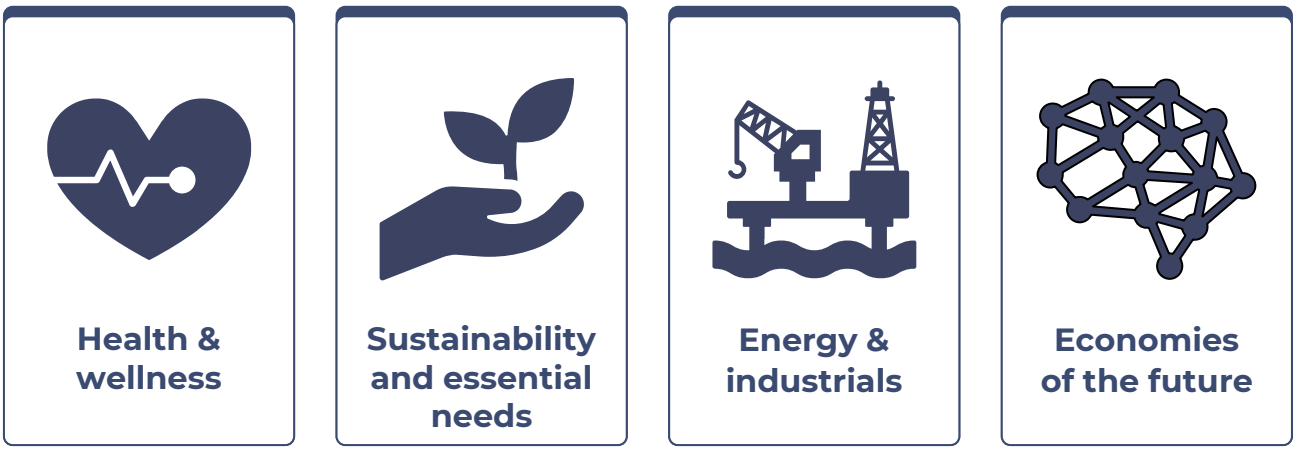
Delivering this effort requires a clear understanding of how the ecosystem balances funding allocation with policy interventions, balancing commercial interests with public health and safety, and community building. This ensures that experts from the public and private sectors, as well as academia, can collaborate effectively.

As such, this document, the 'Research, Development and Innovation (RDI) in Health and Wellness – Joint Innovation Outlook' provides an overview of the ecosystem's evolution. It clarifies to all participants how the RDI ecosystem is evolving, and how they can seize opportunities from challenges encountered on this transformative journey.

At the national level, foundational to this evolution is the role of the Research, Development and Innovation (RDI) Supreme Committee and the Research Development and Innovation Authority (RDIA), as the central policy and funding bodies. Augmenting the role of these two foundational agencies are policy champions from within the public sector, R&D and innovation experts at private enterprises, non-governmental organizations and non-profit enterprises, scientists and academics at university research centers.

At the global level, the Kingdom articulates its vision for the RDI ecosystem through four strategic focus areas: 1) Health & wellness, 2) Sustainability and essential needs, 3) Energy & industrials, and 4) Economies of the future.

Figure A: Four RDI focus areas for the Kingdom of Saudi Arabia were identified

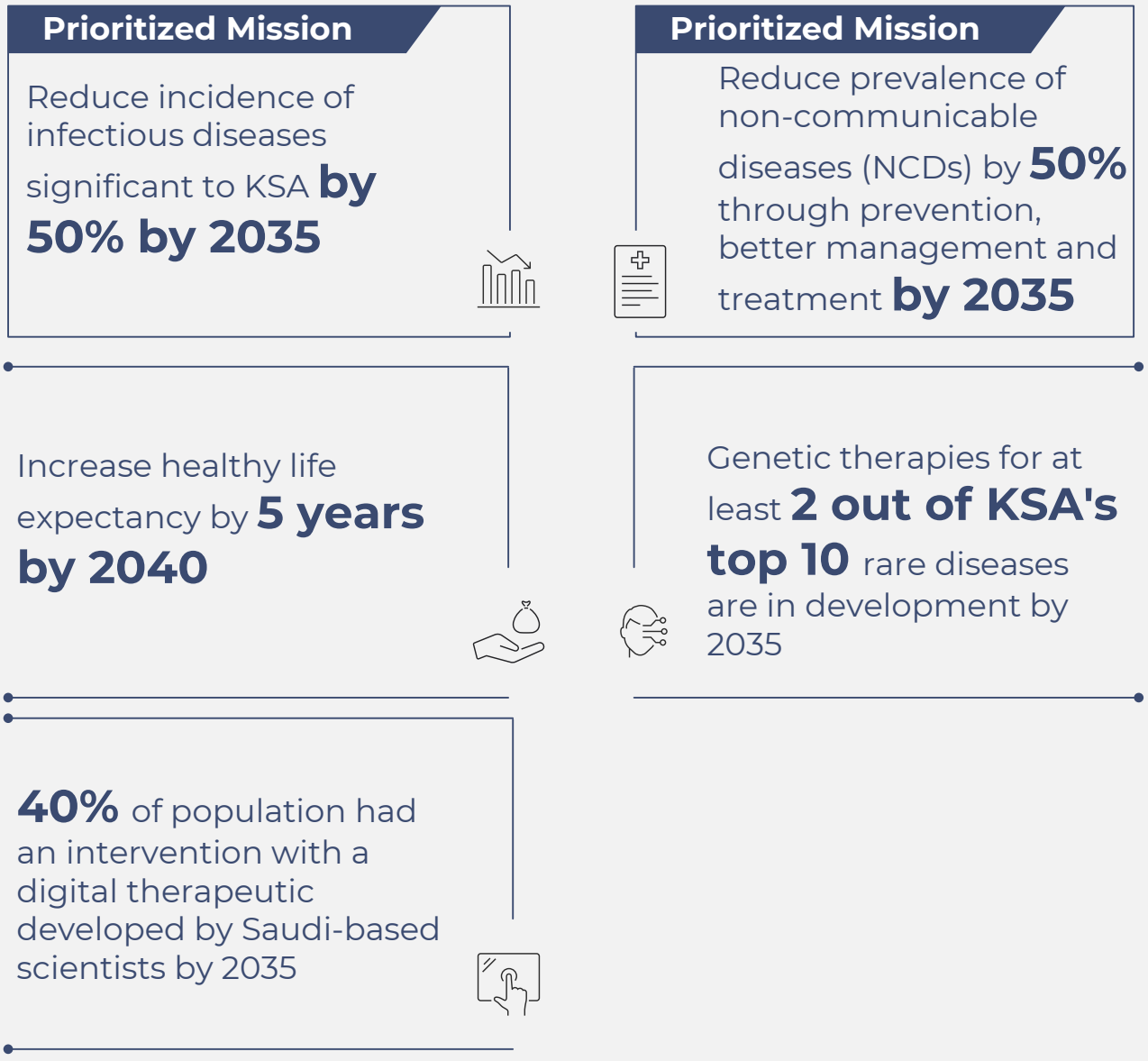


The four focus areas build on a mission-oriented approach, starting with an identification of the challenge, transforming it into an RDI opportunity, and aiming for evolutionary leaps with significant national and global impact.

The document focuses on the first focus area - Health and Wellness. Challenges identified include a high rate of obesity affecting 34% of the population, making the Kingdom the 7th most diabetes-afflicted country and x3.5 higher propensity for hereditary and genetic diseases. Embedded within these challenges is a mission that brings together practitioners from inside and outside the healthcare and medical sectors and creating bridges across borders among scientific communities, and venture capitalists and institutional investors.

In terms of identified missions arising from these challenges, five have been clearly articulated and they possess the potential to scale both nationally and globally.

Figure B: Missions focused on Health and Wellness



In support of this mission-oriented approach, the Kingdom allocated over $65 billion for healthcare infrastructure under Vision 2030. Additionally, it is sequencing 100,000 genomes through the Saudi Genome Program, a crucial step in upraising the RDI guiding principles for Health and Wellness and accelerating the growth of vibrant and thriving RDI eco-system.

Health and Wellness RDI guiding principles

1. Prioritizing patient-centered research and targeted health outcomes, addressing non-communicable diseases like obesity and diabetes, as well as infectious diseases such as MERS and Covid-19.

2. Ensuring equitable access to healthcare and research infrastructure across the population, through innovation in digital health and telemedicine Is key to developing robust services that can reach remote areas effectively.

3. Committing to evidence-based, data-driven decision making in health and wellness, allowing the prioritization of RDI investment to the most impactful areas to generate optimized health outcomes.

4. Increasing focus on preventive healthcare for improved quality of life, through proactive health management, early diagnosis, promoting healthy lifestyles and preparing the population to manage health challenges more effectively.

5. Leveraging RDI to build scalable, global solutions locally in Saudi Arabia, by focusing on creating health-related products and services that can be exported, attractive to international partnerships and investments.

6. Upholding regulatory excellence and maintaining the highest ethical standards in RDI, conducive to the rapid, safe implementation of new technologies, and reinforcing the Kingdom's leadership in global health innovation.

7. Cultivating an economically productive ecosystem to attract talent, capital, and companies, by fostering a dynamic ecosystem, developing infrastructure, offering incentives for innovation, and creating collaborative spaces to bring national peers together and attracting international partners.

A holistic Health and Wellness RDI eco-system

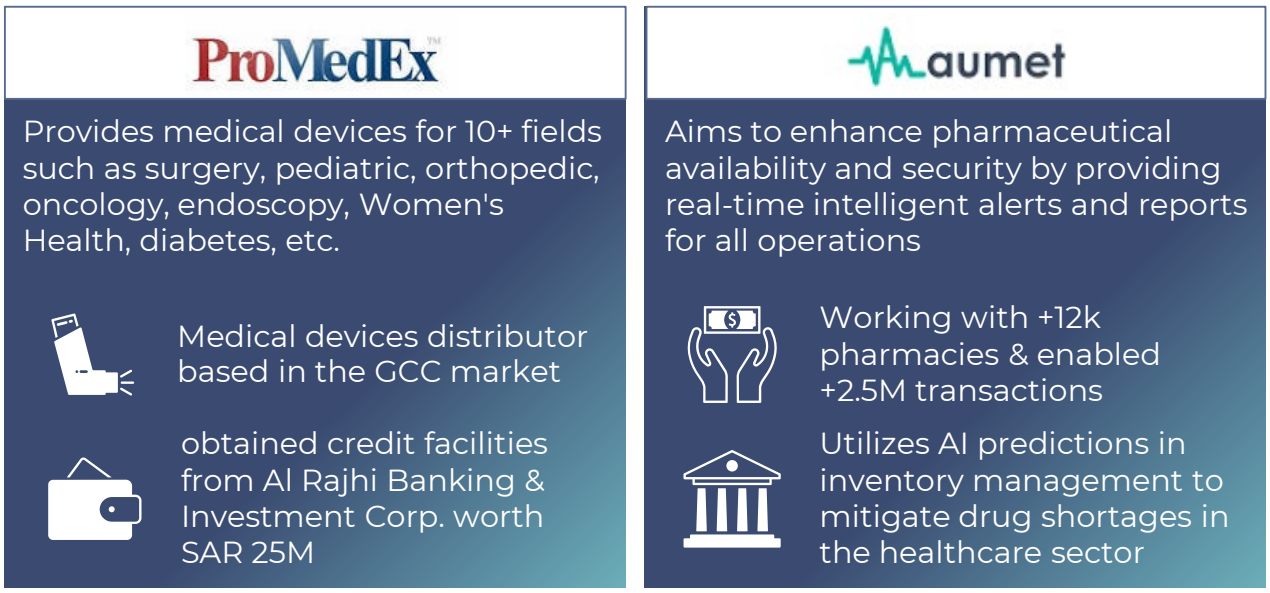
To enable the ecosystem to thrive, policy interventions are being developed and implemented across five key areas:

1. Funding and Investments: Adequate funding and strategic investments are crucial for fostering innovation, supporting groundbreaking projects, and driving economic growth in the healthcare sector. As such, RDIA collaborated with the Ministry of Health on the development of public sector funding instruments, namely contracts, grants, talent attraction incentives and private sector stimulus. In addition, it created frameworks and guardrails for funding from the private sector, NGOs and non-profit organizations.

The Saudi Applied Research and Technology (SART) Technology Development Grant awards funds up to $2.6M (SAR 10M) over a period of five years to scientists and researchers, while the Startup Innovation Grant Program (SIGP) links startups & SMEs with demand-driven challenges by providing non-dilutive grant funding.

Simultaneously, total venture capital (VC) investment in Saudi Arabia's Health and Wellness sector have experienced substantial growth, fueled by a rising number of deals and increased capital investments. In 2023, health startups attracted $1.4B (SAR 5.25B) in venture capital funding across +100 deals, marking a 33% year-over-year growth. Currently, over 200 startups are active in the health and wellness segment. Major VC funds and funding entities such as Saudi Aramco's Wa'ed Ventures, TVM Capital Healthcare, 500 Global, Banque Saudi Fransi, have played a pivotal role in financing health tech startups.

Figure C: Numerous startups are making significant strides in the health and wellness sector, pioneering groundbreaking advancements



2. Human Capital: Human capital is a cornerstone of RDI in the Health and Wellness sector. Recognizing the critical role people play in advancing medical research and healthcare solutions, the Kingdom of Saudi Arabia conducted significant efforts to cultivate a robust and skilled workforce and to attract international talent. From 2019 to 2023, the number of active researchers in Health and Wellness doubled, reaching approximately 27,000. These professionals are involved in various specializations such as drug development, clinical research, biotechnology, and public health. However, to ensure the continuous development and upskilling of its RDI workforce, policy changes are needed to enhance training programs, attract global talent, and streamline processes.

At the core of this growth are extensive training and upskilling programs, such as Mawhiba, which is dedicated to nurture young talent in STEM fields. This includes post-doctoral fellowships provided by the King Abdulaziz City for Science and Technology (KACST) and the King Abdullah International Medical Research Center (KAIMRC). Complementing these efforts, the Small and Medium Enterprises General Authority (Monsha'at) offers coaching, mentoring and upskilling programs for entrepreneurs, either launching startups or managing existing small and medium enterprises (SMEs). Similarly, the Ministry of Communications and Information Technology (MCIT) prepares Saudi youth for future careers by providing upskilling opportunities through the Saudi Digital Academy.

Figure D: The Kingdom showed significant progress in improving human capital and achieving RDI outputs

3. Regulatory Landscape: At the national level, the introduction of the National Intellectual Property Strategy has significantly strengthened the protection of intellectual property rights. Additionally, in 2021, the Ministry of Human Resources and Social Development (MHRSD) enabled through a revised labor policy expatriate mobility without the need for sponsor permission. Policy initiatives such as the Premium Residency Program were implemented to attract and nurture global research talent.

On the commercial level, the National Competitiveness Center focused on enhancing the ease of doing business, launching over 300 reforms since 2019. Furthermore, The Ministry of Investment (MISA) introduced the regional HQ program, which offers 100% exemption on corporate income tax (CIT) and Saudization quotas.

To incentivize private sector participation in Health and Wellness, the Kingdom introduced a variety of incentives and policy mechanisms. These include matching RDI funds to foster private investments in RDI activities, and VAT waivers on RDI-focused services and products. The Local Content and Government Procurement Authority also established a Local Content Formula to incentivize RDI activities and mandate governmental entities to allocate a minimum budget for R&D tenders. Furthermore, the National Incentives Committee (NIC) offers a comprehensive list of existing incentives tailored to the biotech sector, which includes cash grants, preferential loans, VAT and import exemptions, tax reductions, or tax credits.

Inside the health sector, the Saudi Health Sector Transformation Program (HSTP) abides by a comprehensive system of public policies designed to ensure the sustainability of reforms and enhance spending efficiency. Additionally, the Clinical Trials Regulation was introduced to streamline and standardize the approval process for clinical research, ensuring safety and efficacy in medical studies.

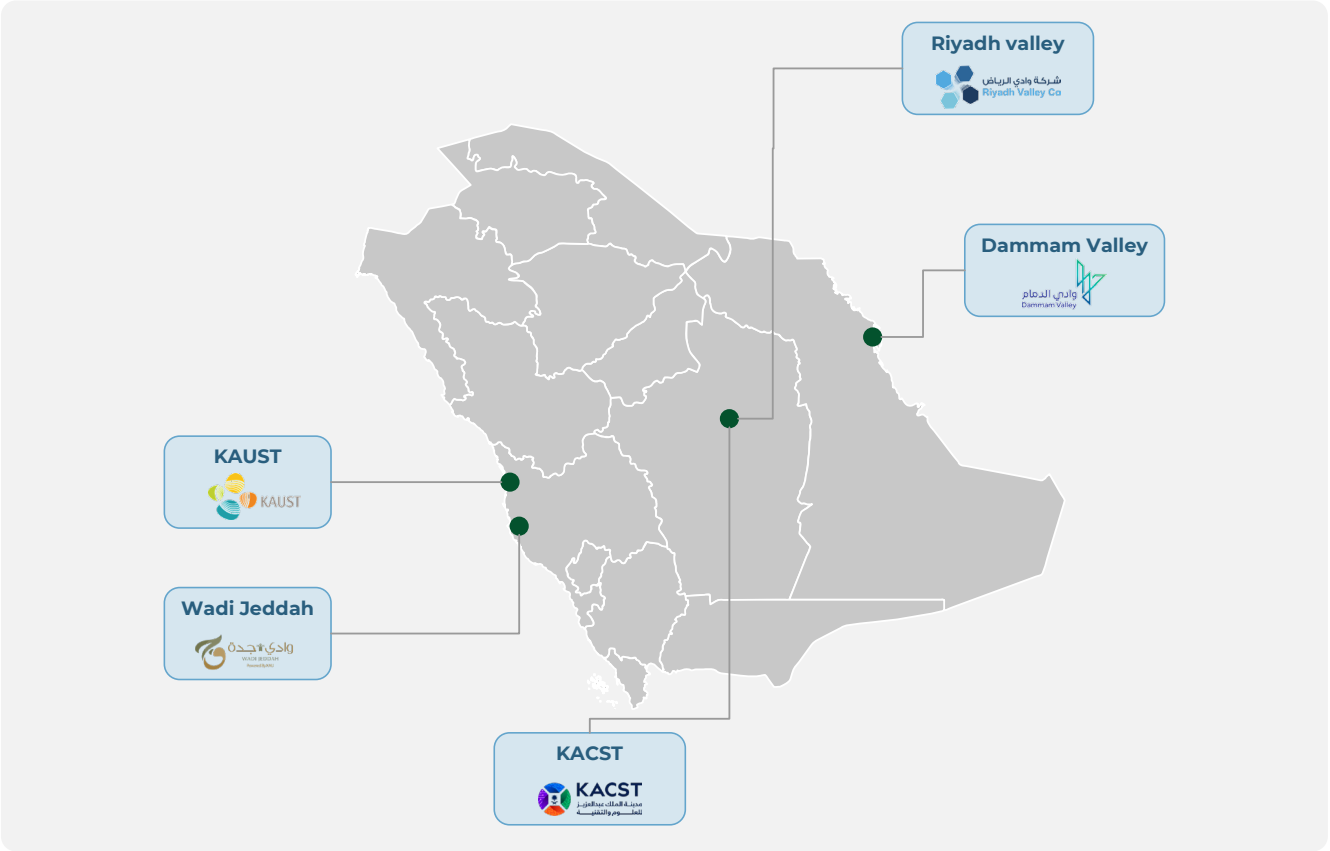
From a governance perspective, the Ministry of Health (MoH) serves as the sector custodian and actively promotes health RDI by implementing policies and providing grants in collaboration with RDIA, the main body responsible for setting RDI priorities, developing strategic plans, and overseeing the implementation of national RDI initiatives. The Saudi Food and Drug Authority (SFDA) plays a critical role in the safety, quality, and efficacy of clinical trials and governing the manufacture, distribution, and dispense of pharmaceutical products. Additionally, the Saudi Commission for Health Specialties (SCFHS) ensures professional licensing and competency standards for healthcare practitioners.

4. Ecosystem Infrastructure and Supply Chain: The Kingdom's infrastructure includes an array of advanced laboratories and research centers dedicated to health and wellness. Leading institutions such as King Faisal Specialist Hospital and Research Center (KFSH&RC), King Fahad Medical City (KFMC), and King Abdullah International Medical Research Center (KAIMRC) are equipped with state-of-the-art facilities, enabling high-quality biomedical research, in areas such as genomics, oncology, and regenerative medicine.

In addition to these laboratories, the Kingdom established over 120 specialized research centers to enhance its RDI capabilities. The Saudi National Institute of Health (SNIH) plays the enabler role, coordinating and funding national health research initiatives, focusing on areas such as infectious diseases, chronic illnesses, and emerging health threats, while KACST supports a wide range of scientific and medical research activities, including pioneering work in biotechnology, nanotechnology, and space sciences.

The Ministry of Health (MoH) is actively improving healthcare delivery by launching health clusters across the country, each designed to serve approximately 1 million people, and promote preventive and integrated care, making healthcare services accessible to a larger segment of the population. The Riyadh First Health Cluster and the Riyadh Second Health Cluster are the initial implementations of this model, with plans to create additional clusters in the future.

Figure E: Multiple innovation clusters focused on Health and Wellness launching across the Kingdom



Innovation in healthcare is further supported by the development of technology and science parks, which serve as hubs for research and collaboration. The King Abdullah Economic City (KAEC) exemplifies such a hub, offering a conducive environment for research and development activities. The city provides modern laboratories, office spaces, and collaboration areas facilitating interdisciplinary research and innovation.

5. Linkages and cultural promotion: RDIA sets strategic priorities, facilitates partnerships, establishes joint research programs, and brings together multiple stakeholders to work on high-impact health and wellness projects. The National Science, Technology, and Innovation Plan (NSTIP) further supports these efforts by providing a platform that bridges various sectors, fostering collaborative RDI activities. These platforms and initiatives are crucial for creating a cohesive and integrated RDI ecosystem. At the same time, the Saudi Health Council serves as a central coordinating body among healthcare providers, researchers, and policymakers, ensuring alignment and cooperation.

Significant developments include an intensified focus on public-private partnerships (PPP) as the Health Holding Company (HHC), the nation's public healthcare trust, is set to expand private sector participation (PSP) across nine priority areas: 1) primary care, 2) hospitals, 3) medical cities, 4) laboratories, 5) radiology, 6) pharmacies, 7) rehabilitation, 8) long-term care, and 9) home care. The Ministry of Health expects that in the next five years there will be more than 100 public-private partnership (PPP) projects in health services, attracting $12.8B (SAR 48B) in private sector investments. Currently, 19 PPP projects are underway with a total investment of $2.9B (SAR 10.9B).

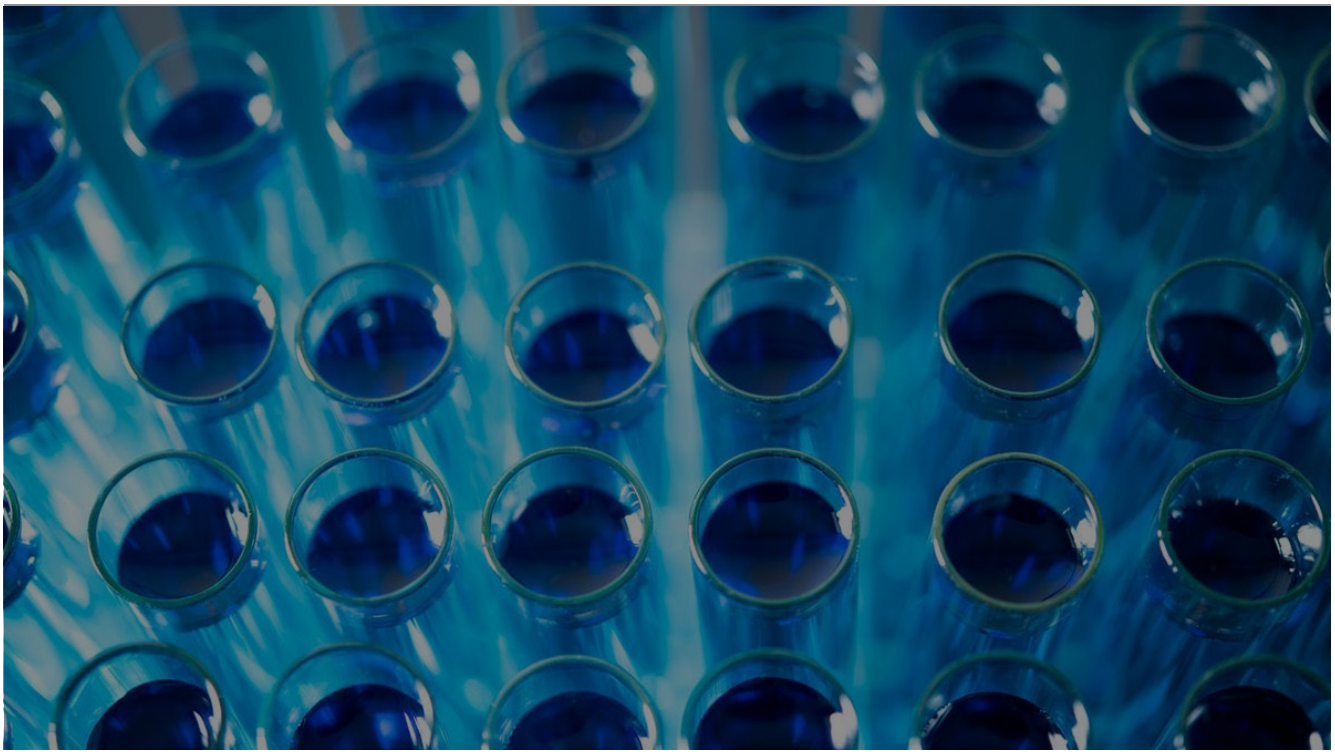
The Clinical Trials Registration Platform, managed by Saudi National Institute of Health, collects and centralizes clinical trial data, making it accessible to researchers, research centers, and stakeholders. This platform fosters enhanced cooperation and communication within the research ecosystem, thereby promoting transparency and facilitating collaboration in clinical trials..

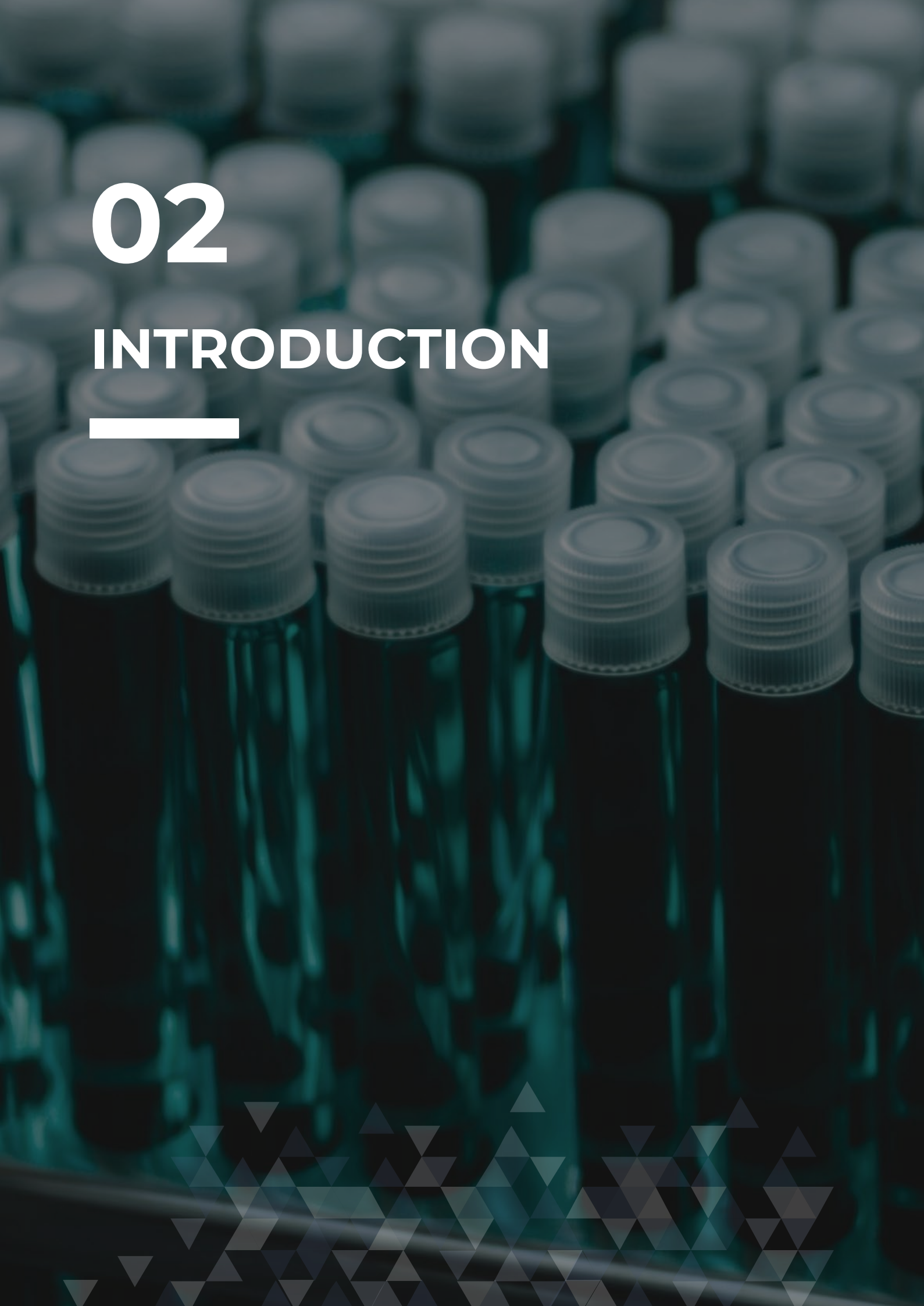
To enhance networking opportunities, the Kingdom organizes numerous key events and forums that enable interactions between researchers, industry professionals, and policymakers in the Health and Wellness sector. Among these is the Global Health Exhibition, a prominent event that gathers healthcare leaders to explore and discuss the latest trends and innovations in the field.

To recognize and celebrate researchers and innovators and highlight the importance of research in advancing healthcare solutions, Saudi Arabia has initiated several prestigious recognition programs and awards. These include the King Faisal Prize for Medicine, the Ada'a Health Program Award, and the Fakeeh awards, all of which honor exceptional achievements in medical research and healthcare.

6. Governance model: Employing a structured and mission-oriented governance model, RDIA and the Ministry of Health work in close collaboration to align the Health and Wellness sector with national priorities aiming for a significant impact on the Kingdom's long-term public health and healthcare innovation. Their joint efforts are underpinned by robust policies, strategic coordination, and continuous engagement with stakeholders, all contributing to the Kingdom's ambition to become a global leader in health and wellness innovation.

At this critical juncture, the Kingdom of Saudi Arabia is poised to become a world leader in health and wellness research, development, and innovation. With considerable momentum and the appropriate frameworks in place, the Kingdom is spearheading significant advancements in this sector by orchestrating the collective efforts of stakeholders across the public and private sectors, academia, and the broader health ecosystem





02

INTRODUCTION

In recent years, the Kingdom of Saudi Arabia recognized the critical role of research, development, and innovation (RDI) in addressing socioeconomic development, national security challenges, and delivering on the ambitions and aspirations outlined in Vision 2030, diversifying the economy away from dependence on oil, and increasing global competitiveness. To spearhead this, the Kingdom established the Research, Development and Innovation (RDI) Supreme Committee and the Research Development and Innovation Authority (RDIA) as the central policy and funding bodies, responsible for strategic oversight and alignment with global trends. Significant investments in research and development, commercialized as innovations, are pivotal to accelerating socioeconomic growth and enhancing competitive advantage.

In the area of Health and Wellness, the Kingdom aims to advance medical research, enhance healthcare services, and promote overall well-being through targeted RDI initiatives. Key policy directions include increased and stable research, development and innovation funding, incentivizing private sector participation through stimulus initiatives, and shifting towards competitive funding mechanisms like grants and awards. By focusing on commercialization of research and development outputs into innovation for practical applications, the Kingdom seeks to create a vibrant ecosystem driving evolutionary advancements in healthcare and medicine.

The policies outlined in this report provide a clear direction for the future of commercializing research and development into innovation across the Kingdom, guiding stakeholders towards innovative solutions enhancing public health and elevating the Kingdom on the global stage in the areas of Health and Wellness.

2.1 The RDI agenda in the Kingdom of Saudi Arabia

For the Kingdom of Saudi Arabia, investing in research and development for commercialization into innovation is essential to increasing global competitiveness and accelerate socioeconomic development. Analysis shows that the top ten nations on the Global Innovation Index (GII) consistently outperform others in GDP growth[1], demonstrating a clear link between innovation and economic success. Furthermore, 22 out of the 25 leaders in Brand Finance's Soft Power Index are also ranked in the top 30 of the GII[2], indicating that innovative countries also wield significant global influence. By prioritizing research, development and innovation, the Kingdom can boost its economic growth, enhance its international standing, and achieve its ambitious Vision 2030 goals, while laying a strong foundation for sustainable progress well into the future.

Prioritizing research and development, and innovation offers significant opportunities to address critical healthcare challenges and drive progress. The pressing health issues provide a unique chance for innovation. By investing in research and development, the Kingdom can pioneer healthcare solutions to combat these conditions, improving public medical services and reducing economic hardship. Embracing research and development for commercialization into innovation targets these crucial concerns, and at the same time helps to elevate the Kingdom on the global stage in the field of healthcare innovation in alignment with the ambitions and aspirations of Vision 2030. The joint innovation outlook detailed in this report provides the strategic framework necessary to guide this evolution.

Figure 1: Why now | Pressure is rising to compete in Health & Wellness

Doubling down on plays
Leading economies invest in national RDI programs

17 G20 countries launched RDI strategies

$2.5T spent globally on RDI, marking the highest spending ever recorded & reflecting an increased focus on RDI efforts worldwide[3]

Capitalizing on emerging health trends
RDI advancements present unique opportunities

$66B to be invested by the Kingdom in healthcare infra. by 2030, with a focus on digital health and advanced medical technologies[4]

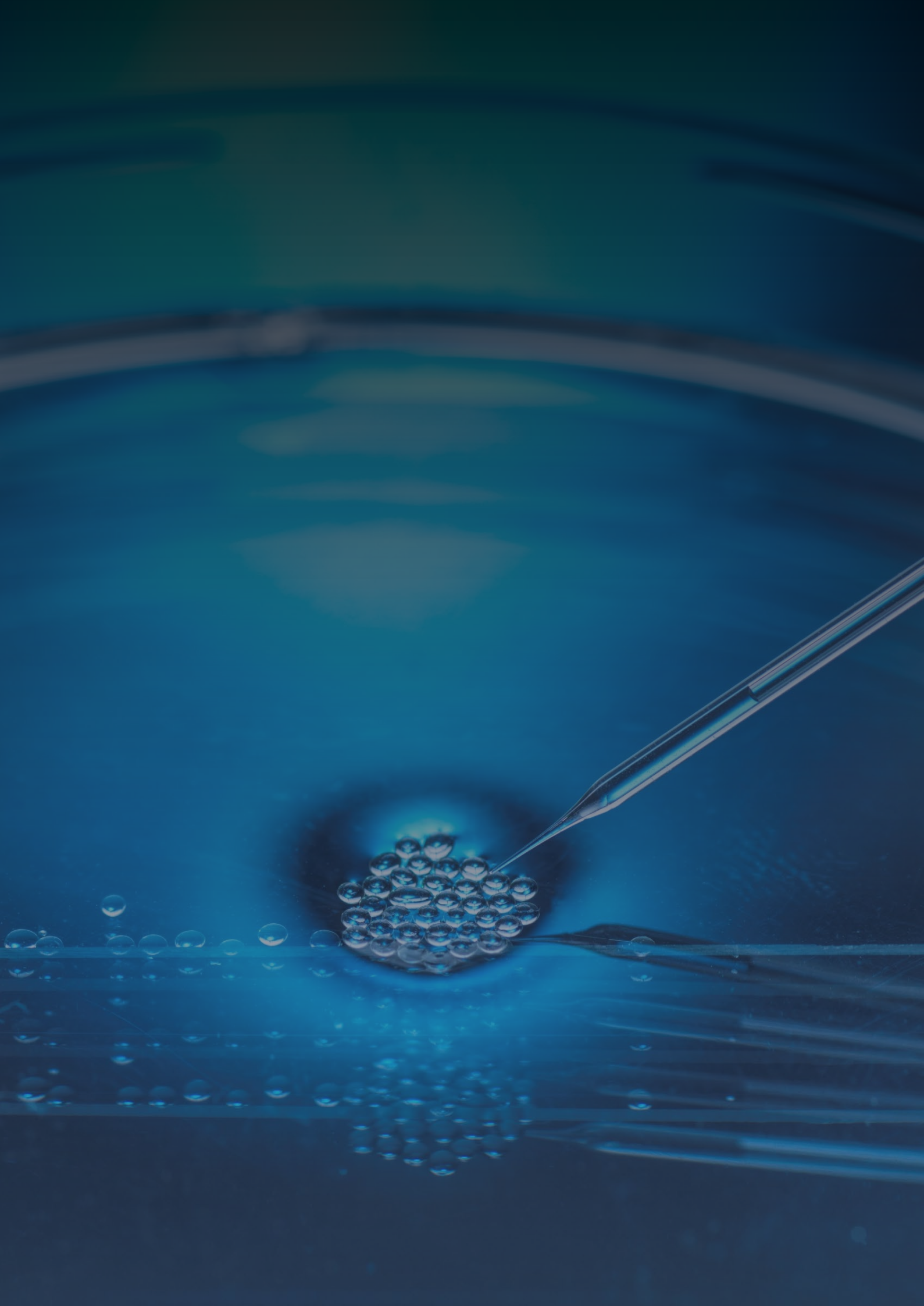
100k genomes to be mapped under the Saudi Human Genome Program, revolutionizing early diagnosis & treatment[5]

Building on momentum in the Kingdom
RDI enables nations/ companies to develop competitive advantages

+20 rank increase in GII report in 4 years[6]

8y increased life expectancy in Kingdom over last 30 years[7]

Source: 1. WIPO and World Bank; 2. Soft Power Index and GII; 3. Statista data (2022); 4. Vision 2030; 5. Saudi Genome Program; 6. WIPO; 7. Oxford Business Group 2023 report on life sciences



2.2 Guiding Principles for RDI in Health and Wellness

The Kingdom of Saudi Arabia is embarking on a transformational journey in the Health and Wellness sector, driven by a commitment to research and development, and innovation. As the Kingdom strives to meet its ambitious Vision 2030 goals and beyond, it establishing a set of guiding principles is crucial to steering the sector towards sustainable growth and evolution. These principles serve as the foundation for decision-making, ensuring actions taken by all stakeholders are aligned with the broader objectives of improving public health, fostering innovation, and positioning Saudi Arabia as a global leader in health and wellness.

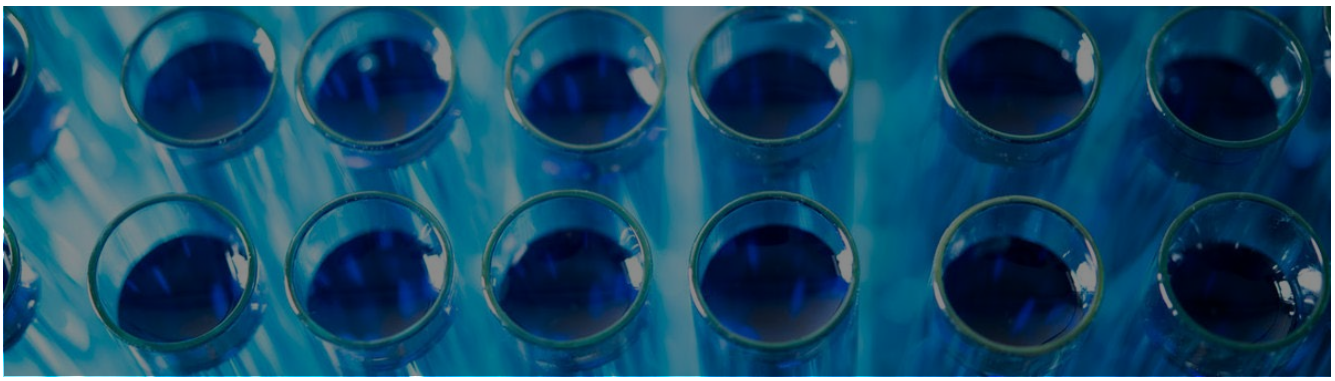
The guiding principles outlined here are designed to provide clear direction and essential guardrails for balancing between trade-offs and streamlining efforts across the RDI ecosystem. They emphasize the importance of cohesive and coordinated actions among the various stakeholders involved, including government entities, private sector players, academia, and international partners. By adhering to these principles, the Kingdom can create a dynamic and innovative healthcare sector that not only addresses current challenges but also seizes opportunities for groundbreaking advancements in healthcare.

Guiding Principles for RDI in Health and Wellness:

- **Prioritize patient-centered research and targeted health outcomes:** Focusing on the most critical health challenges facing Saudi Arabia, this principle emphasizes the need to address non-communicable diseases like obesity and diabetes, as well as infectious diseases such as MERS and Covid-19. By leveraging personalized medicine, engaging with communities, and utilizing Saudi genome data, the goal is to significantly enhance patient outcomes. Prioritizing these areas allows the Kingdom to effectively tackle its most pressing health concerns and contribute to the improvement of overall public health.
- **Ensure equitable access to healthcare and research infrastructure across the population:** Ensuring all citizens, regardless of their location, have access to high-quality healthcare and research opportunities is a central focus. Innovation in digital health and telemedicine is key to developing robust services able to reach remote areas effectively. Moreover, by making research facilities more accessible to a broader range of innovators, the Kingdom seeks to foster inclusive advancements in healthcare. This approach aims to reduce health disparities and ensure that the benefits of RDI are shared equitably across the population.
- **Commit to evidence-based, data-driven decision making in health and wellness RDI:** Anchoring decisions within Health and Wellness RDI in comprehensive, data-driven insights, backs action with solid evidence and the latest research. By prioritizing the most impactful areas for RDI investment through accurate, up-to-date data, the Kingdom can optimize health outcomes and allocate resources more efficiently. This data-centric approach enhances accountability and transparency, and at the same time enables healthcare providers and policymakers to identify emerging trends and respond swiftly to evolving challenges. By continuously iterating with new data, the Kingdom is able to refine its strategies, and remain relevant and effective in addressing the needs of its population.
- **Increased focus on preventive healthcare for improved quality of life:** Emphasizing prevention over treatment, this principle advocates for proactive health management, early diagnosis, and community awareness as key strategies for reducing the incidence of preventable diseases. By promoting healthy lifestyles and preparing the population to manage health challenges more effectively, the Kingdom aims to significantly reduce the burden of disease and healthcare costs. This proactive approach includes implementing widespread public health campaigns, increasing access to preventive services, and encouraging regular health check-ups. By embedding prevention into the fabric of healthcare, the Kingdom is laying the groundwork for a healthier future, and improved long-term health outcomes.

- **Leverage RDI to build scalable, global solutions locally in Saudi Arabia:** Developing innovative solutions that are scalable and meet global demand is key to positioning the Kingdom as a leader in healthcare innovation. By focusing on creating health-related products and services that can be exported, the Kingdom not only addresses domestic health challenges but also contributes to global health advancements. This approach is designed to attract international partnerships and investments, expanding Saudi Arabia's role as a major player in the global healthcare ecosystem.
- **Uphold regulatory excellence and maintain the highest ethical standards in RDI:** Maintaining a culture of regulatory excellence and ethical integrity is essential for all health and wellness initiatives. This principle ensures all RDI activities adhere to the highest standards of transparency, accountability, and international best practices, safeguarding public trust. A strong regulatory framework is critical for the rapid, safe implementation of new technologies, reinforcing the Kingdom's leadership in global health innovation.
- **Cultivate an economically productive ecosystem to attract talent, capital, and companies:** Creating an open and economically productive environment that attracts global talent, capital, and companies is essential to positioning Saudi Arabia as a global RDI hub. By fostering a dynamic ecosystem where cutting-edge research and development can thrive, the Kingdom will not only drive economic growth but also establish itself as a premier destination for healthcare innovation on the global stage. This involves developing infrastructure, offering incentives for innovation, and creating collaborative spaces that encourage the exchange of ideas. By building strong connections with international partners and nurturing a culture of innovation, the Kingdom aims to achieve sustainable growth and maintain its competitive edge in health and wellness RDI.

These guiding principles are essential for steering the Kingdom of Saudi Arabia's RDI activities in Health and Wellness. By providing a structured and collaborative framework, these principles allow the Kingdom to remain at the forefront of global health and wellness advancements. The Research Development and Innovation Authority (RDIA) acts as the central coordinating body, providing guidance and oversight to accelerate RDI efforts and fulfill the Vision 2030 goals and beyond, positioning Saudi Arabia as a global leader in health and wellness innovation.



2.3 The Kingdom's national RDI focus areas

2.3.1 Defining The Kingdom's National RDI Focus Areas

For the realization of the RDI agenda in the Kingdom, as laid out in the previous section, it is essential to introduce focus areas. They provide clear strategic direction for RDI efforts, ensuring that resources are effectively allocated, collaborations fostered, and impactful outcomes achieved in alignment with Vision 2030. By defining specific focus areas, Saudi Arabia can streamline its efforts, avoid fragmentation, and ensure efficiency in its RDI investments. This targeted approach also amplifies the impact of RDI initiatives, ensuring comprehensive advancements in key sectors that contribute meaningfully to national development goals.

Globally, RDI paradigms are shifting towards multi-disciplinary priorities to address pressing challenges. This shift is driven by several key factors. First, it involves mobilizing cross-sectoral and multi-disciplinary capabilities from idea to market, ensuring that diverse expertise and resources are harnessed to tackle complex problems. Second, concentrating and coordinating RDI investments towards measurable goals enables performance management and ensures that funds are used effectively. Creating accountability to facilitate the achievement of RDI priorities is another critical driver, as it ensures that all stakeholders are committed to delivering results.

Additionally, enabling the realization of national ambitions, synchronizing non-RDI policy and regulatory measures, accelerating the uptake of innovations through demand signaling, and boosting private sector engagement are all essential components. Improving the communication of goals and impacts ensures that the benefits of RDI efforts are clearly understood and appreciated by all stakeholders. The policy directions for RDI in the Kingdom are being implemented through the creation of four strategic focus areas.

Figure 2: Three-step approach was adopted to derive the Kingdom's emerging RDI focus areas

Identified long-list of RDI-relevant national objectives

Cluster RDI-relevant national objectives into priority clusters based on:

- Common cross-disciplinary capabilities
- Cross-sectoral linkages and impact
- Common policy instruments measures

Priorities validated through extensive stakeholder and expert engagement

Figure 3: Four RDI focus areas for the Kingdom of Saudi Arabia were identified

01

Health & wellness

- Solve KSA's prevalent medical and behavioral **health challenges**
- Achieve early prevention of diseases through **personalized wellness and healthcare** services
- Disrupt **digital healthcare** to ensure health equity across the Kingdom (based on AI use cases)

02

Sustainability and essential needs

- **Sustainably secure supply of water, food and power** to the population and industry (localized food supply)
- Evolve into a global exporter of **advanced water & food technologies (e.g., water desalination)**
- Become a global paradigm on **environmental conservation** (e.g., coral reefs)

03

Energy & industrials

- Extend **global leadership position in energy** supply
- Become a regional hub for **specialty chemical** derivatives
- Ensure hydrocarbon demand sustainability through **advanced non-metallic products, blue hydrogen & COTC (Crude Oil to Chemicals)**

04

Economies of the future

- Reimagine the **future of urban living** through hyper-connected cognitive cities
- Become a global **space/deep sea champion**, creating economic value from RDI spillover effects
- Foster **digital technology frontiers** in priority sectors to build a regional/ global edge (e.g., AI applications including Gen AI/AGI or semiconductors)

2.3.2 Global trends and the RDI Imperative

Research, development, and innovation are pivotal for advancing global economies. Countries like the United States, UK, China and Japan are heavily investing in RDI to maintain their competitive edge. RDI enhances productivity, drives GDP growth, and yields higher returns on investment. The global significance of RDI in health and wellness is highlighted by substantial investments and initiatives worldwide. Countries and international organizations are increasingly recognizing the critical role of RDI in advancing healthcare, addressing health challenges, and promoting well-being.

The global health and wellness landscape is undergoing significant transformation, driven by trends that highlight the importance of RDI in developing innovative solutions to address health challenges and improve overall wellness. Policy directives in the Kingdom of Saudi Arabia are designed to enable the Kingdom to navigate these trends effectively, ensuring that its RDI efforts are aligned with global best practices and positioned for impactful outcomes.

Figure 4: Key trends shaping the health and wellness landscape

1 Increased focus on Pandemic preparedness

Building resilience against future pandemics through innovative RDI

2 Enhanced emphasis on preventive healthcare

Focusing on early detection, advanced diagnostics and proactive interventions to improve health outcomes and combat NCDs

3 Advancements in Personalized Medicine

Pioneering tailored medical solutions through genetic therapies and genome editing technologies to effectively treat disorders

4 Longevity / Rejuvenation

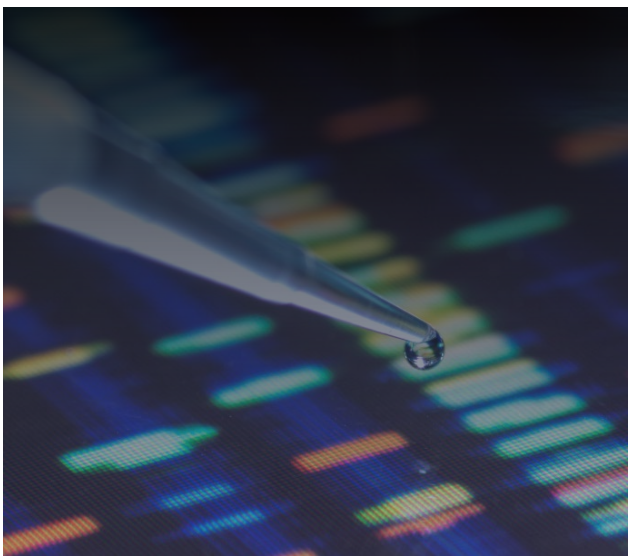
Extending healthy lifespans with regenerative medicine and wellness plans

5 Advancing Digital and Telehealth Solutions

Transforming healthcare delivery with AI and telemedicine

One of the critical trends is the focus on pandemic preparedness. The COVID-19 pandemic exposed vulnerabilities in global healthcare systems and underscored the need for swift and effective responses requiring tailored RDI. CEPI's 100 day mission focuses on delivering swift responses to newly detected pandemic threats which relies heavily on RDI (e.g., additional mRNA based vaccinations). Rapid pandemic-focused RDI efforts are of great benefit to society, and also provide a strong incentive for private sector companies. The Kingdom of Saudi Arabia also made significant advancements in ensuring its ability to fight pandemics, demonstrated by its success in combating the MERS virus.

There is increasing emphasis on RDI towards preventive healthcare, focusing on early diagnosis & proactive interventions. This trend reflects a growing recognition that preventing diseases before they become critical can dramatically improve health outcomes and reduce healthcare costs. From advancements in genome sequencing to the development of AI-driven diagnostic tools, RDI efforts are increasingly geared towards identifying and mitigating health risks early. While death rates from communicable diseases across the nation are significantly decreasing, non-communicable diseases (NCDs) now account for over 73%[1] of the rising death rates. This make the focus on prevention, early detection, and personalized medicine essential for improving the well-being of its citizens.



Personalized medicine is revolutionizing healthcare globally, offering tailored treatments that cater to the unique genetic makeup of individuals. Central to this transformation are genetic therapies, driven by breakthroughs in gene editing technologies like CRISPR/Cas9, which have enabled the development of targeted treatments for conditions such as hemophilia, spinal muscular atrophy, and inherited retinal diseases. The global market for these therapies is projected to exceed $35B by 2027, reflecting the rapid investment in this field. The Kingdom is also advancing in personalized medicine, highlighted by the Saudi Food and Drug Authority's (SFDA) recent approval of Casgevy, a gene therapy for sickle cell anemia and thalassemia, marking a significant step forward in the Kingdom's healthcare innovation efforts.

The trend towards longevity and rejuvenation reflects the increasing focus on extending healthy lifespans and improving quality of life. Innovations in genetics (e.g., senescent cell therapy), AI-based health monitoring, and personalized wellness plans are driving this trend. RDI in these areas is vital for developing therapies that promote healthy aging and enhance well-being. Promising recent RDI success stories (e.g., application of NCD-related drugs like metformin showing impact on human ageing). In Saudi Arabia, life expectancy increased by eight years over the last 30 years[2], making the Kingdom a front runner in this trend, with its billion-dollar-a-year anti-aging initiative, Hevolution, positioning the Kingdom as a leader in the pursuit of breakthroughs in longevity.

Digital and Telehealth solutions are transforming healthcare delivery. The integration of AI, telemedicine, and remote monitoring technologies is enhancing access to healthcare, improving efficiency, and enabling personalized care. The geographic and technological challenge of connecting all Saudi citizens to latest telecommunication solutions (e.g., 5G/6G) is combined with national success stories of telemedicine providers (Seha Virtual Hospital – connected to 130 hospitals and having capacities for ~450,000 patients[3]).

Source: 1. Noncommunicable diseases and health system responses in Saudi Arabia: focus on policies and strategies. A qualitative study; 2. Oxford Business Group 2023 report on life sciences; 3. Wired Middle East

The global significance of RDI in health and wellness is underscored by substantial investments and initiatives worldwide. The European Union's Horizon Europe program, with a budget of €95.5 billion from 2021 to 2027[6], prioritizes health alongside climate change and digital transformation. In the United States, the National Institutes of Health (NIH) allocated over $45B[7] in 2022 for medical research, demonstrating the country's strong focus on health innovation. The United Kingdom's Innovation Strategy commits £22 billion[8] annually to RDI by 2027, emphasizing health innovation, regulatory improvements, and public-private partnerships. China's Healthy China 2030 initiative aims to enhance health and encourage societal participation in health improvements, while Japan's Global Health Development Hub, in collaboration with the World Bank and WHO, focuses on advancing global health solutions.

Figure 5: Countries around the world are focusing on RDI initiatives in health & wellness:

USA

Precision Medicine Initiative[1] to advance RDI in personalized medicine by collecting genetic, environmental, and lifestyle data from +1 million participants - to tailor treatments to individual patients, enhancing the healthcare effectiveness

UK

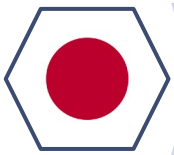
100,000 Genomes Project[2] is a major RDI initiative aimed to sequence 100k genomes from NHS patients with rare diseases and cancer to foster breakthroughs in personalized medicine

EU

European Health Emergency Preparedness & Response Authority[3] (HERA) created to enhance the EU's RDI capabilities in preparing for and responding to health crises - played a critical role in coordinating the EU's response to COVID-19

China

Healthy China 2030 strategy[4] is a RDI-driven plan aiming to improve national health through innovation in medical technologies, digital health, and preventive care - sets ambitious goals to enhance life expectancy and health outcomes



Japan

Japan's Society 5.0 initiative[5] integrates cutting-edge technologies such as AI, robotics, and big data into healthcare, aiming to transform healthcare delivery and improve public health through advanced RDI.

Top countries are defining targeted initiatives and moonshot projects to accelerate RDI in areas that are difficult to solve, require long timelines for breakthroughs, or need pooling of resources. These initiatives are designed to tackle complex health challenges by setting ambitious goals and fostering collaboration among various stakeholders. This approach brought positive results, demonstrating significant progress in medical research and innovation, and holds great promise for future advancements.

One notable example is the Cancer Moonshot initiative in the United States, which aims to reduce cancer deaths by 50%. Launched in 2016, Cancer Moonshot is a coalition that focuses on areas of cancer research most likely to benefit patients through new investments. By pooling resources from multinational pharmaceutical and biotechnology companies, academic centers, and oncologists, the initiative emphasizes early detection and diagnosis in underserved populations, alongside the rapid testing of immunotherapy combination protocols. Managed by The National Immunotherapy Coalition, the Moonshot initiative targets doubling the historical reduction rate of cancer deaths over the next 25 years. From 2000 to 2020, the age-adjusted death rate from cancer fell by approximately 25%.

Source: 1. National Institutes of Health USA, "The Precision Medicine Initiative Cohort Program"; 2. Genomics England; European Commission, 3. "The Health Emergency Preparedness and Response Authority (HERA)", 4. The State Council of the People's Republic of China, 5. Society 5.0 - Japan's Vision for the Future; 6. Horizon Europe - European Commission; 7. Budget | National Institutes of Health (NIH); 8. UK Innovation Strategy

Another impactful example is the UK's 100,000 Genomes Project, which aimed to sequence 100,000 genomes from NHS patients with rare diseases and cancer. The project successfully demonstrated the potential of genomics in personalized medicine, leading to early diagnosis and tailored treatments. Remarkably, 1 in 4 participants with a rare disease received a diagnosis for the first time, and up to 50% cancer patients received clinically actionable results, enabling more precise and personalized treatment. This approach to RDI is being widely adopted globally, as it fosters collaboration, accelerates breakthroughs & improves patient outcomes. The Kingdom is also adopting a similar approach and implementing several initiatives. One such initiative is the Saudi Genome Program, which aims to sequence the genomes of Saudi citizens to identify genetic disorders and develop personalized treatments. By leveraging these advanced models, Saudi Arabia is making concerted efforts to enhance its health and wellness initiatives, aligning with Vision 2030 goals and beyond.

There is increasing emphasis globally on active lifelong prevention of diseases and disorders. Healthcare services are increasingly focusing on prevention, leveraging new vaccine technologies, cost-competitive supply of pharmaceutical drugs, and innovative clinical solutions. These efforts are aimed at boosting economic contribution and national security through robust national medical supplies. The World Health Organization (WHO) emphasizes the importance of RDI in achieving global health goals, advocating for innovative solutions to tackle pandemics, chronic diseases, and health inequities.

Addressing these global trends through targeted RDI efforts is crucial for enhancing health outcomes and meeting the growing demand for personalized, preventive, and holistic healthcare services. **Countries like the UK have laid out comprehensive RDI policies, such as UKRI's 5-year strategy and delivery plan, which provide clear guidelines and guardrails for stakeholders**. Similarly, the USA's NIH and the EU's Horizon Europe have established robust RDI frameworks that prioritize health innovation and set strategic directions. By adopting similar policy-driven approaches, Saudi Arabia can enhance its healthcare resilience, improve public health outcomes, and establish itself as a global leader in health and wellness innovation.

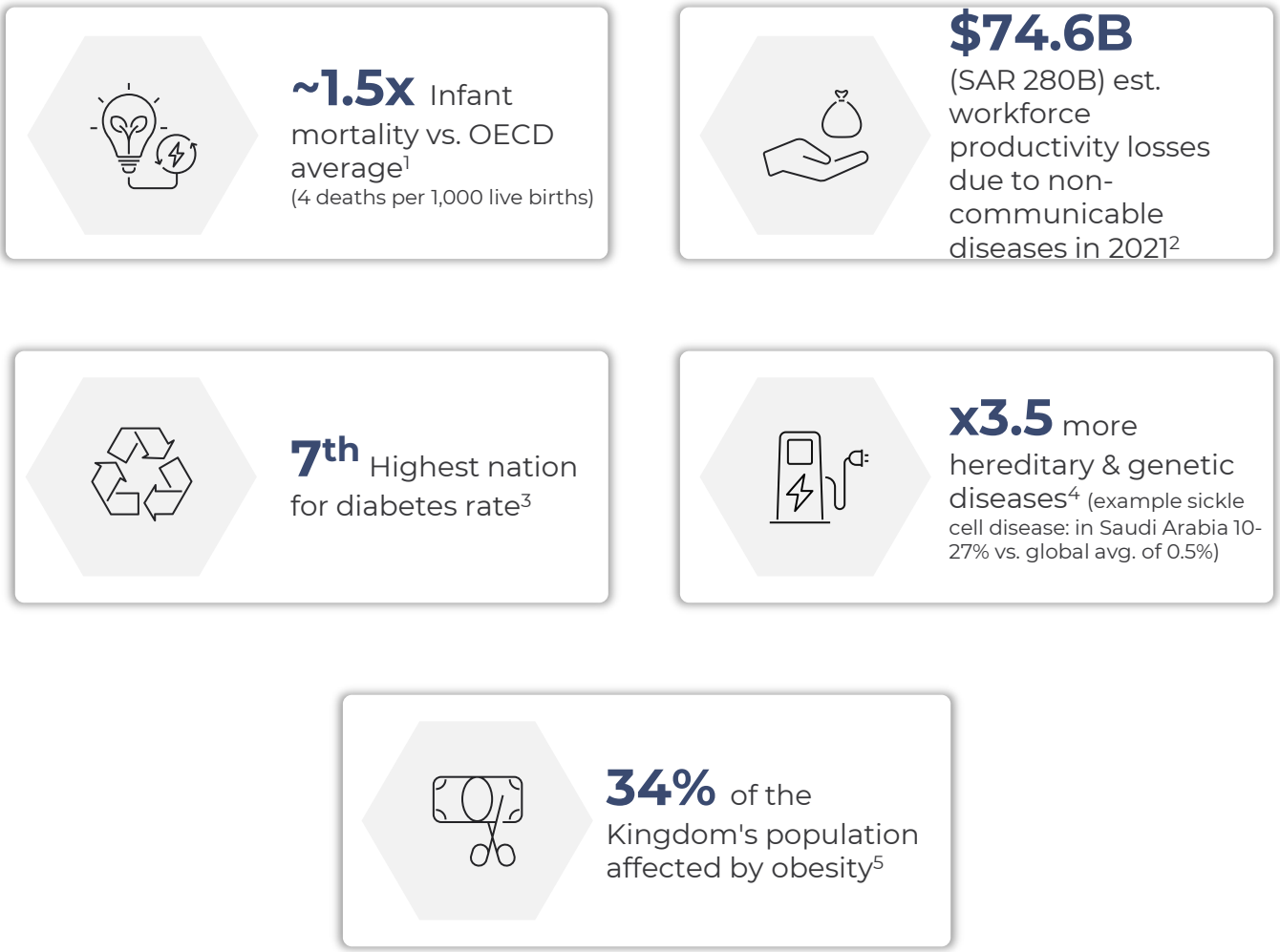
The emphasis on policy guidelines followed by top countries underscores the importance of a structured and strategic approach to RDI. UKRI's 5-year strategy, for example, includes detailed plans and guardrails for RDI activities, ensuring alignment with national health priorities and fostering collaboration among stakeholders. The NIH's strategic plan emphasizes the integration of cutting-edge research with clinical practice, aiming to translate scientific discoveries into tangible health benefits. Similarly, Horizon Europe's work programs outline specific health-related missions and funding opportunities, driving coordinated efforts across member states. By implementing robust policy frameworks, the Kingdom can navigate global health trends effectively, ensuring that its RDI initiatives are well-aligned with international best practices and contribute significantly to its Vision 2030 goals.

2.3.3 Key challenges in Health and Wellness

The Kingdom is at a unique juncture where it faces significant health challenges due to its aging population, the rising prevalence of non-communicable diseases, and an increase in genetic disorders. Advanced research and targeted innovation is required to effectively manage and mitigate these issues. However, the Kingdom also has unique strengths and immense potential, presenting opportunities to make significant progress in Health and Wellness by leveraging RDI. With substantial investments in building a robust healthcare infrastructure and fostering innovation, Saudi Arabia is poised to see considerable benefits in the near future, advancing its health outcomes and global standing.

The Kingdom of Saudi Arabia faces multiple challenges in its health and wellness sector, presenting both obstacles and opportunities for improvement and innovation. The Kingdom's population is projected to rise rapidly by 2030, with the number of elderly individuals expected to more than double. This demographic shift, coupled with rapid urbanization and a high influx of overseas visitors, places immense pressure on the healthcare system, leading to overcrowded hospitals and extended waiting times. Furthermore, the increasing burden of chronic diseases and the demand for advanced medical services are expected to further strain the existing healthcare infrastructure, underscoring the urgent need for strategic RDI initiatives to address these growing challenges.

Figure 6: The Kingdom faces several critical challenges in health and wellness today



Source: 1. OECD, World Bank, 2021 – Kingdom of Saud Arabia in 2021 ~5.7 deaths per 1000 live birth; 2. National Library of Medicine; 3. World Health Organization, among adult population (while ~60% of Saudi population is below 30 years of age, as of 2023); 4. National Biotech Strategy, Example: Thalassemia disease 4.5% in Saudi Arabia vs. European average of less than 1%; 5. CIA Factbook (2016 data), among adult population

The healthcare ecosystem in the Kingdom of Saudi Arabia faces two critical archetypes of challenges: Healthcare Delivery and RDI in Health and Wellness. Addressing these challenges is pivotal to achieving the Kingdom's Vision 2030 goals and improving the overall well-being of its citizens. While Healthcare Delivery challenges focus on expanding access, improving quality, and addressing the high prevalence of non-communicable and genetic diseases, RDI challenges are centered around enhancing the capacity, resources, and infrastructure needed to drive sustained innovation in health. Successfully navigating these challenges requires a holistic approach that integrates advanced technologies, targeted interventions, and strategic policy frameworks.

In the realm of Healthcare Delivery, the Kingdom of Saudi Arabia is contending with a significant burden of non-communicable diseases (NCDs), which account for 73%[1] of all deaths in the country. The prevalence of conditions such as cardiovascular diseases, diabetes, and obesity is alarmingly high, with 34% of the adult population[2] affected by obesity and 14% adult population by diabetes. These chronic conditions contribute to the nation's leading causes of mortality and morbidity, highlighting the urgent need for strengthened prevention efforts and targeted interventions. Additionally, the Kingdom faces a unique challenge with hereditary and genetic disorders, such as sickle cell disease, which disproportionately affects 10-27%[3] (in some geographic areas) of the Saudi population compared to the global average of 0.5%. This challenge, deeply rooted in the genetic makeup of the population, underscores the importance of targeted RDI efforts, including the Saudi GENOME program, which is actively working to map the genome of Saudi citizens to develop personalized medical solutions. Furthermore, expanding healthcare coverage, particularly in remote and underserved areas, remains a critical priority. The quality of care must also be improved with a focused emphasis on achieving better health outcomes, addressing existing infrastructure gaps, and ensuring that healthcare delivery is both equitable and effective.

On the RDI front, the focus must be on channeling resources into areas that are most crucial for the health of Saudi citizens while simultaneously building a robust and inclusive innovation ecosystem. One of the significant challenges is improving human capital in RDI, which requires comprehensive training and upskilling programs to cultivate a highly skilled workforce capable of driving healthcare advancements. This effort includes not only formal education but also continuous professional development to keep pace with the rapidly evolving landscape of medical technology and research. Additionally, expanding access to state-of-the-art RDI facilities is essential to support innovation across the country. Making the RDI ecosystem more open and attractive to the world's best talent is equally important, as it can foster global collaborations, stimulate knowledge exchange, and position the Kingdom as a leading hub for health innovation. To achieve this, the Kingdom must create an environment that not only invites but also retains top-tier talent and global companies, ensuring that its RDI ecosystem is competitive on the world stage.

The RDI policy framework offers a clear and strategic approach to addressing these challenges, with a strong emphasis on enhancing healthcare delivery across the Kingdom. By placing the Saudi citizen at the heart of its efforts, the policy is designed to improve patient outcomes, reduce the prevalence of NCDs, and address the unique genetic health challenges that are specific to the Kingdom. Targeted RDI initiatives are crucial to improving access to high-quality healthcare, particularly in underserved regions, where the need is greatest. Moreover, the policy seeks to ensure that the healthcare system is fully equipped to meet the diverse and evolving needs of the population, from advanced diagnostics to cutting-edge treatments. As Saudi Arabia continues to advance its healthcare goals, the active and strategic direction of RDI efforts will be paramount in effectively overcoming these challenges. By leveraging the strengths of its RDI ecosystem, aligning resources with the most pressing health concerns, and fostering a culture of continuous innovation, the Kingdom is poised to make significant strides in transforming its healthcare landscape. These efforts will not only enhance the health and well-being of its citizens but also solidify the Kingdom’s position as a global leader in health and wellness innovation.

Source: 1. Noncommunicable diseases and health system responses in Saudi Arabia: focus on policies and strategies. A qualitative study (deaths by communicable diseases are decreasing in Saudi Arabia); 2. CIA Factbook (2016 data), among adult population; 3. SNIH

2.3.4 Strong momentum and key opportunities

The Kingdom of Saudi Arabia boasts a unique value proposition and strong momentum in the Health and Wellness sector, making it well-positioned to advance RDI significantly. The Kingdom has a substantial captive healthcare market, with a growing and aging population that will increase healthcare spending and require more specialized services. Additionally, the population is becoming more diverse due to the increasing number of people moving to the Kingdom, further driving the demand for advanced healthcare solutions. The presence of top hospitals like King Faisal Specialist Hospital & Research Center and Riyadh Military Hospital, equipped with state-of-the-art research facilities and a large pool of medical expertise, reinforces this momentum. Several high-impact initiatives have been launched to transform the sector.

The Health Sector Transformation Program (HSTP) aims at an overall transformation of the healthcare sector, allocating substantial resources to realize this change. Additionally, targeted interventions like those by Hevolution, which are unique globally, highlight the Kingdom's commitment to innovative healthcare solutions. The Ministry of Health collaborated with IBM to develop AI tools for early detection of chronic diseases such as cardiovascular conditions and diabetes. Moreover, the Saudi Genome Program (SGP) aims to sequence the genomes of Saudi citizens to identify genetic disorders and develop personalized treatments, enhancing diagnosis, therapy, and prevention. Furthermore, Saudi Arabia's strategic location and large medical and pharmaceutical market, valued at approximately USD 10 billion[1], provide a robust foundation for attracting foreign investment and fostering international collaborations.

The Kingdom has a strong starting point in Health and Wellness with numerous initiatives and partnerships driving forward the sector. The National Intellectual Property Strategy aims to create a conducive environment for innovation by protecting IP rights and encouraging RDI activities. Additionally, King Fahad Medical City and Boston Oncology have signed an MoU for the localization of gene and target cell therapy, further showcasing the Kingdom's dedication to pioneering innovative healthcare solutions. Public Investment Fund (PIF) bolstered RDI in the health sector by investing in entities such as Lifera, demonstrating commitment to advancing healthcare innovation. The government's efforts are compounded by initiatives aimed at fostering a conducive environment for health and wellness RDI.

The Saudi National Institute of Health (SNIH) was established and plays a pivotal role in advancing healthcare research and innovation across the nation. Established with the vision of positioning the Kingdom as a global leader in health research and development, SNIH aims to drive impactful research that improves human health and longevity while supporting economic growth and national development. The institute's key mission is to implement a national health research strategy that identifies critical health research priorities and addresses public health needs. By enhancing the coordination and quality of research efforts, SNIH seeks to ensure that the Kingdom's health RDI ecosystem is capable of producing transformative outcomes.

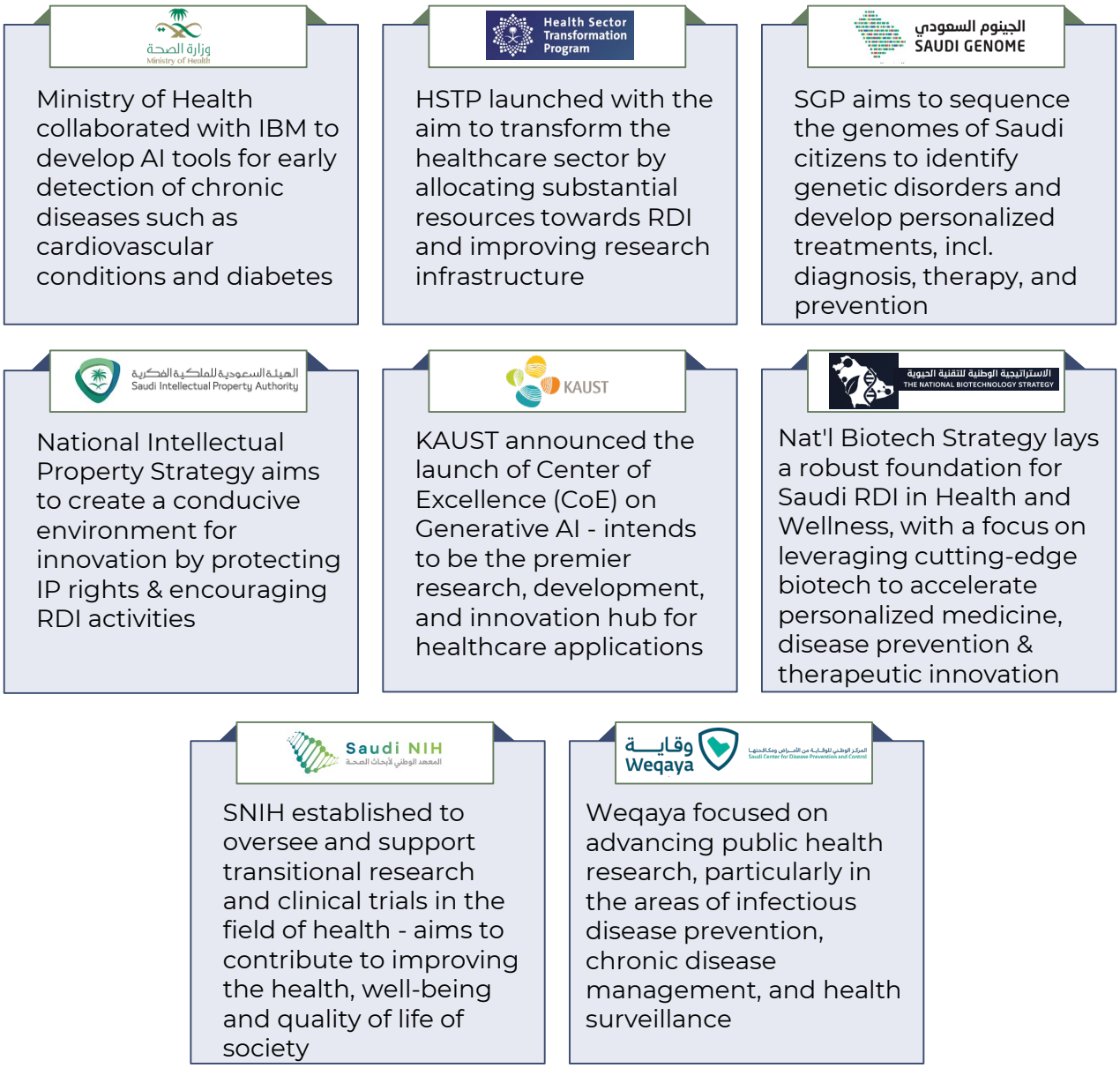
Multiple national strategies have laid a robust foundation for transformative RDI in health and wellness across the country, setting the stage for significant advancements in the sector. The National Biotechnology Strategy, for instance, is not only driving innovation in genetic engineering and personalized medicine but is also fostering a thriving ecosystem for biotech startups and research institutions, further accelerating the Kingdom's progress in developing cutting-edge therapies. Additionally, the Saudi National Strategy for Digital Health is playing a critical role in integrating digital technologies into healthcare, enhancing data-driven decision-making, and improving patient outcomes on a national scale. Partnerships like the MoU between the Saudi Data and Artificial Intelligence Authority (SDAIA) and Philips are advancing the integration of AI technologies in healthcare, addressing critical health challenges and accelerating medical research and technology development. These concerted efforts, supported by the national strategies, are creating strong momentum, positioning the Kingdom to make a substantial impact on global health innovation and establishing the Kingdom as a leader in the health and wellness RDI landscape.

Source: 1. Current status and vision of local pharmaceutical industries in Saudi Arabia: The focus on nanomedicines, National Library of medicine

Multiple players across the ecosystem are already executing numerous initiatives that are transforming the healthcare landscape. For example, the establishment of Jeddah Medical City, which covers an area of 120,000 square meters with an estimated budget of $1.1B[1], underscores the significant investments being made in healthcare infrastructure. Similarly, the partnership between SAMI and NUPCO to provide solutions for medication tracking and IT infrastructure aims to increase local content through medical devices manufacturing, enhancing the overall healthcare delivery system in the Kingdom. By capitalizing on these strengths and the strong momentum in health and wellness, the Kingdom can drive significant advancements in medical research, technology development, and healthcare innovation, aligning with its Vision 2030 goals and positioning itself as a global leader in health and wellness.

Policies such as increased and stable RDI spending, enhanced private sector participation, and the establishment of innovation districts and clusters are crucial. These policy shifts not only support existing initiatives but also pave the way for future advancements, ensuring that Saudi Arabia remains at the forefront of global health and wellness innovation. By fostering an open and inclusive RDI culture and streamlining processes to attract top-tier global talent, the Kingdom is well-positioned to achieve its Vision 2030 goals and solidify its reputation as a leader in healthcare innovation.

Figure 7: Strong momentum observed in the Health and wellness ecosystem, championed by the stakeholders



Source: 1. Hospital projects in the Kingdom of Saudi Arabia, Saudi Hospital Design & Build Expo

03

APPROACH TO RDI MISSIONS

3.1 Overview of RDI missions

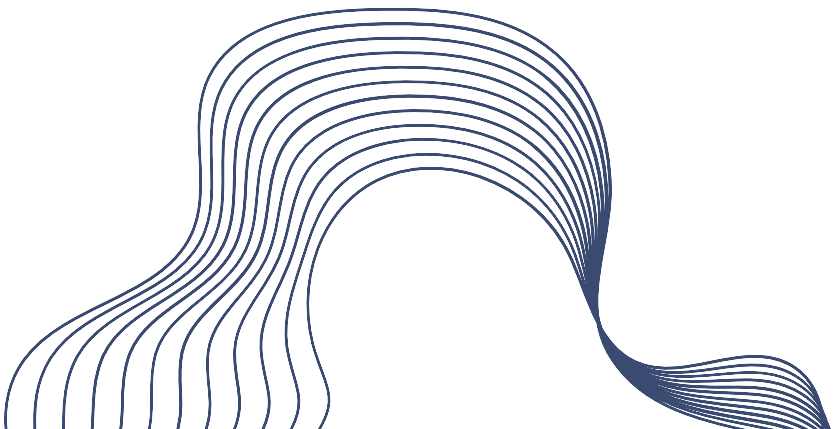
In the pursuit of achieving its ambitious health and wellness goals, the Kingdom of Saudi Arabia adopted a mission-oriented approach This approach serves as a critical framework for spearheading cohesive efforts across a complex system involving numerous and diverse stakeholders. By defining specific missions, this strategy provides a clear direction and aligns the efforts of all involved parties towards the realization of high-stakes, long-term objectives. Missions, in this context, act as a guiding force, ensuring that all actions taken are purpose-driven and contribute to the overarching goals of improving public health and fostering innovation in the health and wellness sector.

Missions are not only about setting goals; they are about creating a structured environment where progress can be consistently tracked, and adjustments can be made in response to emerging challenges. This structured governance is essential for maintaining momentum and ensuring that all efforts are aligned and synchronized. By clearly defining the roles and responsibilities of each stakeholder, the mission-oriented approach minimizes redundancies and promotes efficient use of resources. This collaborative effort is vital in a sector as critical as health and wellness, where timely progress can have a significant impact on the well-being of the population.

The mission-oriented approach also facilitates a systems-level perspective, where complex health issues can be addressed through coordinated and multi-disciplinary efforts. In health and wellness, challenges such as non-communicable diseases, healthcare accessibility, and the integration of advanced technologies require solutions that cut across traditional boundaries. Missions provide a platform for fostering collaboration between public and private sectors, academia, and international partners. This cross-sectoral collaboration is crucial for driving innovation and ensuring the Kingdom remains at the forefront of global health advancements.

Moreover, the policy direction for these missions is not limited to what needs to be achieved but also extends to how these goals will be realized. The inclusion of policy guidelines for increased and stable RDI spending, enhanced private sector participation, and the implementation of performance-based funding models are key components of this strategy. These policies are designed to create a supportive ecosystem where innovation can thrive, and research can be translated into practical applications that benefit the population. The focus on resource sharing, optimization, and commercialization ensures that the outcomes of these missions are not only impactful but also sustainable in the long term.

Mission-oriented approach is a powerful tool for driving systemic change in the health and wellness sector. It provides a clear roadmap for achieving the Kingdom's Vision 2030 goals, ensures that efforts are focused and coordinated, and fosters a collaborative environment where innovation can flourish. The policy directives that underpin this approach are crucial for maintaining alignment with national priorities and ensuring that the missions lead to meaningful and lasting improvements in public health. By rallying the ecosystem around bold and ambitious targets, Saudi Arabia is well-positioned to become a global leader in health and wellness innovation.

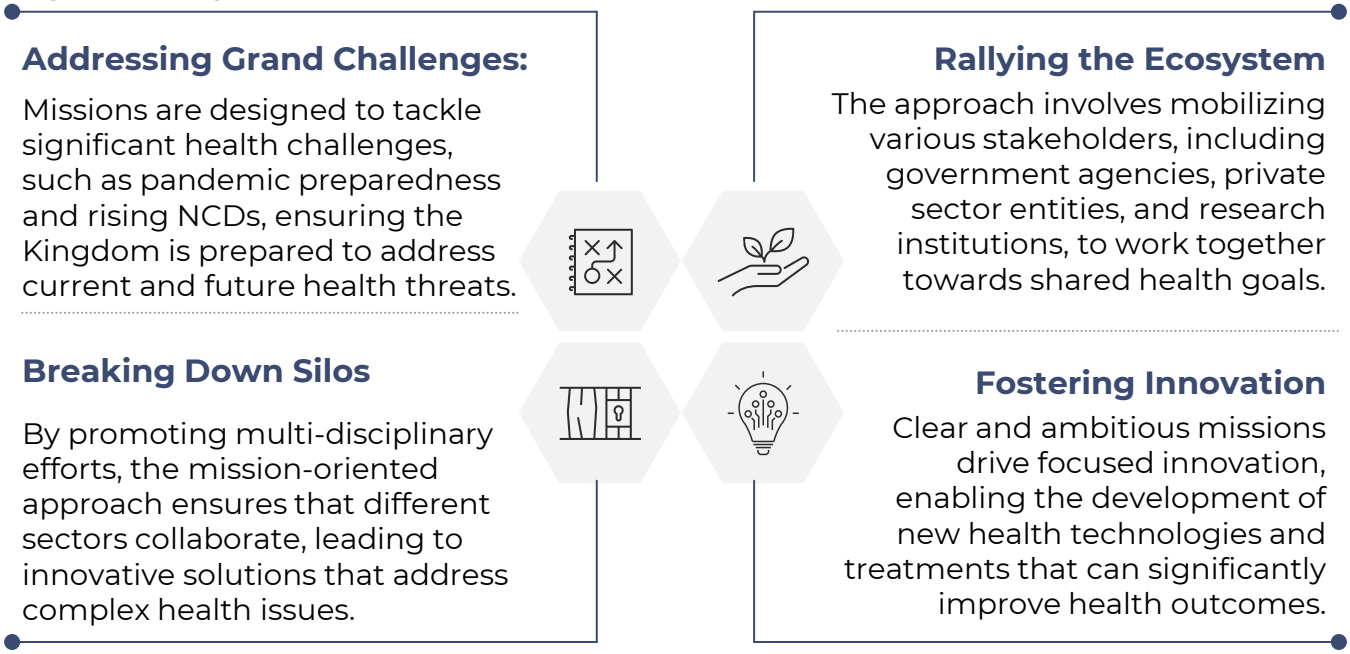


3.2 Mission-oriented approach

In the realm of research, various approaches can be employed depending on the specific objectives and available resources. **For the Kingdom of Saudi Arabia, the mission-oriented approach was identified as the most suitable strategy for advancing its RDI efforts**, particularly in the Health and Wellness sector. This approach is uniquely equipped to streamline the efforts of multiple stakeholders, ensuring that ambitious targets are not only set but also systematically pursued over the long term. The mission-oriented approach provides a structured methodology to manage and orchestrate RDI initiatives, fostering collaboration & innovation across diverse sectors.

The adoption of this mission-oriented approach is a critical policy direction for Saudi Arabia, particularly in the context of Health and Wellness. It emphasizes not just what needs to be achieved but also how these goals will be realized through focused, coordinated efforts. By setting clear, achievable goals and promoting substantial public and private sector collaboration, this approach ensures that the Kingdom can effectively tackle its most pressing health challenges. The policy framework supporting this approach includes key elements such as increased and stable RDI spending, enhanced private sector participation, and performance-based funding, all of which are integral to the successful execution of these missions. This strategic alignment of policy and mission-driven RDI efforts positions the Kingdom to make significant strides in achieving its Vision 2030 health and wellness goals.

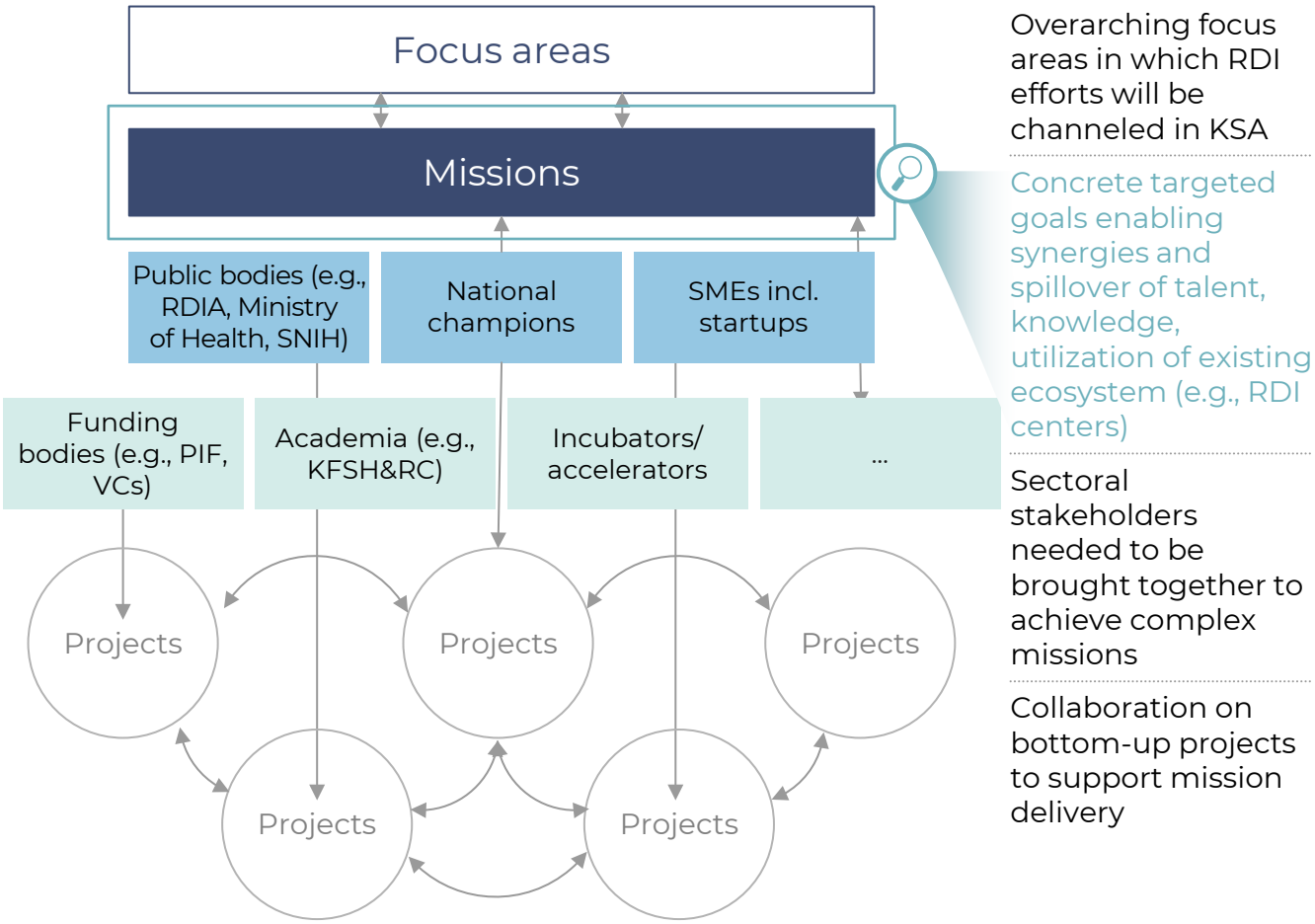
Figure 8: Key Elements of the Mission-Oriented Approach



Addressing grand challenges involves tackling critical health issues such as pandemic preparedness and the rising prevalence of non-communicable diseases (NCDs), ensuring that the Kingdom is equipped to handle current and future health threats. Rallying the ecosystem is essential for mobilizing a diverse group of stakeholders, including government agencies, private sector entities, and research institutions, to work together towards shared health goals. Breaking down silos fosters multi-disciplinary efforts, enabling different sectors to collaborate and develop innovative solutions to complex health problems. Fostering innovation is crucial for driving focused advancements, allowing the development of cutting-edge health technologies and treatments that can significantly improve health outcomes. These elements are critical to the success of the mission-oriented approach, providing a structured and collaborative framework that drives impactful and sustainable improvements in health and wellness.

The mission-oriented approach offers significant benefits. By focusing on specific health missions, such as increasing healthy life expectancy and reducing the prevalence of NCDs, the Kingdom can enhance overall public health outcomes. This approach promotes innovation by driving the development of genetic therapies and digital therapeutics, leading to the creation of cutting-edge medical technologies and practices. It fosters collaboration among public bodies, national champions, SMEs, academia, and funding bodies, ensuring a comprehensive effort towards common goals. Additionally, clear, targeted missions allow for the measurement of returns on investments, ensuring accountability and effective resource allocation.

Figure 9: Missions act as the glue among stakeholders in the ecosystem



The policy direction for this mission-driven approach is also designed to address grand challenges to secure the present and win the future. It focuses on rallying the ecosystem and nation behind bold and ambitious targets, ensuring that all stakeholders are aligned and motivated. By breaking the silos of sectoral priorities and catalyzing multi-disciplinary efforts, this approach fosters collaboration across various sectors, enhancing the collective impact. These guidelines are essential for driving significant advancements, ensuring that resources are effectively utilized, and creating a cohesive and dynamic innovation landscape. This strategic approach not only targets immediate goals but also sets the foundation for sustainable long-term success.

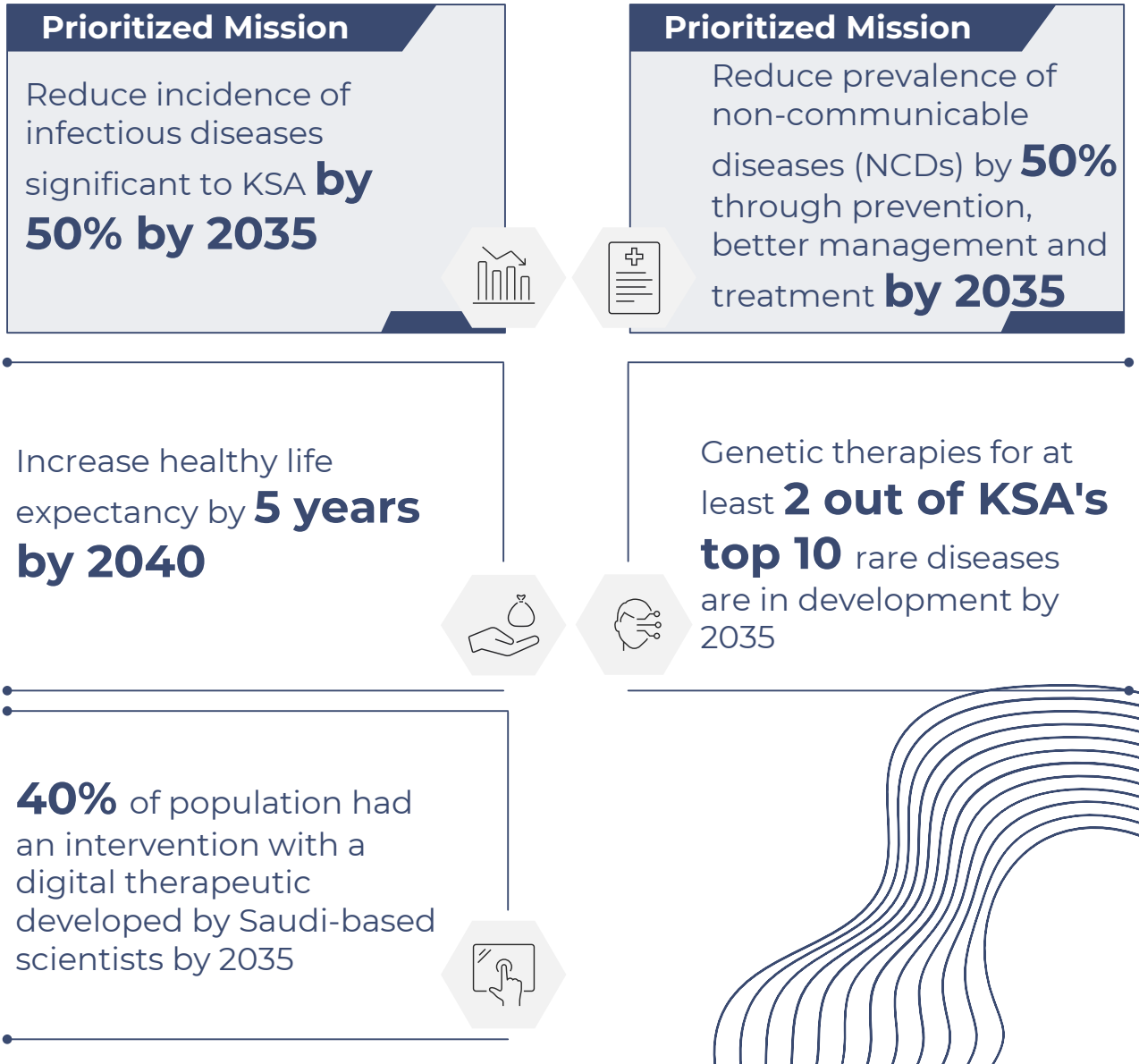
The mission-oriented approach, underpinned by strategic policy directions, ensures the Kingdom's RDI efforts in health and wellness are goal-driven and methodologically sound. These efforts will not only achieve immediate health goals but also lay the foundation for sustainable, long-term success, propelling the Kingdom to the forefront of global health and wellness innovation.

3.3 RDI missions in Health and Wellness

The Kingdom of Saudi Arabia identified several key missions within the Health and Wellness focus area to address critical health challenges and leverage opportunities for innovation. These missions are designed to solve prevalent health issues, enhance healthcare equity, and position KSA as a leader in cutting-edge medical technologies and practices. The mission-oriented approach ensures that these goals are ambitious, achievable, and backed by significant public and private sector collaboration.

The missions for KSA's health and wellness sector are meticulously crafted based on observed trends, significant challenges, and the unique position of KSA. Recognizing the complexity of healthcare, it is crucial to consider the framework of social determinants that impact population health. For innovation to be truly effective, it must target multiple elements simultaneously. These missions aim to leverage the Kingdom's substantial genomic capabilities, advanced research infrastructure, and strategic location to address prevalent health issues. Mission execution will be planned with a specific target population at the outset, such as the 30 to 40 age group, to deliver quick wins and enable more efficient scaling to the broader population. By focusing on these targeted missions, KSA seeks to realize its full potential in health and wellness, driving innovation and improving public health outcomes in alignment with its Vision 2030 goals. The joint innovation framework guiding these missions includes strategic directives on funding, resource allocation, and private sector engagement, ensuring a cohesive approach to achieving these health and wellness objectives.

Figure 10: Missions focused on Health and Wellness



Reduce incidence of infectious diseases significant to KSA **by 50% by 2035**

Prioritized Mission

Mission motivation

Infectious diseases remain a formidable challenge to global health, responsible for 15% of all deaths worldwide and placing immense strain on healthcare systems. In the Kingdom of Saudi Arabia, the risk from diseases such as MERS, influenza, tuberculosis & vector-borne illnesses like dengue fever is particularly pressing due to the KSA's unique geographic & demographic factors. This mission is critical to improving public health, safeguarding economic stability, and enhancing overall quality of life. This mission will prioritize diseases with high mortality and morbidity, ensuring that efforts are impactful and focused where they are most needed, as opposed to areas which may not yield the desired impact. By expanding capabilities in disease prevention, rapid response, and advanced treatment—leveraging technologies such as AI-driven diagnostics, mRNA vaccines & advanced surveillance systems - KSA will fortify its healthcare infrastructure, ensuring a resilient & adaptive response to disease threats.

Potential research areas (non-exhaustive)

Surveillance and monitoring	• Hotspot identification of potential epidemics developments based on data analytics • AI-based infectious mapping and modelling as well as anticipatory surveillance	• Mobile phone tracking of contact cases and infections • Syndromic surveillance systems with real time data through AI
Screening and diagnostics	• Rapid point of care detection • Rapid molecular identification of pathogens • Remote diagnosis through AI • Rapid analysis of pathogen's	genomics • Self testing opportunities for better disease detection and management
Outbreak detection & control	• Medication usage analysis • Social media and mobile data analysis • Satellite imagine to collect information (e.g., sea	temperature or surface height) for water borne diseases) on climatologic parameters
Self Management–Monitoring & Therapy	• Case contact tracing in order to reduce time to isolation • Internet-based self-management program • Self disease management to reduce contact with rest of	population and toll on health care system • Geroscience interventions that target biological aging for better elderly resilience to infectious diseases
New biotech drugs development	• Identify new antigens or immunogens for vaccine development • Expand mRNA vaccine development to other infectious diseases • Nasal filters, biocompatible and biogel-based, and enriched with AgNPs, to reduce infecting microbial-load and protect lower airways, without interfering with normal	respiratory capacity • Genetically modified mosquitoes for vector pathogen interactions in tropical environments • High-throughput screening and identification of unique drug targets amenable for drug discovery • Antimicrobial Resistance Research

Reduce prevalence of non-communicable diseases (NCDs) by **50%** through prevention, better management and treatment **by 2035**

Prioritized Mission

Mission motivation

NCDs are the leading cause of death and disability-adjusted life years (DALYs) globally and in the Kingdom of Saudi Arabia, where they account for 73% of all deaths. In 2019, cardiovascular diseases, cancers, chronic respiratory diseases, and diabetes were the primary contributors to this burden. The mission to reduce the prevalence of NCDs by 50% by 2035 is driven by the urgent need to manage and prevent these conditions more effectively. This mission focuses on expanding telemedicine and remote monitoring, implementing secure messaging tools for doctor-patient interactions, and developing at-home virtual hospitals to enhance patient care. Additionally, predictive analytics using AI to identify patient care gaps, along with next-generation clinical bioinformatics that integrate clinical data, are central to this mission. AI-guided diagnostics & personalized computational modeling enhance disease management and treatment, making the mission critical for improving health outcomes

Potential research areas (non-exhaustive)

NCDs Prevention	• Population Health Management powered by AI • Premarital screening • Personalized diet planning for patients susceptible to chronic kidney disease, prediabetes etc • Predictive analytics (AI) of	surgery results or sudden cardiac death based on patient history • AI-powered high risk patient identification
Screening and early detection capabilities	• Affordable and scalable screening process • Cancer detection through immune system analysis • Computerized and machine	learning based CT analysis • Deep learning networks for automatic analysis/recognition of disease patterns in medical images and image sequences
Treatment technologies	• Microbiome therapeutics • AI-enabled drug dosage optimization for adverse reaction, cross reactivity • Nanorobotic assistance systems	for minimally-invasive surgery • Auto-release drug implants • Personalized computational modeling of patients' organs
Self Management Monitoring & Therapy	• Digital therapeutics • AI-based consumer-friendly monitoring • Digitally enabled monitoring and management- system, able • to signal alerts if intervention is	needed - system can be connected to EHR. Example: warfarin dosage monitoring • Wearable AI-powered devices for patient monitoring • Team based care
Digital technologies	• Telemedicine and remote Monitoring • Secure direct messaging tools for doctor-patient interactions • At Home Virtual Hospital • Predicting and identifying patient care gaps • Next Generation Clinical	Bioinformatics - Scalable, integrative, intelligent processing of omics and clinical data

Increase healthy life expectancy by **5 years by 2040**

Mission motivation

As populations around the world continue to age at an unprecedented rate, the global average life expectancy reached 73.4 years. However, the Healthy Average Life Expectancy (HALE) in the Kingdom of Saudi Arabia lags behind at 63.7 years, with a reported HALE of 64 years in 2019, aligning with the global average. This mission aims to increase the healthy life expectancy of Saudi citizens by 5 years by 2040. The initiative is driven by the recognition that a person's physical, social, and economic environments are key determinants of their health span. By focusing on innovative research and technologies that enhance these factors, the Kingdom seeks to extend the period during which individuals can live healthy, active, and fulfilling lives

Potential research areas (non-exhaustive)

Fitness & wellness tech	• AI wearable and non-wearable tracking sensors connected to fitness apps • Personalized diets through nutritional supplements with genome sequencing • AI monitored virtual exercise	• Polygenic Risk Scores for Arab ethnicities to prevent/delay onset of common diseases • Warfarin, hydro, sound, bio resonance & heat therapy
Disease self-management	• Nano-tech non-invasive glucose monitoring • AI-based personalized medicine • VR exposure treatment for addictions	• AI enhanced self-monitoring of vital signs • Digital tools to monitor medication adherence and habits the medications taken
Bio-designed equipment	• Wearable fake skin able to monitor and share vital signs • Exoskeletal Smart Glove for stroke victims • Noninvasive AI based diagnostics (e.g., for idiopathic	pulmonary fibrosis) • Smart Bandage for Compression Therapy • Photo-biomodulation tech for • Brain Therapy
Specially-abled healthcare	• Infrastructure and assistance solutions to facilitate mobility • Speech & memory aids • Sign language-to-speech converter	• Personal emergency response systems (e.g., accident injury detection system) • Pharmacogenomics for better therapy outcome and reduced Adverse Drug Events
Emerging rejuvenation technologies	• 3D bioprinting applications for cellular and tissue constructs and regenerative medicine • Mitochondrial medicine extending the lifespan of cells	• Complex tissue regeneration via tissue embryonation • Activation of iNKT cells to eliminate senescent cells (that do not multiply anymore)

Genetic therapies for at least **2 out of KSA's top 10** rare diseases are in development by 2035

Mission motivation

Genetic diseases present a significant health burden in the Kingdom of Saudi Arabia, with approximately 8% of births affected by congenital, neonatal, and pediatric genetic disorders. The mission to develop genetic therapies for at least two of KSA's top ten rare diseases by 2035 aims to mitigate this burden through cutting-edge genetic research and advanced therapies. This mission involves leveraging technologies such as automated whole genome sequencing, RNA sequencing, and AI-based detection of genetic disorders. Next-generation molecular newborn screening, integrated health record systems with AI-driven decision-making, and non-viral vector technologies are also crucial components. CRISPR and base-editing technologies will be central in curing genetic diseases like sickle cell disease and thalassemia, alongside personalized medicine based on genomic profiles

Potential research areas (non-exhaustive)

Rapid diagnosis and evaluation	• Leveraging automated whole genome sequencing to reduce diagnosis-to-treatment time • RNAseq and rapid transcriptomic profiling • Using AI machine learning based detection of genetic diseases in children	• Next Generation Molecular Newborn Screening • Integrated HER systems with AI- and analytical based clinical decision making
At scale vector manufacturing	• High volume and reliable virus manufacturing • Vectors able to deliver multiple types of gene cassettes • Non-viral vector technologies such as nanoparticles	• Fully continuous commercial manufacturing facilities • AI-enabled "smart manufacturing"
Proper gene delivery and activation	• Develop organ specific delivery systems for more specific organ targeting (e.g., bonne marrow targeting) • CRISPR and base-editing technology to cure sickle cell disease, thalassemia etc..	• Silencing of mutant tumor suppressing genes through RNA interference • CAR-T, oncology vaccines and oncolytic viruses
Enhance clinical profile	• Reduce immunogenicity issue for viral or LNP • Reduce off target gene editing effects by CRISPR or MegaTAL • Codon optimization in order to facilitate gene expression and increase translational efficiency	• Optimize viral vector to deliver more sustained effects • Preimplantation genetic diagnosis (PGD)
Monitoring long term effects	• Real time monitoring system to safely monitor patient vital signs • Global and digitalized records to evaluate long term success and effect of gene therapies through AI	• Leveraging high throughput whole genome sequencing to monitor for potential integration of vector into human genome

40% of population had an intervention with a digital therapeutic developed by Saudi-based scientists by 2035

Mission motivation

New technologies, such as Artificial Intelligence (AI) and increasing internet penetration, are driving innovative approaches to disease management. Digital therapeutics, particularly for chronic diseases like diabetes, respiratory conditions, and mental health disorders, offer significant potential for improving health outcomes. The mission to ensure that 40% of the population had an intervention with a digital therapeutic developed by Saudi-based scientists by 2035 focuses on leveraging these technologies to enhance disease prevention, early diagnosis, and personalized treatment. This mission includes AI-driven applications for diabetes prevention, machine learning tools for early disease detection, and gamification-based wellness programs. Additionally, wearable AI-powered devices for patient monitoring and digital tools for cognitive behavioral therapy will play a crucial role in achieving this mission

Potential research areas (non-exhaustive)

Prevention

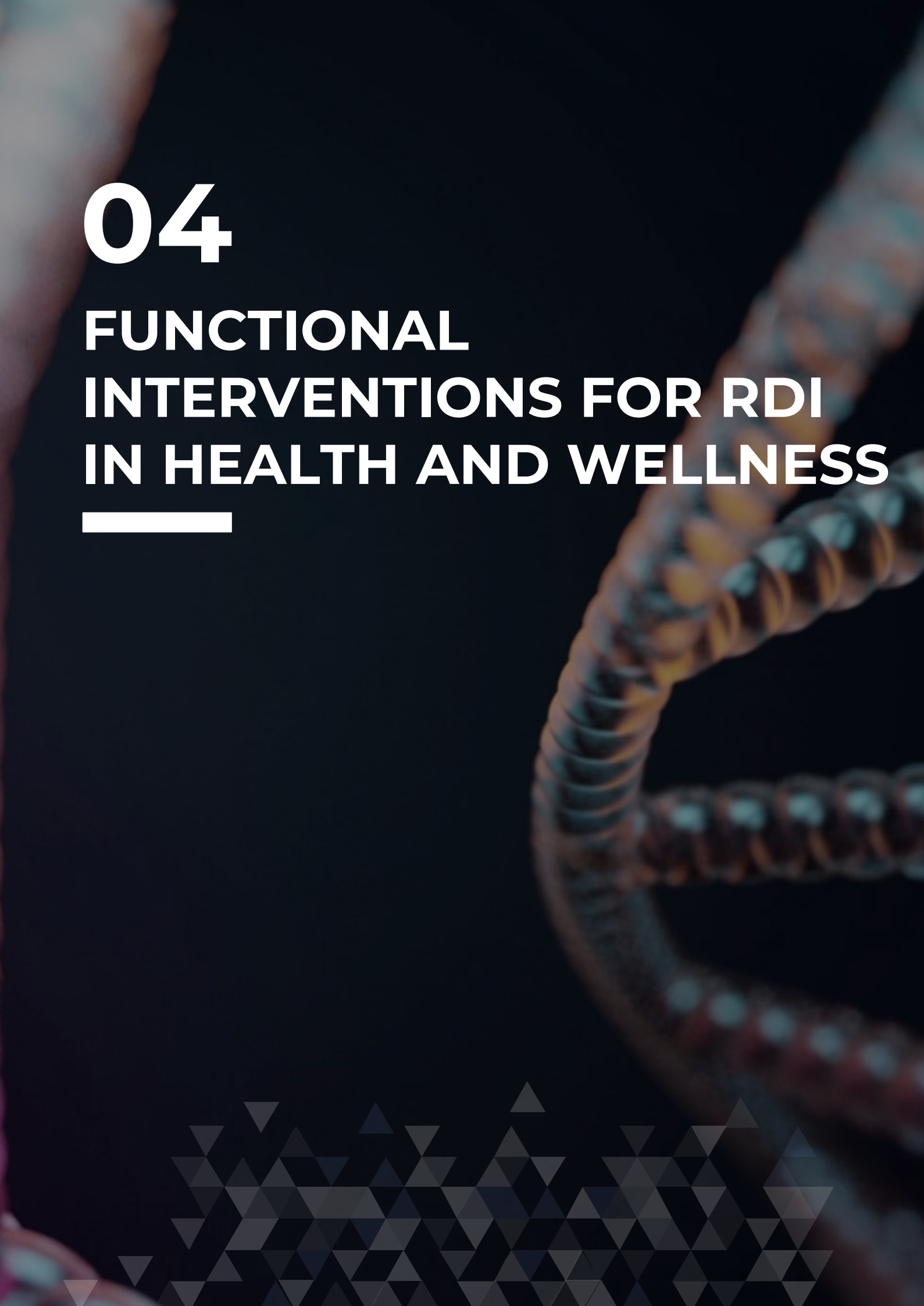
- Diabetes prevention through digitalized monitoring
- Apps that use AI and ML for early disease diagnosis
- Gamification based wellness
- AI-enabled behavior modification through digital therapeutics
- 24/7 real time AI based live therapist bot, able to ask and understand questions to provide adapted feedback and help manage depressive symptoms
- Anxiety management through interactions with mobile app

Diagnostics and monitoring

- AI in medical decision support
- AI based digital diagnostics for pediatric behavioral healthcare
- Closed loop systems (e.g., glucose monitoring)
- Pills with ingestible sensors
- Combined software and hardware programs to improve asthma and COPD control, optimizing healthcare utilization
- Insulin mobile dose calculator for type 2 diabetes patients
- Wireless wearable neuromodulation unit controlled by a smartphone app and self administered by patient

Treatment

- Sleep improvement programs through Cognitive Behavioral Therapy techniques delivered by mobile phone
- VR in pain management and phobias through gradual facing of fears and traumas
- Gaming and virtual reality for treatment of disease
- Neurologic music therapy to address speech, motor and cognitive dysfunctions caused by neurologic diseases or injuries
- Chronic pain management through physical, cognitive, emotional and recreative activities, increasing pain acceptance and reducing pain interference



04

FUNCTIONAL INTERVENTIONS FOR RDI IN HEALTH AND WELLNESS

In the Kingdom of Saudi Arabia, the advancement of RDI is underpinned by 5 crucial enablers which are essential for creating a robust & dynamic RDI ecosystem. The RDI policy in KSA provides cohesive direction to improve on these enablers in tandem, ensuring that the overall RDI posture of the Kingdom can advance effectively and sustainably. By addressing each enabler comprehensively, the Kingdom aims to foster innovation, improve public health outcomes, & establish itself as a global leader.

Funding and Investments ensure that adequate financial resources are available to support groundbreaking research and development projects. Human Capital focuses on developing a skilled workforce capable of driving medical advancements & health solutions. Regulations create a conducive environment for innovation by establishing clear guidelines and standards. Ecosystem Infrastructure and Supply Chain facilitate the efficient delivery of health services & the commercialization of new technologies. Linkages & Cultural Promotion emphasize the importance of collaboration and engagement across sectors to drive innovation & improve health outcomes. By enhancing these enablers, KSA is poised to achieve significant progress in its Vision 2030 goals and beyond, leveraging RDI to address critical challenges & promote overall well-being.

Figure 11: Key enablers for fostering and supporting RDI in the health and wellness

Funding & investments

Adequate funding and strategic investments are crucial for fostering innovation, supporting groundbreaking projects, and driving economic growth in the healthcare sector. Financial backbone is necessary for advancing research and development in health and wellness.

Human Capital

Developing a skilled workforce is essential for RDI success. Investing in education, training, and upskilling is at the heart of a robust national talent pool capable of driving advancements in medical research and healthcare technologies.

Regulatory landscape

Effective policies and regulations create a conducive environment for RDI. By establishing clear guidelines and standards, the government can promote innovation, ensure safety and efficacy, and facilitate the smooth implementation of initiatives.

Ecosystem, Infrastructure & Supply Chain

Well-developed infrastructure and efficient supply chain are critical for supporting RDI activities. This enabler ensures that researchers have access to state-of-the-art facilities and that innovations can be quickly and efficiently brought to market.

Linkages and Cultural Promotion

Building strong connections between various stakeholders and promoting a culture of innovation are vital for RDI success. By fostering collaboration and engagement across sectors, the Kingdom can drive significant advancements in health and wellness.

4.1 Funding and investments

Status quo and current efforts

The Kingdom of Saudi Arabia made substantial strides in bolstering its RDI landscape, particularly in the Health and Wellness sector. Significant investments and strategic funding initiatives have driven advancements and fostered innovation within this crucial area. Under Vision 2030, the Government plans to invest over $65B[1] to develop the country's healthcare infrastructure, reorganize and privatize health services and insurance, and launch over 20 “health clusters”[2] across the country, expanding the provision of e-health services. These health clusters are designed to enhance the accessibility and quality of healthcare services, bringing state-of-the-art medical facilities to various regions and ensuring that the population receives high-standard care.

To support RDI in Health and Wellness, the Kingdom launched a variety of funding instruments that provide a comprehensive financial foundation for advancing healthcare research and innovation. These instruments include RDI contracts, grants, institutional spending, talent attraction incentives, and private sector stimulus. RDI contracts involve launching projects through third-party agreements to achieve predefined objectives, ensuring focused efforts in specific research areas. Grants offer financial awards for research across the RDI value chain, targeting both individuals and institutions. Institutional spending allocates funds to governmental entities for their own RDI activities, incentivized through the annual budgeting cycle. Talent attraction incentives aim to close the local talent gap by offering competitive packages to international researchers. Additionally, private sector stimulus and funding are crucial for driving investments from multinational corporations, large local players, SMEs, and startups, complemented by third sector funding from NGOs and non-profit organizations. These diverse funding categories ensure that all aspects of RDI are supported in KSA.

The Ministry of Health (MoH) was at the forefront of these efforts, implementing various initiatives to support RDI activities. These include grants and funding for research projects focused on public health, disease prevention, and medical treatments. Institutions such as the Saudi National Institute of Health (SNIH) and the King Abdulaziz City for Science and Technology (KACST), play a pivotal role in driving forward the Kingdom’s health and wellness agenda by fostering a culture of scientific excellence and innovation. The institute is a health research enabler focused on clinical trials and translational research, serving as a funding entity with all its activities being extramural, while KACST operates as a national lab, executing research activities in collaboration with institutions like King Saud University (KSU) and the King Faisal Specialist Hospital Research Center (KFSH&RC).

Figure 12: Diverse Funding Instruments Driving RDI in Health and Wellness

Source	Funding Instrument	Description
Public sector	RDI contracts	Funding model, whereby RDI projects are launched through a RFP & executed through a contract with 3rd party to achieve predefined objective; focused contacts cover relevant research area with little current RDI contracting
	Grants	Financial awards provided to applicants within predefined research areas (to be tailored per mission) across RDI value chain (e.g., basic & applied science grants) and potential beneficiaries (e.g., HEIs[2] , private sector, individuals)
	Institutional spending	Funds disbursed to governmental entities incl. HEI[2] and ministries for RDI purposes (e.g., own research activities) through an annual MoF budgeting cycle whereby spending on mission activities can be incentivized
	Talent attraction incentives	Funding to close the local RDI talent gap with international talent in KSA through various incentives covering salary, housing, and education
	Private sector stimulus	Funding vehicles to stimulate RDI investment from the private sector through various incentive programs (Incl. matching funds incentives to hire researchers, tax offsets, entrepreneur attraction)
Other sector	Private sector funding	Private sector investments from multinational corporations, large local players, SMEs, and startups on RDI in research areas specific to RDIA missions
	Third sector funding	Third sector investments from non-governmental and non-profit organizations on RDI in the research areas specific to RDIA missions

Source: 1. Alpen Capital report; 2. Saudi Gazette

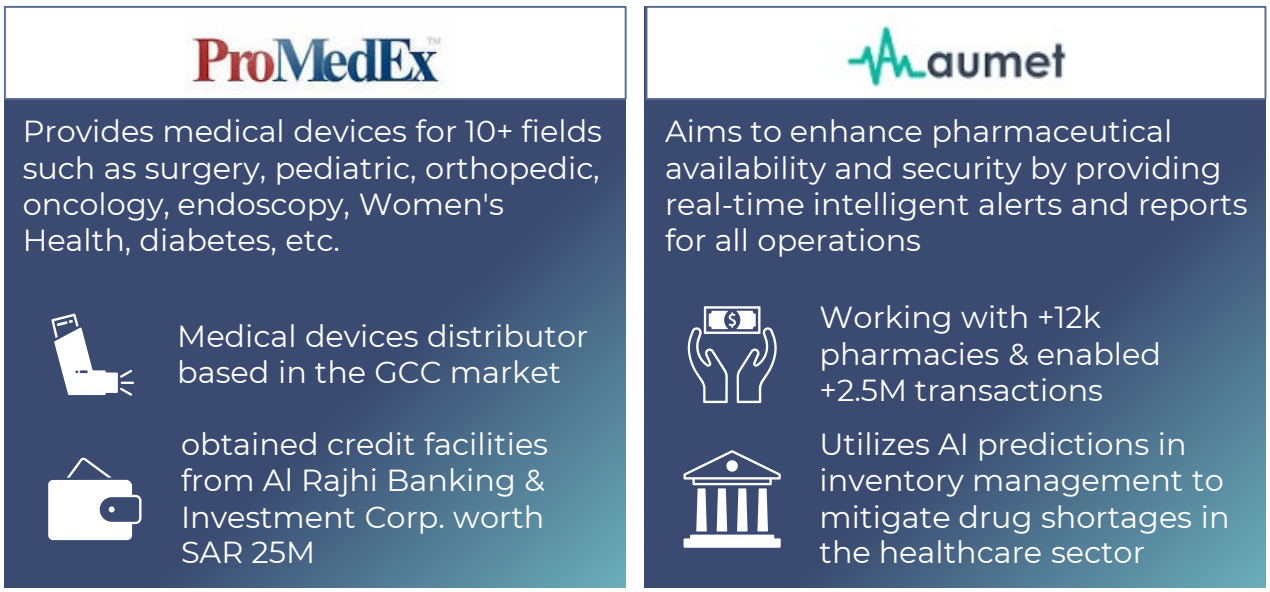
Grants offer benefits that extend beyond the scientific community in the Kingdom. Grant programs like the Saudi Basic Science (SBS) initiative and Saudi Applied Research and Technology (SART) support fundamental scientific research and applied technology development activities. The SBS initiative is divided into specific tracks: Young Scholars Grant (YSG), Basic Science Grant (BSG), and Research Consortium Grant (RCG). The Technology Development Grant under SART awards funds of up to $2.6M (SAR 10M) [1] over a period of 5 years. These initiatives are aimed at expanding the pool of talented researchers and enhancing their participation in areas leading to the next generation of breakthroughs. Additionally, the Startup Innovation Grant Program (SIGP) provides non-dilutive grant funding to stimulate RDI in startups & SMEs, linked to demand challenges.

Institutional funding represents a significant portion of the Kingdom's RDI expenditure, focused on funding varied areas within the ecosystem. RDIA launched the Research Lab Support Program, which aims to disperse over $48M (SAR 180M) [2] to 30 entities overseeing more than 80 research labs across the Kingdom (across the 4 focus areas). Notable institutions like King Faisal Specialist Hospital and Research Center (KFSH&RC) and King Abdullah International Medical Research Center (KAIMRC) have been at the forefront of health and wellness research, supported by government grants and internal funding mechanisms. These institutions have been key players in developing advanced medical technologies and conducting groundbreaking research to address prevalent health issues in Saudi Arabia.

Total venture capital (VC) investment in the Saudi Health and Wellness plays saw significant growth, driven by an increasing number of deals and higher capital investments. In 2023, health startups attracted $1.4B (SAR 5.25B)[3] in venture capital funding across +100 deals, marking a 33% year-over-year growth. To date, ~200 startups[4] are active in the health and wellness segment. Major VC funds and funding entities such as Saudi Aramco's Wa'ed Ventures, TVM Capital Healthcare, 500 Global, Banque Saudi Fransi, have been instrumental in funding health tech startups. Focus is on supporting innovative solutions that address critical health challenges in the Kingdom and beyond. The private sector also showed a growing interest, with investments from corporations and national champions.

Notable examples of startups which raised funding include ProMedEx (medical devices distributor operating across the Gulf Cooperation Council (GCC) market) and Aumet (a B2B healthcare solution provider). ProMedEx provides medical devices for +10 fields such as surgery, pediatric, orthopedic, oncology, endoscopy, Women's Health, diabetes, etc. It obtained credit facilities from Al Rajhi Banking & Investment Corporation worth $6.7M (SAR 25M) [5]. Aumet solutions aim to enhance pharmaceutical availability and security by providing real-time intelligent alerts and reports for all operations. Additionally, it utilizes AI predictions in inventory management to mitigate drug shortages in the healthcare sector. Aumet is working with +12k pharmacies and enabled +2.5M transactions [6].

Figure 13: Numerous startups are making significant strides in the health and wellness sector, pioneering groundbreaking advancements



Source: 1. Saudi Applied Research and Technology documents; 2. RDIA plan 2024; 3. MagniTT; 4. MagniTT; 5. Zawya; 6. Aumet website

Outlook for funding and investments

Looking forward, the Kingdom of Saudi Arabia aims to continue its progress by increasing overall RDI spending and leveraging RDI to solve critical health and wellness problems. Concrete steps have been taken to provide policy direction, such as the announcement of new national funding guidelines for government entities and the planned launch of a performance-based institutional funding model. **These guidelines will ensure a more efficient allocation of resources, transitioning from traditional institutional funding to more competitive funding mechanisms.** This shift aims to increase the efficiency of spending and ensure that financial resources are directed towards the most promising and impactful RDI projects.

Several initiatives will be worked upon to strengthen funding and investments. These include the reactivation and rebuilding of grants for existing Saudi labs, the introduction of the Saudi Basic Science Initiative and the Saudi Applied Research and Technology Initiative for project-level funding. Such initiatives are designed to provide stable and sustainable RDI funding, ensuring continuous support.

For grants, future initiatives will focus on potential research topics highlighted under the missions specified for Health and Wellness. These targeted grants will drive innovation in key areas, ensuring that funding is directed towards projects with the highest potential for impact. Additionally, the Startup Innovation Grant Program (SIGP) will continue to support startups and SMEs, fostering a dynamic and innovative ecosystem. The reactivation and rebuilding grants for existing labs across the country will also ensure that these facilities remain at the cutting edge of research and development.

Venture capital investments are projected to increase, with a focus on funding health and wellness startups specializing in deep tech, such as AI for health and digital health solutions. This will enable the development and commercialization of cutting-edge technologies, positioning the Kingdom as a leader in digital health innovation. Private sector investments will be stimulated through various incentive programs, including matching funds incentives to hire researchers, tax offsets, and entrepreneur attraction. These efforts will create a favorable environment for private sector participation, driving significant advancements in health and wellness RDI.

The National Incentives Committee (NIC) will provide a comprehensive list of existing incentives tailored to the biotech sector, including cash grants, preferential loans, VAT and import exemptions, tax reductions, and tax credits. These incentives will create a favorable environment for private sector participation, driving significant advancements in health and wellness RDI. Additionally, third sector funding will continue to play a crucial role in supporting targeted RDI initiatives. Multiple NGOs and non-profits are actively funding RDI projects in specific areas, complementing public and private sector efforts.

Hevolution Foundation, with an annual budget of up to $1B (SAR3.75B), is investing in grants for aging research and pioneering impact investments in early-stage biotech. Additionally, Hevolution actively funds startups and supports research efforts by individual researchers whose work aligns with its goals of advancing longevity and wellness. These efforts will complement government and private sector initiatives, ensuring a holistic approach to advancing health and wellness in Saudi Arabia. By leveraging these diverse funding sources and implementing strategic policy directions, the Kingdom can drive significant progress toward its Vision 2030 goals and beyond. These efforts will improve public health outcomes and establish the Kingdom as a global leader.

SNIH also provides substantial RDI funding opportunities through grants, which are designed to support researchers and institutions in conducting high-impact studies. These grants are focused on areas such as public health, precision medicine, and innovative medical technologies. By prioritizing health research aligned with national objectives, SNIH enables the Kingdom to stay at the forefront of global medical advancements, ensuring that health RDI contributes not only to improving public health outcomes but also to economic prosperity and sustainable national development. SNIH will contribute to raising national income by developing locally manufactured products for prevention, diagnosis and treatment. SNIH will also support clinical trials in different strategic health priorities like diabetes, cancer, cardiovascular diseases.

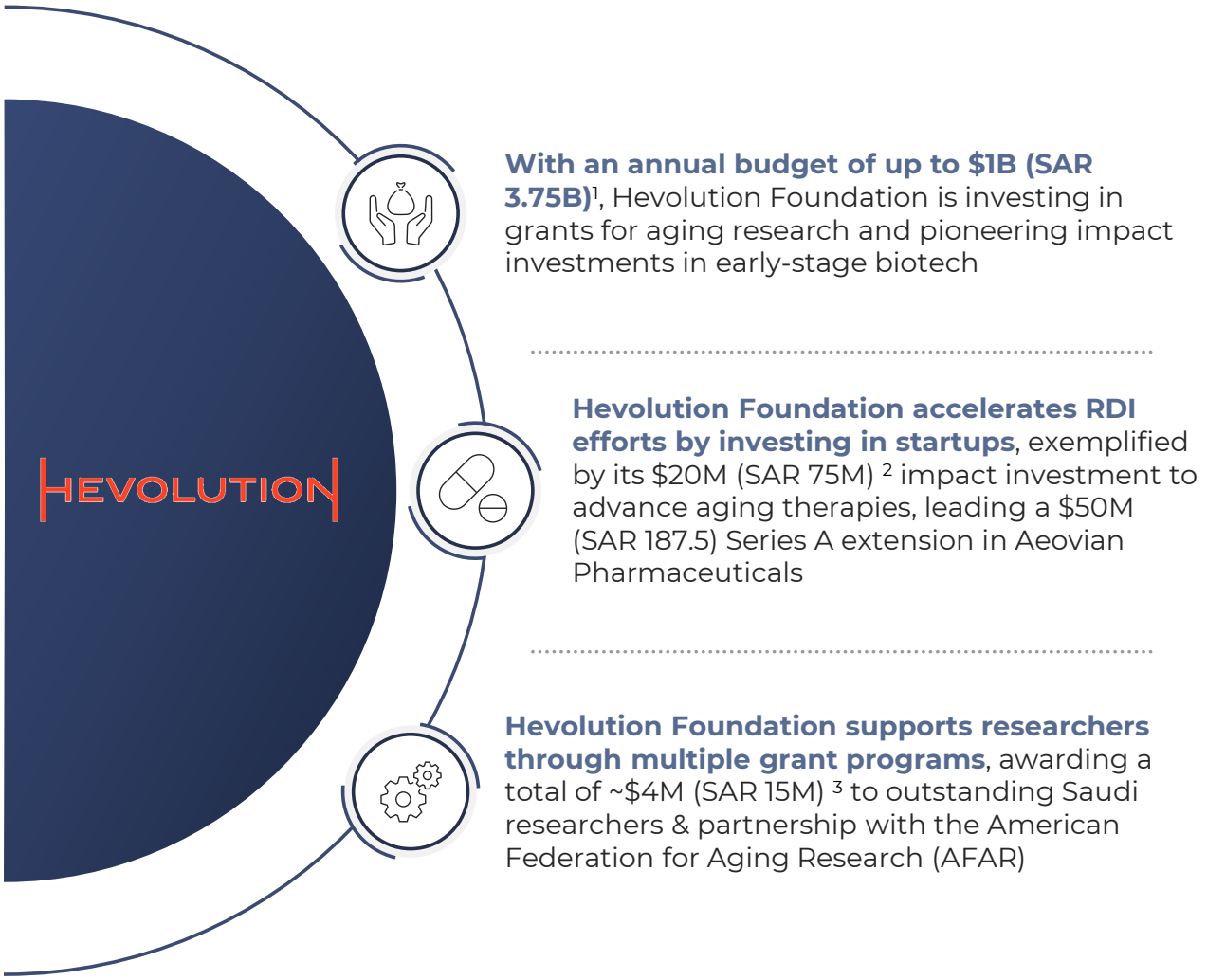
We will advance efforts across all Technology Readiness Levels (TRLs) to ensure both research breakthroughs and successful commercialization that drive economic impact and GDP growth. Special focus will be placed on the critical transitions from TRL3 to TRL6 and from TRL6 to TRL9, where collaboration with venture funds will play a pivotal role in scaling innovation.

In the future, the Kingdom of Saudi Arabia plans to establish a more dynamic and flexible RDI funding ecosystem by integrating policy guardrails that ensure strategic alignment with national health goals. The policy direction will emphasize the need for a balanced distribution of funds across the RDI value chain, ensuring that resources are allocated efficiently to support the entire lifecycle of innovation from discovery to deployment. This strategic alignment will ensure that all stages of research, development, and commercialization are adequately funded, promoting a holistic approach to health and wellness innovation. Moreover, a significant focus will be on fostering an environment that encourages international collaborations and partnerships. By aligning with global best practices and establishing robust frameworks for international research cooperation, the Kingdom aims to attract top-tier global talent and leverage international expertise. By fostering partnerships between research institutions and industry, Saudi Arabia will bridge the gap between discovery and market-ready solutions, ensuring sustainable development.

Clinical Trials Funding Program by SNIH offers long-term support for transformative and rapid-response research, focusing on product development, medications, and health system improvements of national strategic importance. The program funds Clinical Trial Planning, Randomized Controlled Trials, and the development of new health research technologies and prototypes, driving innovation in healthcare solutions.

Additionally, the Kingdom will continue to prioritize transparency and accountability in its funding and investment strategies. This will involve the implementation of rigorous performance management frameworks and risk management mechanisms to track the progress and impact of RDI spending. Regular evaluations and audits will ensure that funded projects meet their objectives and contribute to the broader health and wellness goals of Vision 2030. By maintaining a transparent and accountable funding system, the Kingdom will foster a culture of excellence and continuous improvement, ensuring that its RDI initiatives deliver tangible benefits to the population and contribute to global health advancements.

Figure 14: Hevolution is focused on advancing anti-aging and longevity research to enhance healthy lifespan



Source: 1, 2, 3. Hevolution web portal

4.2 Human Capital

Status Quo and Current Efforts

Human capital is at the cornerstone of RDI in the Health and Wellness sector, and the Kingdom of Saudi Arabia undertook substantial efforts to develop a robust and skilled workforce to drive advancements in medical research and healthcare solutions. The Kingdom boasts a growing number of researchers and support staff dedicated to advancing medical research and healthcare technologies. From 2019 to 2023, the number of active researchers in Health and Wellness doubled, reaching approximately 27,000 by 2023. These professionals are distributed across various subdomains, including drug development, clinical research, biotechnology, and public health. However, to ensure the continuous development and upskilling of its RDI workforce, policy changes are needed to enhance training programs, attract global talent, and streamline processes.

To address these needs, KSA implemented several comprehensive training and upskilling programs. Initiatives like Mawhiba focus on nurturing young talent in STEM fields, providing specialized training and mentorship to high-potential students. Institutions like KACST and KAIMRC offer post-doctoral fellowships to enhance research capabilities and foster a culture of excellence in health and wellness research. Additionally, regular professional development workshops and seminars are conducted to update researchers on the latest advancements in medical research and healthcare technologies. The Ministry of Education's Research and Development Office launched a post-doctoral program to promote the creation of post-doctoral research positions. Monsha'at offers programs to upskill entrepreneurs and SME owners and to provide mentorship, while the Saudi Digital Academy, launched by the Ministry of Communications and Information Technology (MCIT), aims to upskill Saudi youth for future jobs.

The Kingdom introduced several initiatives to attract and retain top global talent. The Premium Residency Program offers long-term residency options for highly skilled international researchers, making it easier for them to live and work in the KIngdom. The visa process for researchers is being streamlined to ensure a smooth and efficient application process for international talent. Competitive salaries and benefits are offered to attract high-caliber researchers and support staff, making the Kingdom an attractive destination for global talent. The Kingdom also partnered with the National Institute for Health (NIH) to facilitate collaborative research under the MENA-NIH Visiting Post-Doctoral Fellowship Program.

Figure 15: The Kingdom showed significant progress in improving human capital and achieving RDI outputs

Source: 1, 2, 3: RDIA and Elsevier publication on "Saudi Arabia's Leap in Research and Development Excellence" (2023)

Scholarships play a crucial role in developing local talent and supporting advanced education in health and wellness. The King Abdullah Scholarship Program provides scholarships for Saudi students to pursue higher education in top universities worldwide, with a focus on health and medical fields. Additionally, institutions like KFSH&RC and KAIMRC offer scholarships for students pursuing degrees in medical and health sciences, ensuring a steady pipeline of skilled professionals. However, a policy shift towards more targeted scholarships is needed to address specific health challenges unique to the Kingdom, such as high obesity rates and rising non-communicable diseases (NCDs).

Saudi National Institute of Health (SNIH) is committed to building a robust, knowledge-driven infrastructure by offering comprehensive Innovation Training Programs. These programs are designed to empower researchers, innovators, and stakeholders with critical skills in innovation management, market analysis, and technology utilization. Covering key topics such as design thinking, corporate venturing, and biomanufacturing readiness, these programs equip participants to drive impactful innovation and align with global market trends. The SNIH's training packages, registered with the Saudi Authority for Intellectual Property (SAIP), play a crucial role in enhancing the Kingdom's human capital and fostering a thriving innovation ecosystem.

The development of human capital in health and wellness is supported by several key institutions and programs. Digital upskilling of government employees is being conducted by the Digital Government Authority to support the adoption of technology solutions. King Faisal Specialist Hospital and Research Center (KFSH&RC) offers extensive training and research opportunities in clinical and biomedical sciences. King Abdullah International Medical Research Center (KAIMRC) focuses on translational research and provides specialized training programs for researchers and healthcare professionals, including the Residents Research Program (RRP), Clinical Research Coordinator Program (CRC), Research Methodology Course and workshop, Good Clinical Practice (ICH-GCP), and Research Summer School (RSS). The Kingdom is also prioritizing the training of healthcare professionals in global standards of RDI to advance innovative solutions in health.

Figure 16: Select examples of Saudi programs enhancing human capital

Source: Ministry of Health, press search

Outlook for human capital

The Kingdom of Saudi Arabia aims to further enhance its human capital in the Health and Wellness sector by increasing investments in education, training, and professional development. As part of the policy directive, the Kingdom plans to expand existing training programs and introduce new initiatives to ensure that the workforce remains at the forefront of health and wellness advancements. The focus will be on developing specialized training programs in emerging fields such as digital health, genomics, and personalized medicine, directly aligned with the missions specified for Health and Wellness.

KSA plans to foster greater collaboration between academia, industry, and government institutions to create a more integrated and innovative RDI ecosystem. By establishing partnerships with leading global universities and research institutions, the Kingdom aims to attract top-tier talent and leverage international expertise. This will be supported by initiatives like the Saudi Genome Program, which seeks to sequence the genomes of Saudi citizens to identify genetic disorders and develop personalized treatments. Scholarships will be leveraged to attract researchers to contribute to areas specific to KSA, addressing challenges like high obesity rates and rising NCDs.

The Kingdom will continue to streamline the visa process and enhance the Premium Residency Program to attract and retain highly skilled international researchers. Competitive salaries and benefits will be maintained to ensure that KSA remains an attractive destination for global talent. Additionally, the government will focus on creating a supportive environment for researchers, providing state-of-the-art facilities, and ensuring access to advanced research infrastructure. As a policy directive, Saudi Arabia will also strive to become a global research hub by attracting foreign researchers through targeted initiatives and incentives.

To further promote a culture of innovation, the Kingdom is investing in continuous professional development for researchers and healthcare professionals. This includes regular workshops, seminars, and training programs to keep the workforce updated on the latest advancements in medical research and healthcare technologies. By fostering a culture encouraging creativity and innovation, the Kingdom can ensure that its workforce remains competitive on the global stage. Policy directions will focus on nurturing a dynamic and resilient workforce capable of driving the Kingdom’s health and wellness agenda forward.

The Kingdom also plans to optimize the distribution of human capital across the RDI value chain of Discover, Develop, and Deploy. This will involve assessing the maturity of different RDI technologies and allocating resources accordingly. By ensuring that talent is directed to areas where it can have the most significant impact, Saudi Arabia can support the entire lifecycle of innovation, from initial discovery to market deployment. Strategic policy directions will ensure that human capital development aligns with national health priorities and contributes to sustainable growth and innovation.

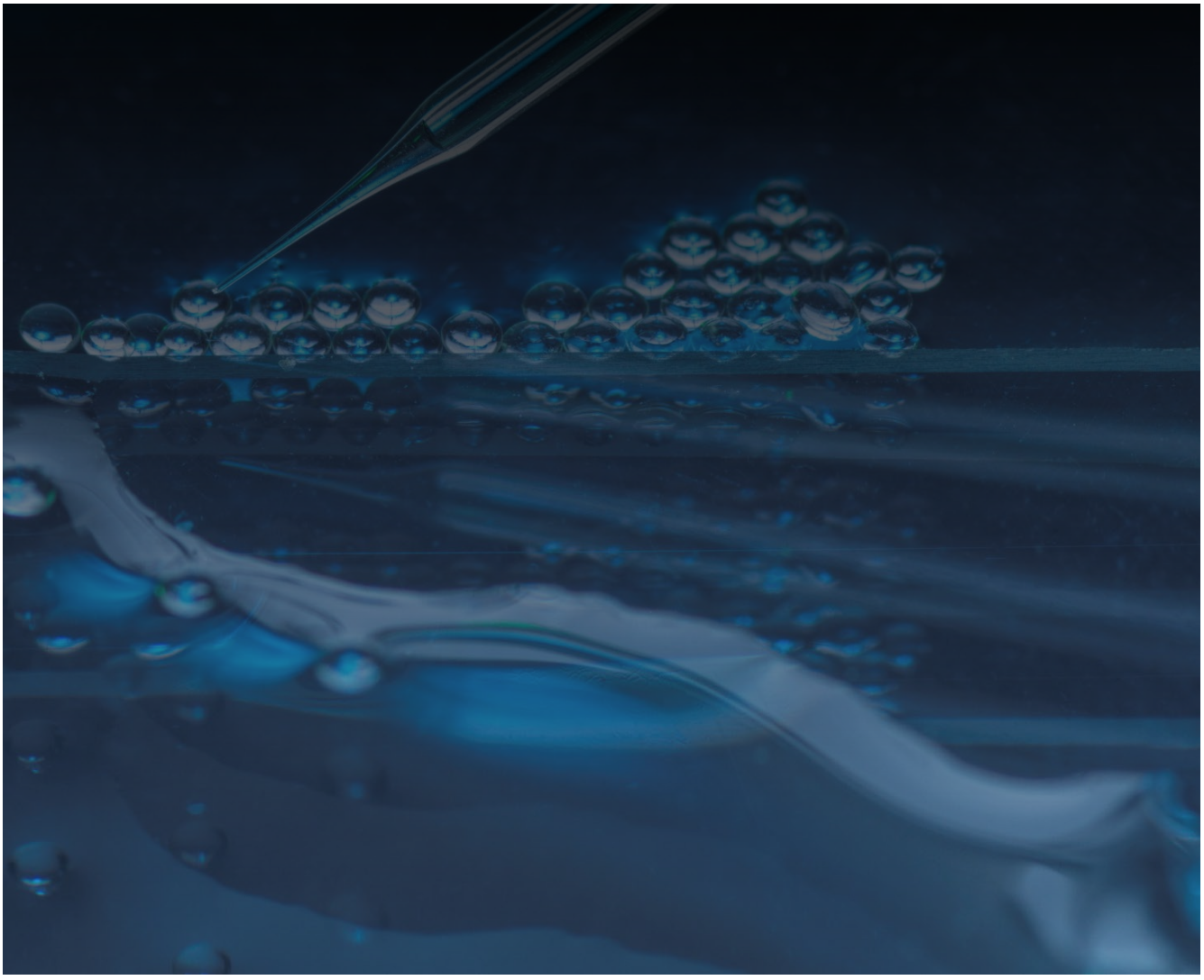
SNIH will continue its efforts towards advancing human capital by offering tailored educational programs that meet the specific needs of departments, academic units, and organizations. Activity customization ensures that educational activities on a variety of research topics are designed and delivered by experts to address the unique requirements of each entity. In addition, on-demand educational activities are provided throughout the year, focusing on critical health research topics to close capacity gaps and enhance the skills and competencies of health researchers and practitioners. Through its Career Development support, SNIH empowers Saudi researchers with the guidance and experience needed to acquire essential skills, broaden their horizons, and maximize their professional potential in the research field.

These guiding principles are crucial for steering the Kingdom's RDI efforts in the Health and Wellness sector. By increasing investments in human capital, fostering public-private collaborations, streamlining processes to attract global talent, and promoting a culture of innovation, the Kingdom can drive significant progress towards its Vision 2030 goals.

SNIH offers a range of training programs designed to equip researchers and healthcare professionals with the skills necessary to advance health research in the Kingdom. The **Research Certification Program (RCP)** provides participants with the essential skills to successfully run research projects, ensuring that they are fully prepared for the challenges of conducting high-quality research. The **Research Fellowship Program (RFP)** focuses on the development of future researchers by providing clinical research training to healthcare practitioners and clinical researchers, fostering the next generation of research leaders. Additionally, the **Research Mentorship Program (RMP)** offers participants the opportunity to engage in various research activities while being mentored by experienced professionals, facilitating hands-on learning and knowledge transfer to build a robust research ecosystem in the Kingdom.

Developing human capital is essential for improving the Kingdom's RDI capabilities, as it ensures that the healthcare sector is equipped with skilled professionals who can drive innovation and translate research into practical applications. This focus on human capital will also enhance the quality of health delivery, enabling more effective and efficient healthcare services that directly benefit the population. These efforts will not only improve public health outcomes but also position Saudi Arabia as a global leader in health and wellness innovation.

The Kingdom’s vision of enhancing human capabilities is central to driving the future of RDI in Health and Wellness. With contributions from multiple organizations, Saudi Arabia is positioning itself as a global leader in human capital development, ensuring a highly skilled workforce that fuels innovation and transformative advancements in healthcare. This collective effort will be instrumental in realizing significant breakthroughs in health and wellness, driving progress and improving the quality of life for generations to come.



4.3 Regulatory landscape

Status Quo and Current Efforts

Over the past few years, the Kingdom of Saudi Arabia introduced several key regulations to strengthen the RDI ecosystem in Health and Wellness. The health law in Saudi Arabia aims to provide comprehensive healthcare for all people in a fair and accessible manner. One of the major regulatory frameworks is the establishment of the National Intellectual Property Strategy, which aims to create a conducive environment for innovation by protecting intellectual property rights. The Saudi Health Sector Transformation Program (HSTP) abides by a comprehensive system of public policies to ensure the sustainability of reforms and increase spending efficiency. Additionally, the Clinical Trials Regulation was introduced to streamline and standardize the approval process for clinical research, ensuring safety and efficacy in medical studies.

Several government agencies and regulatory bodies are instrumental in facilitating RDI. The Ministry of Health (MoH) is the custodian of the sector and actively promotes health RDI by implementing policies and providing grants. The Research Development and Innovation Authority (RDIA) is the main body responsible for setting RDI priorities, developing strategic plans, and overseeing the implementation of national RDI initiatives. The Saudi Food and Drug Authority (SFDA) plays a critical role in regulating clinical trials and ensuring the safety and efficacy of medical products. The SFDA also governs the manufacturing, distribution, and dispensing of pharmaceutical products to ensure safety, quality, and efficacy. The Saudi Commission for Health Specialties (SCFHS) ensures professional licensing and competency of healthcare practitioners.

Figure 17: The Kingdom has several initiatives to attract foreign talent

الإقامة المميزة
Premium Residency

Premium Residency program
Aims to draw highly skilled individuals and investors to contribute to KSA progress by offering flexible options for housing, settlement and work.

Business investor residency
Targets investors wishing to invest in economic activities in Saudi Arabia, supporting the stability of investors and empowers their businesses to achieve ambitious positive results

Talent residency
Mawhiba residency product targets talents and specialists in the sports, cultural and artistic fields. Works to attract talented people and enable their aspirations towards creativity, innovation and progress

Establishment of exceptional efficiency
Targets attracting talented individuals with scientific, administrative, and research capabilities who have distinguished experiences

Unlimited and fixed-term privileged stay
Includes those interested in settling in the Kingdom for a limited or unlimited period

Property owner's residence
This product is aimed at foreign property owners in the Kingdom

Entrepreneur residency
This product targets entrepreneurs and innovators who wish to work on developing various sectors across the Kingdom

Source: Saudi Premium residency program

The ecosystem introduced multiple initiatives to foster innovation. The Ministry of Human Resources and Social Development (MHRSD) updated local labor policies in 2021, enabling expat mobility without the need for sponsor permission. Policy initiatives like the Premium Residency Program are aimed at attracting and nurturing global research talent. The National Competitiveness Center focuses on improving ease of doing business, with over 300 reforms launched since 2019. The Ministry of Investment (MISA) launched the regional HQ program, offering 100% exemption on corporate income tax (CIT) and Saudization quotas. These efforts are complemented by tax exemptions on R&D export earnings and fees related to participation in exhibitions. Invest in Saudi is a strategic initiative that fosters a favorable regulatory environment. By simplifying regulations and providing robust support to investors, this initiative accelerates the development of cutting-edge healthcare technologies and enhances KSA's position as a global hub for health innovation.

Regulatory sandboxes have been introduced in KSA as part of the Kingdom's effort to encourage RDI by providing a more flexible and conducive regulatory environment. These sandboxes serve as dedicated experimentation schemes where companies can test innovative products, services, or business models with actual customers within a controlled environment. This approach allows for real-time testing and adjustments, reducing the risks associated with traditional regulatory frameworks. The sandboxes also enable regulators to gather necessary data for policy-making and to better understand the legal implications of new technologies, ultimately fostering a culture of innovation while maintaining necessary safeguards .

To promote private sector participation in health and wellness RDI, KSA introduced various incentives and policy mechanisms. These include matching RDI funds to encourage private investments in RDI activities, and RDI value added tax (VAT) waivers for RDI-centric services and products. The Local Content and Government Procurement Authority developed a Local Content Formula to incentivize RDI activities and mandate governmental entities to allocate a minimum budget for R&D tenders. Additionally, the National Incentives Committee (NIC) provides a list of existing incentives tailored to the biotech sector, comprising cash grants, preferential loans, VAT and import exemptions, tax reductions, or tax credits. Despite these efforts, there is a recognized need for policy shifts towards more open and inclusive regulations, particularly in attracting international researchers and fostering a more collaborative RDI environment.

Outlook for regulatory landscape

As the Kingdom of Saudi Arabia looks towards the future, the Kingdom is committed to refining and enhancing its policy and regulatory framework to accelerate RDI in the Health and Wellness sector. The establishment of the Research, Development, and Innovation Authority (RDIA) as the central policy and funding body for RDI marks a significant milestone in creating a cohesive and integrated RDI ecosystem. This centralized approach will ensure that policies are effectively implemented, resources are utilized efficiently, and strategic goals are consistently met. By consolidating the oversight of RDI initiatives under one umbrella, the RDIA will streamline decision-making processes, reduce bureaucratic hurdles, and foster a more agile and responsive regulatory environment.

A key component of this forward-looking strategy is the commitment to increased and stable spending on RDI. The Kingdom plans to allocate substantial funds to support cutting-edge research, the development of advanced medical technologies, and the creation of innovative healthcare solutions. This stable funding environment is essential for enabling long-term RDI projects that require sustained financial support. By ensuring continuous investment in health and wellness RDI, KSA will drive ongoing innovation and make significant strides in improving public health outcomes. The government’s commitment to consistent funding reflects its recognition that long-term financial support is crucial for fostering breakthrough discoveries and advancements that can transform the healthcare landscape.

In addition to stable funding, the Kingdom of Saudi Arabia is placing a strong emphasis on enhancing private sector participation through targeted incentives and supportive policies. By fostering Public-Private Partnerships (PPPs), the government aims to leverage the efficiencies, expertise, and financial resources of the private sector to accelerate the development and deployment of innovative health solutions. These partnerships will play a critical role in ensuring that resources are utilized effectively and that the most promising RDI projects receive the support they need to succeed. The collaboration between public and private entities will lead to more impactful outcomes and will drive significant advancements in the health sector, ultimately benefiting the entire population.

A significant shift towards performance-based funding is also on the horizon, moving away from traditional institutional funding models. This approach will involve awarding funds based on competition and merit, ensuring that financial resources are allocated to the most promising and impactful RDI projects. Performance-based funding is expected to increase accountability, drive targeted efforts, and foster a culture of excellence and innovation within the RDI ecosystem. By rewarding high-performing projects, this funding model will incentivize researchers and institutions to pursue ambitious goals and deliver results that have a tangible impact on public health.

Furthermore, the Kingdom will focus on optimizing the distribution of funds across the entire RDI value chain, from Discover to Develop to Deploy. Recognizing that different RDI technologies are at varying levels of maturity, the Kingdom will allocate funds based on a thorough assessment of each technology's stage of development. This strategic allocation of resources ensures that investments are directed to areas where they can have the most significant impact, supporting the entire lifecycle of innovation—from initial discovery and research to development and market deployment. By carefully managing the flow of funds across the RDI value chain, Saudi Arabia will maximize the effectiveness of its investments and ensure that innovations reach the market in a timely and efficient manner.

To further bolster RDI efforts, the Kingdom will prioritize the pooling of resources and the creation of innovation districts and clusters. These clusters will serve as dynamic environments where researchers, businesses, and institutions can collaborate and share resources. By facilitating collaboration and resource sharing, these innovation districts will accelerate the development of new health solutions and drive the commercialization of cutting-edge technologies. These initiatives will also include the establishment of state-of-the-art RDI spaces and infrastructure, the implementation of open-door ecosystems for immigration and visa policies, and the development of robust intellectual property (IP) and patent legal frameworks. These measures are designed to create a thriving ecosystem that supports innovation and attracts top-tier talent and international partnerships.

Moreover, the Kingdom is committed to fostering an open and inclusive culture of RDI. As part of its policy directives, the Kingdom will provide open access to a wide range of labs and research facilities for both local and international researchers. By promoting an open RDI environment, Saudi Arabia aims to become a global research hub, attracting top-tier international researchers and fostering a culture of collaboration and innovation. This inclusive approach is designed to ensure that the Kingdom remains at the cutting edge of global health innovation and that the benefits of RDI are shared widely. These comprehensive policy directions and strategic initiatives will provide the necessary guardrails to steer KSA's RDI efforts in the Health and Wellness sector. By increasing RDI spending, fostering public-private collaborations, transitioning to performance-based funding, and optimizing resource allocation across the RDI value chain, the Kingdom is well-positioned to achieve its Vision 2030 goals. These efforts will not only enhance public health outcomes but also establish the Kingdom as a global leader in health and wellness innovation. By creating a sustainable and advanced healthcare ecosystem, Saudi Arabia will ensure that it remains a key player on the global stage, driving progress and innovation in health and wellness for years to come.

4.4 Ecosystem infrastructure and supply chain

Status Quo and Current Efforts

The Kingdom of Saudi Arabia made significant strides in developing a robust talent, and facilitate collaboration across various stakeholders in the healthcare sector. ecosystem and infrastructure to support RDI in the Health and Wellness sector. These efforts are crucial to the Kingdom's Vision 2030, which seeks to transform the nation into a global hub for healthcare innovation. The Kingdom's strategy includes increasing private sector contributions to RDI funding and privatizing hospitals and primary health centers. These ambitious goals are supported by a strong existing infrastructure that is already contributing to advanced medical research and healthcare solutions. However, there is a recognized need for further policy enhancements to create a more open RDI environment, attract global

The Kingdom's infrastructure includes an array of advanced laboratories and research centers dedicated to health and wellness. Leading institutions such as King Faisal Specialist Hospital and Research Center (KFSH&RC), King Fahad Medical City (KFMC), and King Abdullah International Medical Research Center (KAIMRC) are equipped with state-of-the-art facilities that enable high-quality biomedical research. These institutions are central to the Kingdom's RDI efforts, driving advancements in areas such as genomics, oncology, and regenerative medicine. Nationwide initiatives are also underway to activate additional laboratories across universities with government funding, further expanding KSA's research capabilities. These labs are vital for conducting cutting-edge research and developing innovative healthcare solutions that address both local and global health challenges. However, there is a need to improve access to these facilities, ensuring that a broader range of researchers and innovators can utilize these resources. By promoting an open and collaborative research environment, the Kingdom can maximize the impact of its investments in RDI infrastructure.

In addition to these laboratories, KSA established over 120 specialized research centers to enhance its RDI capabilities. The Saudi National Institute of Health (SNIH) plays the enabler role, coordinating and funding national health research initiatives, focusing on areas such as infectious diseases, chronic illnesses, and emerging health threats. KACST supports a wide range of scientific and medical research activities, including pioneering work in biotechnology, nanotechnology, and space sciences.

Figure 18: Saudi Arabia has a strong network of infrastructure to support RDI

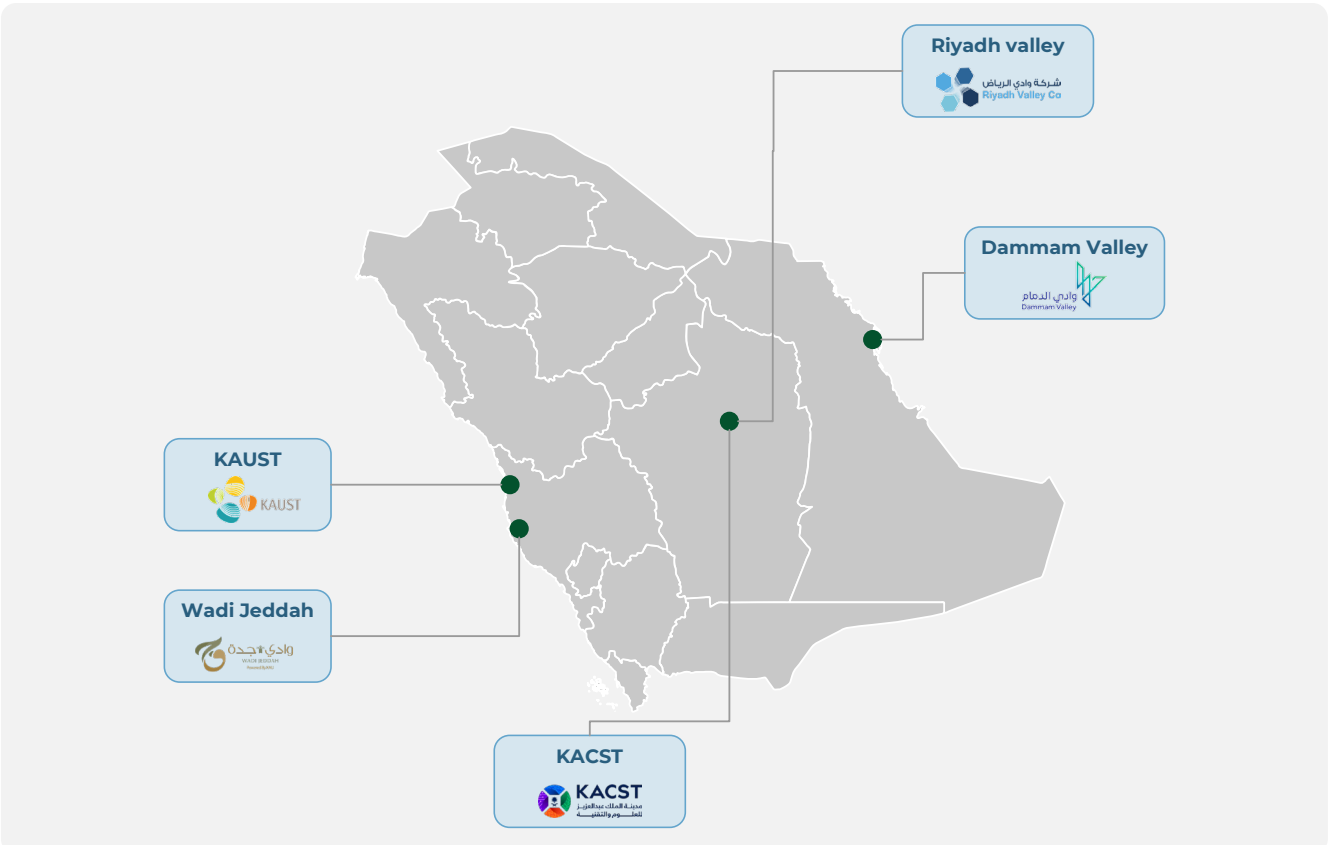
Source: 1: RDIA "Reactivating & Rebuilding of Existing Labs Initiative" (2023), 2: Tracxn database, 3: Press search

The Ministry of Health (MoH) is also taking significant steps to improve healthcare delivery by launching health clusters across the country, each designed to serve approximately 1 million people. These clusters aim to promote preventive and integrated care, ensuring that healthcare services are accessible to a larger segment of the population. The Riyadh First Health Cluster and the Riyadh Second Health Cluster are the initial implementations of this model, with more clusters planned for the future. These clusters will be integral to the Kingdom's strategy to enhance healthcare access, improve patient outcomes, and foster a more coordinated approach to healthcare delivery. King Saud University's Medical Research Center is another key player, contributing to various health-related studies and innovations.

Saudi National Institute of Health (SNIH) acts as an enabler of the clinical trial ecosystem in The Kingdom of Saudi Arabia, through contributing to the coordination and collaboration among relevant stakeholders in the field of clinical trials, enhancing the utilization of the infrastructure related to clinical trials, funding and ensuring the quality and efficiency of their outputs. As well as facilitating regulatory framework of clinical trials. Moreover, SNIH Provides investment opportunities for the private sector in clinical trials, aiming to create an attractive ecosystem and being the regional hub for clinical trials.

Innovation in healthcare is further supported by the development of technology and science parks, which serve as hubs for research and collaboration. The King Abdullah Economic City (KAEC) is one such hub, offering a conducive environment for research and development activities. The city provides modern laboratories, office spaces, and collaboration areas that facilitate interdisciplinary research and innovation. This environment is designed to attract global companies, research institutions, and startups, creating a vibrant ecosystem for healthcare innovation. Another key initiative is the establishment of the Madina health tech hub, which aims to create a dynamic innovation ecosystem for healthcare. This hub will bring together researchers, healthcare professionals, and technology experts to develop and implement innovative solutions that address Saudi Arabia's most pressing health challenges. These science parks and innovation hubs are essential components of the Kingdom's efforts to build a world-class RDI ecosystem in health and wellness.

Figure 19: Multiple innovation clusters focused on Health and Wellness launching across the Kingdom



Outlook for Ecosystem infrastructure and supply chain

The Kingdom of Saudi Arabia is set to further enhance its ecosystem infrastructure and supply chain to support RDI in Health and Wellness, with a particular focus on initiatives under the Health Sector Transformation Program (HSTP). One of the cornerstone initiatives of this program is the expansion of health clusters across the Kingdom. These clusters are designed to create integrated healthcare ecosystems that bring together healthcare providers, researchers, industry partners, and patients in a collaborative environment. Each health cluster will serve approximately 1 million people, ensuring that state-of-the-art medical facilities and services are accessible to a broad segment of the population. These clusters will focus on promoting preventive care, integrating health services, and enhancing the overall quality of care. By facilitating collaboration among various stakeholders, these clusters will play a critical role in advancing RDI efforts, fostering innovation, and improving health outcomes across the Kingdom.

The Kingdom's future infrastructure development will also place a strong emphasis on digital health technologies. The Ministry of Health's e-Health strategy is set to leverage telemedicine, AI, and big data analytics to improve the accessibility and quality of healthcare, particularly in remote and underserved areas. The Seha Virtual Hospital, launched in 2022, is already the largest e-health provider of its kind in the world, remotely supporting 130 hospitals and providing over 30 specialized services. The National Healthcare Command Center (NHCC) will continue to serve as the authoritative hub for national healthcare system data, enabling advanced analysis and informed decision-making. This digital transformation is expected to enhance patient outcomes, streamline healthcare delivery, and position KSA as a leader in digital health innovation.

In addition to digital health infrastructure, KSA plans to expand its network of incubators and accelerators to support the growth of startups and early-stage companies in the health and wellness sector. Programs like the KAUST Innovation Fund and the Taqadam startup accelerator have already played a crucial role in nurturing health tech companies, providing essential resources, mentorship, and funding. The Ministry of Health is also planning to establish an incubator focused specifically on digital health solutions, further strengthening the Kingdom's position as a hub for healthcare innovation. These incubators will be complemented by additional facilities for testing and prototyping, enabling researchers to validate their innovations in real-world scenarios. Institutions like KFSH&RC and KAIMRC will continue to provide comprehensive testing and prototyping services, ensuring that new medical products are safe, effective, and ready for market deployment.

To support the growing demands of RDI, the Kingdom is investing heavily in computational facilities and data centers. The King Abdulaziz City for Science and Technology (KACST) is home to high-performance computing resources able to facilitate large-scale data analysis and bioinformatics research. These facilities are crucial for supporting advanced research in genomics, personalized medicine, and other cutting-edge areas of health and wellness.

Source: 1: International Trade Administration report; 2. Wired Middle East

The expansion of these computational resources will ensure that the Kingdom of Saudi Arabia remains at the forefront of global health innovation, providing researchers with the tools they need to tackle the most complex health challenges.

Infrastructure and Capacity Grants by SNIH provide essential resources to maintain and enhance the quality of health research across a full spectrum, from bench-to-bedside innovations to policy-focused research programs. Through these grants, governmental, profit, and nonprofit organizations can strengthen their research capabilities and contribute to advancements in healthcare solutions, ensuring a robust and impactful health research ecosystem.

Furthermore, Saudi Arabia is committed to fostering an open and inclusive RDI environment. The Kingdom is implementing policies that promote open access to its RDI infrastructure, including laboratories, research centers, and innovation hubs. This approach aims to facilitate the free flow of ideas, attract global talent, and encourage international collaboration. By creating an environment that supports the exchange of knowledge and best practices, the Kingdom is positioning itself as a global leader in health and wellness RDI. These efforts will not only enhance the Kingdom's ability to develop cutting-edge healthcare solutions but will also contribute to the global advancement of health and wellness. In conclusion, Saudi Arabia's significant and targeted infrastructure initiatives present an optimistic future for RDI in Health and Wellness. By focusing on the development of health clusters, fostering a collaborative research environment, and leveraging digital health technologies, the Kingdom is well-positioned to create a sustainable and advanced healthcare ecosystem. These efforts will not only improve public health outcomes but will also establish the Kingdom as a global leader in health and wellness innovation, driving progress and setting new standards in the global healthcare landscape. Through continued investment in infrastructure, technology, and talent, Saudi Arabia is building a foundation for a future where health and wellness are prioritized, and innovation thrives.

4.5 Linkages and cultural promotion

Status Quo and Current Efforts

Significant strides have been made in fostering collaboration and partnerships in the Health and Wellness RDI ecosystem. To enhance collaboration between the public sector, private sector, and academia, the Kingdom of Saudi Arabia implemented several formal mechanisms. One such initiative is the University-Industry Collaboration Initiative, which provides funding to support joint projects between universities & industry players. This initiative encourages the sharing of knowledge, leading to innovative solutions.

The RDI Authority (RDIA) plays a pivotal role in coordinating national RDI efforts, setting strategic priorities, and facilitating partnerships. RDIA's efforts include establishing joint research programs and funding consortia that bring together multiple stakeholders to work on high-impact health and wellness projects. Additionally, the National Science, Technology, and Innovation Plan (NSTIP) supports collaborative RDI activities by providing a bridging platform for various sectors. These platforms and initiatives are crucial for creating a cohesive and integrated RDI ecosystem.

Several platforms and mediums have been established to promote collaboration in the Health and Wellness sector. The Saudi Health Council is a central body that fosters coordination among healthcare providers, researchers, and policymakers. The Health Sector Transformation Program (HSTP) also provides a framework for collaboration by integrating digital health initiatives and supporting joint research projects. The Saudi Genome Program (SGP) represents a distinctive national initiative that harnesses state-of-the-art genomic technologies to effectively reduce the occurrence of genetic diseases. Efforts are underway to execute a nationwide obesity reduction program with Nesta.

There is an increased focus on public-private partnerships (PPP) as well. The Health Holding Company (HHC) plans to introduce private sector participation (PSP) and identified nine priority areas for PPP: primary care, hospitals, medical cities, laboratories, radiology, pharmacies, rehabilitation, long-term care, and home care. The Ministry of Health expects that in the next five years there will be more than 100 public-private partnership (PPP) projects in health services with $12.8B (SAR 48B) in private sector investment. Nineteen PPP projects are currently underway, (total investment of $2.9B [1]).

Clinical Trials Registration Platform by Saudi National Institute of Health collects and centralizes clinical trial data, providing open access to researchers, research centers, and stakeholders. This platform enhances cooperation and communication across the research ecosystem, promoting transparency and collaboration in clinical trials.

KSA hosts several key events and forums that facilitate interactions between researchers, industry professionals, and policymakers in the Health and Wellness sector. The Global Health Exhibition is a prominent event that brings together healthcare leaders to discuss the latest trends and innovations in health. This event provides a platform for networking, knowledge exchange, and collaboration. The Kingdom's international research collaboration also increased significantly, demonstrating extensive global reach and cooperation in research initiatives. The top countries for research collaboration were Egypt, India, and Pakistan, with the United States and China as additional significant contributors globally.

Through formal mechanisms, key platforms, and dedicated events, the Kingdom created a collaborative ecosystem that drives innovation and ensures the sustainable development of healthcare solutions. To motivate researchers and innovators, the Kingdom launched several recognition programs and awards such as the King Faisal Prize for Medicine, Ada'a Health Program Award, and Fakeeh awards, recognizing outstanding contributions to medical research and healthcare. These awards not only honor individual achievements but also highlight the importance of research in advancing healthcare solutions.

Source: 1: Zawya

Outlook for linkages and cultural promotion

The Kingdom of Saudi Arabia aims to further enhance its linkages and cultural promotion in the Health and Wellness sector by adopting a more comprehensive and strategic approach. As part of the policy directive, the focus will be on conducting Innovation Weeks and establishing innovation districts to foster collaboration and drive innovation. These events and spaces will bring together researchers, industry professionals, and policymakers, providing platforms for networking, knowledge exchange, and joint project development.

KSA plans to actively engage with international bodies like UKRI and G20, enhancing global collaborations and partnerships. By aligning with global best practices and establishing robust frameworks for international research cooperation, Saudi Arabia aims to attract top-tier global talent and leverage international expertise. This will be supported by initiatives to simplify immigration and visa policies for scientists and researchers, coupled with enhanced international research programs. The Research Development and Innovation Authority is also working on the National Cancer Consortium to accelerate efforts in this field. These efforts will facilitate knowledge transfer, promote cross-border innovation, and enhance the overall quality of health and wellness research in the Kingdom.

The Kingdom will also focus on creating an open culture of RDI. This includes providing open access to multiple labs and research facilities to both local and international researchers. By promoting an open and inclusive RDI environment, Saudi Arabia aims to become a global research hub, attracting top-tier international researchers and fostering a culture of collaboration and innovation. Policy directions will emphasize the importance of inclusivity and openness in driving innovation and ensuring the sustainable development of healthcare solutions.

SNIH is dedicated to advancing knowledge translation research, ensuring that research findings are effectively translated into actionable insights for healthcare and policy. By fostering a network of researchers and research users, SNIH strengthens collaboration and enhances capabilities in this crucial area. The institute actively supports and promotes excellence in knowledge translation, building a culture that bridges the gap between research and real-world application, ultimately driving improvements in public health outcomes and innovation across the Kingdom.

Through its Innovation Department, SNIH supports innovators at every stage of their journey—from prototype validation to innovation adoption—offering mentorship, coaching, and strategic advice. SNIH is also driving an innovation culture across the Kingdom by empowering innovators with the knowledge, capacity, and confidence needed to accelerate health impact. The Innovation Department plays a crucial role in facilitating connections with experts, investors, and strategic partners while fostering external partnerships with universities, research institutions, and industry leaders. Focused on continuous improvement, SNIH ensures that innovation initiatives are constantly monitored and refined to drive healthcare advancement and economic growth.

The outlook for linkages and cultural promotion is promising, with substantial efforts planned to enhance collaboration and drive innovation in the Health and Wellness sector. By conducting Innovation Weeks, establishing innovation districts, engaging with international bodies, and creating an open RDI culture, the country can achieve significant progress towards its Vision 2030 goals. Efforts not only improving public health outcomes but also positioning the Kingdom as a global leader in health and wellness innovation, creating a sustainable and advanced healthcare ecosystem for the future.

4.6 Governance model

The Research, Development, and Innovation Authority (RDIA), in partnership with the Ministry of Health, plays a crucial role in advancing RDI in the Health and Wellness sector in the Kingdom of Saudi Arabia. By adopting a mission-driven approach, RDIA and the Ministry of Health work collaboratively to ensure that research, development, and innovation (RDI) activities are aligned with the Kingdom's overarching goals of improving public health, advancing medical research, and enhancing healthcare delivery. This governance model not only supports the Kingdom's healthcare objectives but also fosters innovation, driving progress toward a more resilient and advanced healthcare system.

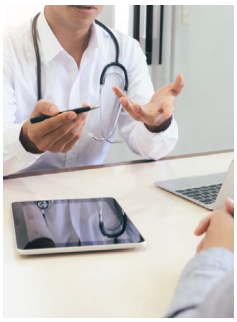
How RDIA and the Ministry of Health Govern the Sector:

- **Governance for missions:** The Research Development and Innovation Authority, in collaboration with the Ministry of Health, established Mission Steering Committees composed of multidisciplinary experts from academia, the private sector, and government. These committees oversee and guide specific missions, such as combating chronic diseases, enhancing healthcare accessibility, and promoting digital health solutions. They provide critical decision-making support, ensuring that these missions align with national health priorities and are executed effectively.
- **Stakeholder engagement:** The Research Development and Innovation Authority and the Ministry of Health actively engage with universities, research institutions, healthcare providers, and the private sector to foster a collaborative environment. This engagement is vital for the successful implementation of health missions and for driving innovation in medical technologies and healthcare services.
- **Policy development and implementation:** The Research Development and Innovation Authority and the Ministry of Health are responsible for developing and enforcing policies that guide RDI within the health sector. This includes setting regulations that promote the commercialization of innovative healthcare solutions and practices, ensuring alignment with the Kingdom’s health and wellness goals.
- **Sector-wide coordination:** The Research Development and Innovation Authority and the Ministry of Health work together to align all stakeholders, including public and private entities. This coordination is achieved through health research councils and advisory committees that provide technical and scientific expertise to support the missions.
- **Monitoring and evaluation:** The governance structure includes regular monitoring and evaluation of ongoing health projects and initiatives. The Research Development and Innovation Authority and the Ministry of Health ensure that missions progress according to plan and deliver the intended health outcomes, ensuring accountability and transparency.

Through this structured and mission-oriented governance model, RDIA and the Ministry of Health ensure that the Health and Wellness sector is not only aligned with national priorities but also positioned to make a significant impact on the Kingdom's long-term public health and healthcare innovation. Their collaborative efforts, supported by robust policies, strategic coordination, and continuous stakeholder engagement, contribute to the Kingdom’s vision of becoming a global leader in health and wellness innovation.

SUCCESS STORIES

Figure 20: The Kingdom made exemplary progress across multiple fronts in Health & wellness

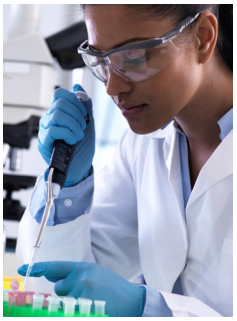


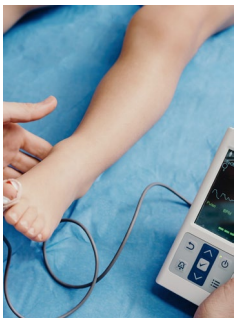
World's Largest Virtual Hospital:

The Kingdom of Saudi Arabia launched the Seha Virtual Hospital, the largest of its kind globally, and an expression of the RDI drive to expand healthcare coverage through digital innovation. This initiative leverages advanced tele-medicine technologies & AI-driven diagnostics to provide remote healthcare services. By supporting 170 health facilities and having the capacity to serve 480,000 patients annually, this exemplifies how RDI can transform healthcare delivery. It significantly improves access to specialized medical care and is a major step forward in integrating digital health solutions to enhance the reach of healthcare services.

Genomic Medicine Advancements:

The Kingdom made significant strides in genomic medicine, with notable achievements such as the identification of a new genetic syndrome named after Professor Majid Alfadhel. This discovery provided valuable insights into previously unknown diseases, enhancing the understanding and treatment of genetic disorders. The Kingdom's investment in genomic research is paving the way for personalized medicine and early disease detection.



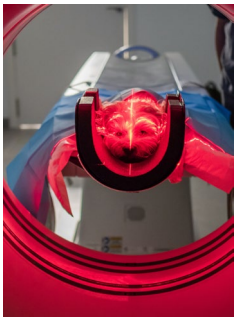


Tele-Cardiology Program - "NABAD 24":

The NABAD 24 program is a pioneering tele-cardiology initiative that showcases the Kingdom’s focus on preventive healthcare. By enabling remote diagnosis and treatment of heart attacks, this program revolutionized cardiac care in the Kingdom, providing timely interventions that significantly reduce mortality rates. The NABAD 24 program exemplifies how digital health innovations are being integrated to enhance healthcare delivery and improve patient outcomes, setting a new standard in the region.

Gene Therapy Breakthrough and Genome Sequencing Leadership:

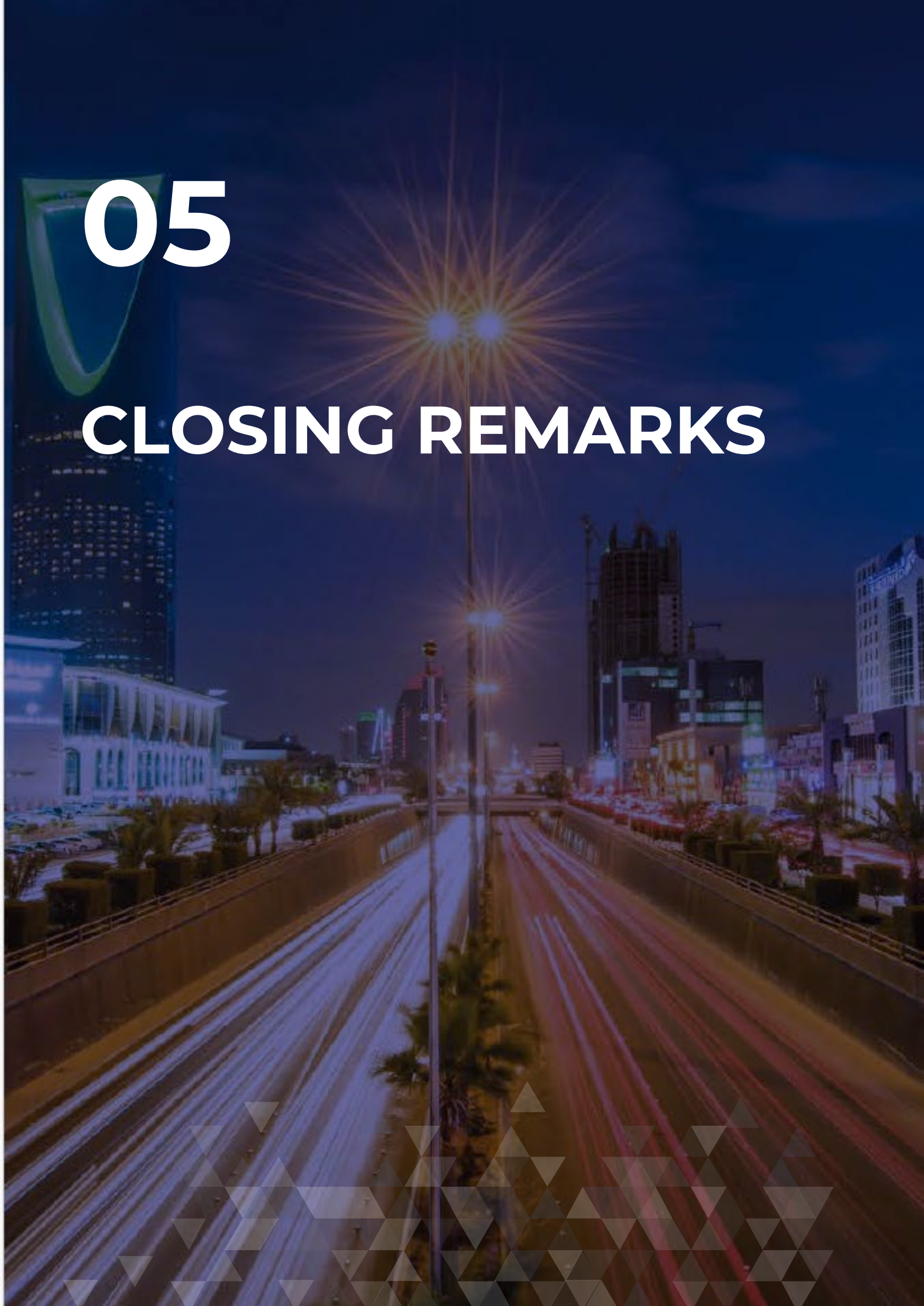
The Kingdom's SFDA approved Casgevy, the first gene therapy for sickle cell anemia and thalassemia, utilizing the revolutionary CRISPR/Cas9 technology. This landmark approval highlights the Kingdom's commitment to cutting-edge medical innovation. Simultaneously, the Kingdom's genome sequencing initiatives, like the Saudi Human Genome Program, are setting new standards in personalized medicine by decoding the genetic blueprint of its population. These advancements firmly position the Kingdom as a leader in genetic research and innovative healthcare solutions.



Advanced Diagnostic Technologies:

Early screening programs for breast & colon cancers led to higher QALYs gains and lower mortality rate with accumulative realized cost avoidance of $1.1B (SAR 4B). The collaboration with KAUST led to the development of innovative diagnostic technologies. One such technology uses nano-sized antibodies extracted from camels to accelerate the detection of infectious diseases. This rapid detection system has the potential to revolutionize disease management and control, reducing the spread of infections.

These success stories highlight the Kingdom's commitment to advancing healthcare through RDI. By leveraging innovative technologies and fostering collaborations, Saudi Arabia is positioning itself as a global leader in health and wellness.



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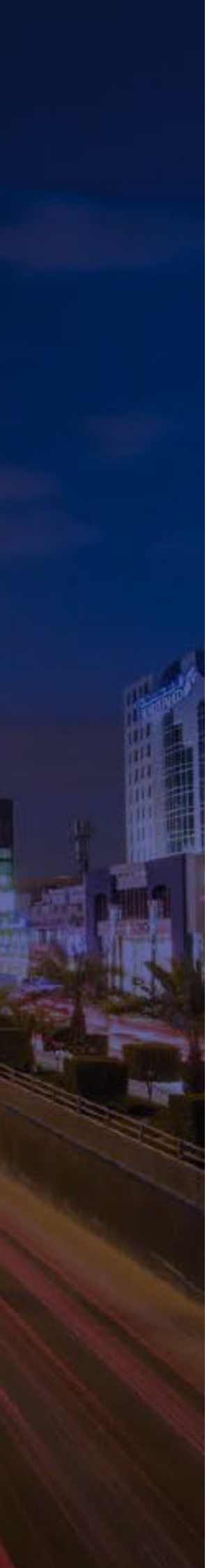
CLOSING REMARKS



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CLOSING REMARKS

The Kingdom of Saudi Arabia stands at a pivotal moment in its journey toward becoming a global leader in health and wellness research, and development, and innovation. With significant momentum and the right frameworks in place, the Kingdom is creating evolutionary jumps in this sector. The launch of groundbreaking initiatives aimed at addressing critical health challenges and fostering innovation underscores the Kingdom's commitment to the well-being of its citizens. Central to this progress is the robust policy framework underpinning these efforts, and providing clear guidelines and strategic direction to guide the RDI landscape in achieving its ambitious goals.

The Research Development and Innovation Authority (RDIA) along with MOH plays a crucial role in orchestrating the collective efforts of all actors across the public and private sectors, academia, and the broader health ecosystem. By ensuring cohesive and collaborative efforts, RDIA maximizes the effective utilization of resources, aligning them with the goals of Vision 2030. This coordinated approach, grounded in well-defined policy guidelines, is essential for advancing the ambitious health and wellness RDI agenda, addressing challenges head-on, and seizing opportunities for significant advancements.

With a strong foundation and a mission-oriented approach, Saudi Arabia is well-positioned for its evolutionary jumps in Health and Wellness RDI. The Kingdom’s dedication to fostering innovation, enhancing healthcare infrastructure, and improving public health outcomes is paving the way for a brighter, healthier future. Through coordinated efforts and a focus on impactful research and development, the Kingdom is set to lead globally in the health and wellness sector, ensuring a high quality of life for its citizens and contributing to global health advancements. The policy directions are vital, providing the necessary guardrails to ensure sustainable and impactful progress, thereby ushering in a new era for RDI in health and wellness in the Kingdom.

LIST OF FIGURES

GLOSSARY

Abbreviation	Full form
AFAR	American Federation for Aging Research
AGI	Artificial general intelligence
AI	Artificial Intelligence
BSG	Basic Science Grant
CAR-T	Chimeric antigen receptor
Cas9	CRISPR associated protein 9
CEO	Chief Executive Officer
CEPI	Coalition for Epidemic Preparedness Innovations
CIA	Central Intelligence Agency
CIT	corporate income tax
CMS	Centers for Medicare & Medicaid Services
CoE	Center of Excellence
COPD	Chronic obstructive pulmonary disease
COTC	Crude Oil to Chemicals
COVID-19	Coronavirus disease 2019
CRC	Clinical Research Coordinator Program
CRISPR	Clustered regularly interspaced short palindromic repeats
DALY	Disability-adjusted life year
EHC	Eastern Health Cluster
EU	European Union
GCC	Gulf Cooperation Council
GCP	Good Clinical Practice
GDP	Gross Domestic Product
Gen AI	Generative Intelligence
GII	Global Innovation Index
H&W	Health and Wellness
HALE	Healthy Average Life Expectancy
HEI	HElsinki international schools
HERA	Health Emergency Preparedness & Response Authority
HHC	Health Holding Company
HSTP	Health Sector Transformation Program
IBM	International Business Machines
ICH	International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use
IP	Intellectual Property
IT	Information Technology
KACST	King Abdulaziz City for Science and Technology
KAEC	King Abdullah Economic City
KAIMRC	King Abdullah International Medical Research Center
KAUST	King Abdullah University of Science and Technology
KFMC	King Fahad Medical City
KFSH & RC	King Faisal Specialist Hospital & Research Center
KSA	Kingdom of Saudi Arabia
MCIT	Ministry of Communications and Information Technology
MENA	Middle East and North Africa
MERS	Middle East respiratory syndrome
MHRSD	Ministry of Human Resources and Social Development
MISA	Ministry of Investment
MNC	Multinational Corporation
MoF	Ministry of Finance
MOH	Ministry of Health
MoU	Memorandum of understanding
mRNA	Messenger ribonucleic acid

GLOSSARY

Abbreviation	Full form
NCD	Non-communicable disease
NGO	Non-governmental organization
NHCC	National Healthcare Command Center
NHS	National Health Service
NIC	National Incentives Committee
NIH	National Institutes of Health
NPO	Non-profit organizations
NSTIP	National Science, Technology, and Innovation Plan
NUPCO	National Unified Procurement Company
OECD	Organisation for Economic Cooperation and Development
PIF	Public Investment Fund
PPP	Public-Private Partnerships
PSP	private sector participation
R&D	Research and Development
RCG	Research Consortium Grant
RDI	Research, Development and Innovation
RDIA	Research, Development and Innovation Authority
RFP	Request for proposal
RNA	Ribonucleic acid
RRP	Residents Research Program
RSS	Research Summer School
SAMI	Saudi Arabian Military Industries
SAR	Saudi Riyal
SART	Saudi Applied Research and Technology
SIGP	Startup Innovation Grant Program
SBS	Saudi Basic Science
SCFHS	Saudi Commission for Health Specialties
SCHS	Saudi Commission for Health Specialties
SDAIA	Saudi Data and Artificial Intelligence Authority
SFDA	Saudi Food and Drug Authority
SGP	Saudi GENOME Program
SME	Small and medium-sized enterprises
SNIH	Saudi National Institute of Health
STEM	Science, technology, engineering, and mathematics
UK	United Kingdom
UKRI	UK Research and Innovation
UNCTAD	United Nations Conference on Trade and Development
U.S. or US	United States of America
USA	United States of America
USD	United States Dollar
VAT	Value Added Tax
VC	Venture Capital
VR	Virtual reality
WHO	World Health Organization
WIPO	World Intellectual Property Organization
YSG	Young Scholars Grant

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