Partnership for Health System Sustainability and Resilience

SAUDI ARABIA

Sustainability and Resilience in the Saudi Arabian Health System

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For further information on the PHSSR, including additional country reports, please visit www.phssr.org

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The Kingdom of Saudi Arabia's commitment to reform and development, underpinned by *Saudi Vision 2030*, has propelled significant advancements across various sectors, none more critical than healthcare. As one of the largest economies in the Middle East and North Africa, with a rapidly growing population, our health system faces unique challenges and opportunities.

The Partnership for Health System Sustainability and Resilience (PHSSR) report, crafted through collaboration with experts and stakeholders across our health ecosystem, stands as a testament to our collective dedication to enhancing the sustainability and resilience of our health system. This comprehensive assessment, spanning governance, financing, workforce, medicines and technology, service delivery, population health, and environmental sustainability, provides invaluable insights and evidence-informed recommendations for our future path.

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Glossary

Organisations

ARAMCO	Saudi Arabian Oil Group
CBAHI	Central Board for Accreditation of Healthcare Institutions
CHI	Council of Health Insurance
EMRAM	HIMSS EMR Adoption Model
GAMEP	General Authority of Meteorology and Environment Protection
GCC	Gulf Cooperation Council
HESN	Health Electronic Surveillance Network
HIMSS	Health Care Information and Management Systems Society
HSTP	Health Sector Transformation Programme
MEWA	Ministry of Environment, Water, and Agriculture
MoE	Ministry of Education
MoH	Ministry of Health
NCA	National Cybersecurity Authority
NHIC	National Health Information Centre
NTP	National Transformation Programme
NUPCO	The National Unified Procurement Company
SAGIA	Saudi Arabian General Investment Authority
SCEBH	Saudi Centre for Evidence-Based Health Care
SCFHS	Saudi Commission for Health Specialities
SDAIA	Saudi Data and AI Authority
SFDA	Saudi Food and Drug Authority
SHC	Saudi Health Council
SHIB	Saudi Health Insurance Bus
SPSC	Saudi Patient Safety Centre

Terms

BIA	Budget impact analysis
AI	Artificial intelligence
CET	Cost-effectiveness threshold
EMR	Electronic medical records
EPR	Electronic patient records
EV	Electric vehicle

FIFO	First-in first-out method
GHGE	Greenhouse gas emissions
HMW	Health care medical waste
HTA	Health Technology Assessment
LEED	Leadership in Energy and Environmental Design
MEA	Managed entry agreement
MOC	Model of Care
NCD	Noncommunicable disease
OOP	Out-of-pocket expenditure
PHCC	Primary health care centre
PPE	Personal protective equipment
PPP	Public–private partnership
VBA	Value-based agreements

Executive summary

Background

This report, developed by a team of experts and practitioners working in the Kingdom of Saudi Arabia's health system, with the input of a broad and diverse group of expert stakeholders, provides an holistic assessment of sustainability and resilience of Saudi Arabia's health system, and makes recommendations for its strengthening. By identifying the system's strengths, its challenges, and potential ways forward, it is the authors' hope that the analysis and recommendations provided in this report make a substantive contribution to policy and action to enhance the sustainability and resilience of the Saudi Arabian health system.

The report has been developed against the backdrop of a major, whole-of-government, programme of reform and development, which provide essential context. *Saudi Vision 2030* was launched on 25 April 2016, under the leadership of His Majesty King Salman, with a roadmap drawn up by His Royal Highness Crown Prince Mohammed bin Salman. This initiative was driven by three overarching goals: (1) creating a vibrant society, (2) creating a thriving economy and (3) creating an ambitious nation. The objectives of the programme included promoting economic growth, raising living standards, and achieving operational distinction in public services through accelerated deployment of digital infrastructure and improved stakeholder engagement. Large-scale reforms have been initiated across the public sector, in the wider economy and across society. Despite challenges, significant progress has been achieved, and this has enhanced the country's experience and its confidence in pursuing more meaningful and sustainable goals. The health system is no exception to this, and this report embodies a shared ambition for a more resilient, more sustainable health system in Saudi Arabia.

Health sector transformation

As part of *Vision 2030*, significant steps are being taken in the health sector with the aim of improving health service quality, efficiency and safety. The reforms underway seek to promote the financial sustainability of the health system through innovative financing mechanisms, ensure equitable access to care, and secure continuous improvements in the quality of services for Saudi Arabia's population.

Saudi Arabia is the largest economy in the Middle East and North Africa region. Its population of 36 million is growing rapidly. In 2022, it accounted for around 60% of both the total population and total health expenditure of Gulf Cooperation Council countries. The health sector is one of the government's three top priorities, alongside education and defence, and accounts for approximately 15% of total government spending, which continues to be derived predominantly from revenues from oil and gas rather than taxation.

Saudi Arabia's demographic profile poses certain challenges for the health sector. Striking a balance between providing healthcare for a growing older population while meeting the needs of a sizable adolescent population that exhibits comparably higher levels of chronic health conditions and other youth health problems than many other developed countries is one of the biggest challenges.

By examining each of these domains, this report seeks to identify health systems' strengths and challenges, and generate evidence-informed solutions and policy recommendations to improve sustainability and resilience. The report is divided into chapters by domain, providing a comprehensive assessment of the key components of the health system. However, it is important to recognise that the domains are complexly interrelated, and cannot be considered in isolation. Furthermore, the report includes two case studies. The first provides an overview of the award-winning Tawakkalna app, an invaluable asset in protecting population health during the Covid-19 pandemic. The second details Saudi Arabia's experience in upholding population health during the mass gatherings of Hajj and Umrah in the context of the pandemic.

Findings: key themes for sustainability and resilience

Domain 1: Governance

Sustainability

- With the implementation of *Vision 2030*, central government and local authorities aim to streamline governance by aligning their planning processes and ensuring communication and collaboration.
- The National Transformation Programme 2020 includes specific targets and key performance indicators (KPIs) to measure the progress and effectiveness of initiatives. These KPIs are regularly monitored, and reports are published to ensure accountability and transparency
- The healthcare system is increasingly prioritizing inclusivity and transparency in national decision-making.
- The health information system is still in the developmental phase, which adds to the complexity of healthcare governance.
- There is still limited patient participation in the healthcare decision-making process.
- There is a need for a more stringent regulatory mechanism to ensure quality, safety, and accountability within the system to improve healthcare governance in Saudi Arabia.

Resilience

- The country's long experience of population health risk assessment and mitigation (for example, during the annual pilgrimages and prior experience with MERS-CoV) plays a vital role in finding effective solutions to governance challenges during national health crises.
- Strong governance and decisive policy-making, underpinned by centralised authority and good coordination between the healthcare system's sectors – including healthcare providers, public health agencies and government bodies – allowed policies to be swiftly implemented to protect the population.
- Existing strong communication and coordination between the different sectors played a vital role in the implementation of effective strategies to mitigate the impact of the Covid-19.
- Coordination between different levels of the health system ensured a unified response, enabling the efficient allocation of resources and the delivery of high-quality care throughout the crisis.
- Collaboration between the health and non-health sectors allowed for the rapid dissemination of accurate and up-to-date information, fostering public trust and adherence to preventive measures.
- The country lacks a single, nationwide database providing real-time national-level status health updates of communicable and noncommunicable diseases other than Covid19.
- Given the growth in the Saudi population, government investment to integrate and forge successful strategic partnerships with the private sector is essential. This includes expanding essential industries at the national level to improve health security and self-sufficiency.
- Establishing and implementing plans for national health security and self-sufficiency are crucial to safeguard the well-being of the population and ensure the resilience of healthcare infrastructure.
- Development of comprehensive strategies that incorporate preventative measures, emergency response capabilities and robust supply chains will allow effective management and mitigation of the effects of future potential health crises. Such plans should foster collaboration between government agencies, healthcare providers and private sector stakeholders.
- Promoting self-sufficiency in pharmaceutical production and medical equipment manufacturing will reduce reliance on foreign imports, enhancing national health security.

Domain 2: Financing

Sustainability

- The demographic shift towards an aging population places a major burden on the healthcare allocation from the national budget, which is derived predominantly from oil and gas revenues which have seen a decline in recent years. However, health service expenditure as a percentage of GDP has increased steadily since 2018 and, in 2022, was standing at 8.1%
- Health care infrastructure has seen heavy government investment In recent years, focusing on underserved regions and, under *Vision 2030*, there are plans to invest over USD$65 billion. Further investments should be directed towards closing the gap between urban and rural areas..
- The government is the main source of health system funding (70%). The remainder comes from private insurance contributions (16%) and out-of-pocket (OOP) expenditure (14%). The private health insurance market is expected to grow significantly and account for 2% of GDP by 2030.
- The current dual (public and private) service provision and limited coordination between providers have led to excessive costs stemming from the duplication of services for the same case.
- The National Centre for Privatisation seeks to enhance the role of the private sector in healthcare delivery. By facilitating greater managerial autonomy for healthcare providers, and moving away from centralised management, this aims to both improve service quality and promote greater efficiency. The programme also seeks to attract local and foreign direct investments. This expanded role for the private sector will see the privatisation of close to 290 hospitals and 2,300 primary health centres, which will continue to deliver services to patients with both public and private insurance coverage.
- While primary care services are usually free at the point of access, providers are predominantly reimbursed through a fee-for-service model. Although the government provides subsidies to ensure that services are affordable, fees remain too high for some vulnerable groups.
- Although the government provides subsidies to ensure user charges do not pose a financial barrier to access, their coverage is limited and some lower-income groups may struggle to access care as a result.
- There is an increasing focus on value-based payment models in Saudi Arabia, with ongoing efforts to implement these models in primary, secondary and tertiary care settings. These models aim to incentivise high-quality, efficient and accessible patient-centred care, which can lead to better health outcomes and lower costs. However, these remain at a relatively early stage of implementation.

Resilience

- The government has implemented financial risk-management plans to increase reserves and ensure that additional public funds are available during crises.
- Significant additional resources have been allocated to the healthcare sector, including funding for new hospital construction, increasing testing and tracing capacity, and investing in telemedicine and other digital health technologies.
- Two institutions – the Health Care Information and Management Systems Society (HIMSS) and the Saudi Centre for Evidence-Based Health Care (SCEBH) have fostered improved healthcare financing practices, while emphasising the importance the national supply chain and the availability essential medicines, diagnostics and technologies to strengthen the country's self-sufficiency and resilience.
- The government's expenditure decisions during the pandemic enhanced the resilience of the health system. In addition to increasing funding, user fees were temporarily decreased to ensure access to services. At the same time, the transfer of funding away from essential services to support the crisis response was kept to a minimum.

Domain 3: Workforce

Sustainability

- As elsewhere, the length of time it takes to train healthcare workers poses challenges to the sustainability of the health workforce. On average, it takes 16 years to add skilled talent to the health workforce.
- Despite a projected overall surplus of physicians and nurses by 2030, imbalances in skill-mix and geographic (urban v. rural) distribution of the healthcare workforce pose challenges to equitable access.
- The current heavy reliance on non-Saudi health professionals, who have a high turn-over rate, threatens the long-term sustainability of the health workforce. In addition, nearly 20% of physicians and 7% of nurses are expected to retire within the coming ten years.
- The educational and training infrastructure has not produced enough qualified healthcare professionals to meet the growing demand, leading to a reliance on foreign workers to fill the gap. The government is actively working to increase the number of trained Saudi healthcare professionals through the establishment of the Saudi Health Academy and initiatives such as the Nitaqat programme.
- Health practitioners from over 120 countries work in different clinical and support fields. This blend of international and national professionals (a) provides a diverse range of expertise and perspectives, enhancing the quality of care and fostering innovation, (b) helps to transfer international best practices into the Saudi healthcare system and (c) facilitates knowledge exchange, promoting continuous learning and improvement in healthcare provision.

Resilience

- Going into the Covid-19 pandemic, the most significant challenge was having a sufficiently skilled workforce to deal with the pandemic within both health facilities and communities. To tackle this, a national multi-organisation effort resulted in the creation of the National Rapid and Emergency Response Programmes.
- Despite workforce pressures, a number of factors contributed to the effective handling of the Covid-19 pandemic: swift adaptation by the health workforce to the evolving situation; expansion of the capacity of the health workforce; strong emphasis on collaboration among healthcare sectors and professionals; expansion of telemedicine services to reduce the risk of transmission while maintaining accessibility; rigorous infection prevention and control measures to protect the health workforce; and effective public health campaigns.
- Addressing burnout is becoming an urgent priority at the national level, with a survey in 2020 finding that almost two-thirds of SCFHS postgraduate trainee were affected. In response, a national well-being support programme has added well-being to the accreditation of all healthcare training institutions. The programme is growing, with more than 550 counselling sessions in 2022, compared to 300 in 2019.

Domain 4: Medicines and technology

Sustainability

- The Centre for Health Technology Assessment will provide evidence-based recommendations and inform policy regarding specific medicines and technologies. The implementation of Health Technology Assessment (HTA), which focuses on evidence and value-based approaches to the allocation of resources, should facilitate improved and equitable quality of care, improved efficiency (both allocative and technical), and thus sustainability.

- The cost-effectiveness threshold (CET) initiative will enable opportunity costs to be taken into account in resource allocation, to maximise population health benefits. The CET will determine the willingness of the health system to pay for the health benefits offered by a new health technology without compromising total population health.
- Managed entry agreements (MEAs) promote access to new medicines and technologies in the context of uncertainty regarding cost-effectiveness, real-life clinical benefit and potential impact on health expenditure. They also promote innovation and R&D in value-adding therapeutic areas. The majority of MEAs in Saudi Arabia are finance-based. However, the MoH is seeking to shift to more value-based agreements that prioritise performance and outcomes.
- These value- and evidence-based initiatives rely heavily on high-quality data and information. A reliable and fit-for-purpose platform, incorporating disease registries and national formularies, will be needed to address challenges related to limited lack of reliable data.

Resilience

- The government is working on a policy to improve resilience through changes in the use of medicines and technologies. Key to this is the establishment of the Centre for Health Technology Assessment outlined above.
- The Health Electronic Surveillance Network was one of the key digital platforms in the effective management of information during the pandemic. It played a pivotal role in enabling surveillance of Covid-19 across the nation in a timely manner, allowing public health policy and decision-makers to implement actions effectively.
- The Tawakkalna mobile application was a transformational digital health technology which performed several key functions during the pandemic. The real-time data-driven approach allowed the government to monitor the spread of the virus, identify hotspots and allocate resources effectively.
- Insights from social and behavioural sciences were used to support the pandemic response, helping authorities craft targeted messaging and interventions to encourage adherence to safety measures, such as social distancing and mask-wearing.
- The National Cybersecurity Authority regularly evaluates the compliance of government organisation portals against set cybersecurity controls. The resulting evaluation reports help to improve preparedness against cybersecurity threats. This increases the resilience of health organisations and assists in preventing interruptions of service due to cybers attacks.
- Adoption of telehealth in clinical practice is a key policy initiative currently taking place in Saudi Arabia. This was essential in maintaining access to services during Covid-19 and limiting its spread in healthcare settings. Maintaining access to telehealth and scaling up its deployment where there is clear evidence of benefits could substantially contribute to the resilience of Saudi Arabia's healthcare system in the face of future pandemics.
- The health system mitigated and managed shortages in medical supplies during the Covid-19 pandemic through effective hospital exchange programmes and increased public healthcare spending. In light of the country's focus on technological advancements and infrastructure improvements, implementing a centralised inventory management system to anticipate and mitigate challenges and risks could enhance the resilience of the supply chain.
- Public-private partnerships enhanced the distribution of medicines and vaccines. Several logistics companies were involved in the transportation and delivery of medical supplies and vaccines, ensuring efficient and timely distribution.

Domain 5: Service delivery

Sustainability

- There has been a significant growth in the number of hospitals, resulting in an 26.5% increase in the total number of beds from 2012 to 2021. The average waiting time for an outpatient appointment has seen a marked improvement, decreasing from 35 days in 2017 to 13 days in 2021.
- The proportion of patients discharged safely from emergency rooms also shows improvement, increasing from 85% in 2017 to 92% in 2021. This positive trend indicates significant advancements in emergency care protocols and patient management strategies.
- There are numerous initiatives and standards that aim to improve overall quality of hospital care and patient safety in line with international best practices.
- A study of socioeconomic determinants and inequalities on chronic non-communicable diseases (NCDs) found that prevalence varied significantly according to age, gender, education level, income and region of residence, indicating disparities in access to healthcare across different socioeconomic groups. Another study found that uptake of preventive health checks was concentrated among people with greater wealth. These findings suggest that policy makers may need to increase their focus on addressing socioeconomic disparities in access to care.
- *Vision 2030* seeks to expand the role of primary healthcare centres, with primary care prioritised as a key element of the new Model of Care to tackle the increasing burden of NCDs. In the past two decades, primary health services have improved significantly, this is reflected in patient satisfaction scores of, for example, 71.7% in March 2018 and 75.1% in March 2019.

Resilience

- Saudi Arabia exhibited high resilience during the pandemic, with all social distancing restrictions lifted within 73 days of the outbreak.
- The private healthcare sector played a significant role in reducing the impact of Covid-19, providing critical support to the government in responding to the pandemic.
- Despite the overall success of the response, some hospitals faced limited disruptions to services due to the need to prioritise patients with Covid-19 and to minimise the risk of transmission of the virus. The surge in Covid-19 cases also put a strain on hospital capacity, particularly in ICU. Some of this pressure on hospitals was alleviated through the use of telemedicine.
- The pandemic accelerated the deployment of novel care delivery methods, such as remote consultations, which reduce the risk of virus transmission and ensure continuity of care. These delivery methods will continue to be valuable tools for clinicians in the remobilisation of health services post-pandemic and in any future pandemic.
- The Health Sector Transformation Programme (HSTP) seeks to improve health system resilience and restructure the sector with a focus on primary care, rehabilitation and long-term care. It aims to address challenges such as barriers to public–private partnerships, developing the Saudi workforce, calibrating reimbursement mechanisms to health system goals, and ensuring vulnerable populations have access to high- quality tertiary healthcare.

Domain 6: Population health and public awareness

Sustainability

- In recent years, Saudi Arabia has made significant progress in enhancing the quality of health services, which is reflected in substantial improvements in key population health indicators. However, numerous public health threats persist, including lifestyle factors (and particularly unhealthy diets, lack of physical activity and tobacco use), contributing to a high prevalence of chronic health conditions.
- Noncommunicable diseases (NCDs) are an increasing public health challenge and represent the leading cause of ill health, with hypertension, diabetes and cardiovascular diseases among the leading causes of death. The HSTP recognises the importance of this category of diseases and is focused on ways to address NCDs.
- Some mental health conditions are increasingly recognised as public health threats, with one in five Saudi Arabian adults having a mental health condition. Common challenges include stigma associated with diagnosis, treatment and access to services. To address these, Saudi Arabia has invested in raising awareness of the symptoms of common mental illnesses, reducing stigma and facilitating access to appropriate health services.
- Population health protection is an important consideration in religious events (the Hajj and the Umrah). Mass gathering management strategies are used to reduce the risk of the spread of infectious diseases and public health programmes have been implemented to support the management of chronic conditions among pilgrims performing the rituals.
- There is low health literacy, particularly among some minority ethnic communities, individuals from underprivileged socioeconomic backgrounds and those with limited education. Efforts are being made to address this through a variety of programmes and initiatives. Health literacy education is being incorporated into the national curriculum and specialised training provided for teachers and health professionals.

Resilience

- One of the goals of the Saudi government is to build a strong and resilient health system that maintains health service access and quality during unprecedented events. Covid-19 highlighted the need to reduce health system vulnerability and for resilient approaches that respond to dynamic situations, combining health security with disease-specific and life course programmes.
- Saudi Arabia used learning from previous health epidemics, especially the Middle East Respiratory Syndrome (MERS) and acted pre-emptively and promptly to prevent Covid-19 from spreading, following or exceeding WHO recommendations. Before there were any confirmed cases in the Kingdom, direct flights were stopped to and from China. This was followed by other measures, such as school closures, case isolation and quarantine, mass PCR screening and partial curfews, until the decision was made to implement a country-wide lockdown..
- Even before WHO's formal declaration of Covid-19 as a global pandemic, the MoH started to disseminate information about the unknown virus, routes of transmission, and precautionary actions through television, radio, SMS text messaging and social media platforms in 12 languages. Clear instructions for handwashing and hygiene were clearly displayed in all public places and means of transport.
- Once the vaccine was approved by the WHO, Saudi Arabia was among the first countries to authorise it for use. Numerous national campaigns to raise awareness were conducted by the MoH, medical professionals and social media influencers. The King and Crown Prince received vaccinations early, with the event being televised to encourage vaccine uptake.
- Health authorities made a pivotal decision to provide free Covid-19 testing, treatment and vaccines to everyone, including individuals with irregular residency status. This equality of access helped to minimize the impact of Covid-19 on migrants and other vulnerable groups.

Domain 7: Environmental sustainability and resilience

Sustainability

- Saudi Arabia has set binding greenhouse gas emissions (GHGE) reduction targets for key sectors, including health, and has pledged to reduce carbon emissions to net zero by 2060. Initiatives and indicators have been implemented in multiple sectors to build environmental sustainability and resilience, and achieve GHGE targets that are compatible with international standards.
- Efforts to mitigate the environmental impacts of the health system, such as atmospheric carbon emissions, waste production and natural resource consumption, are an important component of broader initiatives to reduce pollution, waste and emissions.
- Achieving environmental sustainability and resilience requires increased coordination at the national level, regular monitoring, transparent and accountable targets for reducing the ecological footprint, a commitment to behavioural change, and established guidelines for health service providers.
- The National Centre for Waste Management regulates and supervises waste management activities (recycling, resource retrieval and safe disposal) to achieve better environmental and economic results. In 2022, the government allocated $50 billion to municipal services, including health facility waste management. Key stakeholders in the waste management sector collaborate to ensure the proper disposal of health facility waste, contributing to the overall goal of an environmentally sustainable health system.
- Developing sustainable built infrastructure is another critical aspect of environmental sustainability. The Saudi Mostadam (sustainable) rating system for existing and new buildings was recently introduced. However, as it does not include international standards for sustainable hospitals and green healthcare, a new domestic rating system for healthcare facilities needs to be developed in Saudi Arabia.

Resilience

- In addition to environmental impacts, climate change is linked to adverse health impacts, such as heat-related injuries and deaths, and increased mortality from natural disasters and vector-borne diseases.
- Air quality is a key environmental factor and critical to the health sector's focus on wellbeing. Average NO_2 concentration in Saudi Arabia is much higher than recommended by WHO. Major cities record high PM2.5 levels, and O_3 concentrations surpass standard levels. However, due to decreases in the sulphur content of diesel, SO_2 rates in have fallen to within acceptable limits.The Ministry of Environment, Water, and Agriculture has warned that data on air quality are incomplete and unreliable, due to the lack of source emission monitoring and inventory.

Recommendations

We make 46 recommendations across the seven domains, as shown in Table 1.

Table 1: Recommendations across the seven domains

DOMAIN 1	GOVERNANCE
1A	Establish and implement plans for national health security and self-sufficiency to safeguard the well-being of residents and ensure a resilient healthcare infrastructure.
1B	Encourage collaborations between public and private organisations to finance and develop healthcare infrastructure, services and innovations.
1C	Develop a centralised healthcare database to facilitate information sharing among healthcare professionals, institutions and patients.
1D	Support healthcare research and innovation through funding, infrastructure development and collaboration with international research institutions.

DOMAIN 2	FINANCING
2A	Empower the national supply chain and enhance self-sufficiency in the supply of essential medicines, diagnostics and technologies..
2B	Implement value-based healthcare financing models that prioritise patient outcomes and allocate resources based on the effectiveness of treatments to promote efficient use of funds and improved patient care.
2C	Encourage public-private partnerships (PPPs) to increase investment in healthcare infrastructure and facilitate access to innovative technologies while sharing risks and resources between public and private sectors.
2D	Leverage the power of funding allocated to research and development to advance national health security in specific areas.
2E	Diversify funding sources for the Saudi health system to increase financial stability, reduce reliance on a single revenue stream and improve resilience to economic fluctuations.
2F	Expedite the implementation of a national health insurance system to provide truly universal healthcare coverage, ensuring equitable access to health services and promoting financial protection for residents.
2G	Allocate more resources to preventative care and health promotion initiatives to reduce the demand for expensive curative care and thus reduce healthcare costs and promote a healthier population.
2H	Implement innovative financing mechanisms, such as social impact bonds or blended finance, to attract private sector investment in public health initiatives to complement public funding.

DOMAIN 3 WORKFORCE

3A	Establish mechanisms to forecast future healthcare workforce supply and demand, with projections taken into account in national workforce training strategies.
3B	Design and implement a mechanism for the routine evaluation of health workforce performance, productivity and wellbeing to inform interventions for their improvement.
3C	Develop and enforce a national health competency framework aligned with the plans to implement a value-based health system.
3D	Ensure prioritisation of the well-being and psychological safety of healthcare workers, involving service providers, regulator and accreditation organisations and in the health ecosystem in general to reduce burnout and staff turnover.
3E	Meet targets for the number of Saudi Arabian nationals in the health workforce, especially in the nursing profession.
3F	Incentivise services to rural and underserved areas to address disparities in access to care.
3G	Expand and diversify the healthcare workforce by investing in education and training programmes to meet the needs of a growing population.

DOMAIN 4 MEDICINES AND TECHNOLOGY

4A	Establish public–private partnerships (PPPs) in medicines and health technologies in order to pool resources and expertise, thus improving access, affordability and innovation.
4B	Increase the digital maturity of health service providers, especially in relation to clinical documentation using electronic medical record (EMR) systems, disease registries and national formularies to reduce medication errors, improve patient safety and enhance the efficiency of the healthcare system.
4C	Enhance national stockpiles of essential medicines, equipment and supplies to ensure the timely and efficient distribution of medicines and health technologies, reduce stockouts and improve accessibility.
4D	Accelerate health technology assessment (HTA) capacity to determine the value and effectiveness of new health technologies and medicines, enabling evidence-based decision-making and resource allocation.
4E	Encourage research and development (R&D) in medicines and health technologies to foster innovation and development to address the evolving healthcare needs of the population.
4F	Foster the use of cost-effectiveness analysis in the evaluation of medicines and health technologies to improve resource allocation and ensure value for money.
4G	Promote cost-effective use of generic medicines and biosimilars to improve affordability and accessibility, without compromising quality.

DOMAIN 5	SERVICE DELIVERY
5A	Target evidence-based, preventative interventions based on intelligence on individual and population health risks in order to reduce reliance on curative care.
5B	Enhance primary healthcare (PHC) services to reduce the burden on secondary and tertiary care facilities, improve early detection and management of diseases and promote preventative healthcare.
5C	Integrate telemedicine and digital health solutions in health service delivery to expand access to healthcare services, particularly in remote areas, reduce waiting times and improve the overall efficiency of the healthcare system.
5D	Develop a patient-centred approach and integrate care across the patient pathway and provider boundaries, to reduce variation in practice and to improve clinical outcomes and patient experience.
5E	Invest in health workforce development to address shortages, improve quality of care and contribute to a more resilient healthcare system.
5F	Foster public-private partnerships (PPP) to improve access to healthcare services, leverage private sector expertise and enhance overall healthcare system efficiency.

DOMAIN 6	POPULATION HEALTH
6A	Enable and encourage cross-sectorial work to measure and address the social determinants of health in order to promote a healthier and more resilient population.
6B	Support and enhance national disease registries that reflect the major burden of disease, particularly non-communicable diseases (NCDs) that take account of socioeconomic status.
6C	Invest in technologies, social media and online engagement platforms to promote healthy behaviours.
6D	Develop and implement targeted health promotion and disease prevention programmes focusing on key health issues prevalent in the Saudi population.
6E	Establish a robust monitoring and evaluation system to assess the impact of population health interventions and inform future policy development.
6F	Strengthen the health information system and leverage data analytics to inform evidence-based decision making to identify population health needs, allocate resources and monitor outcomes to ensure a more efficient and effective health system.
6G	Address and report health disparities among different population groups by ensuring equal access to healthcare services and resources to improve overall population health outcomes and contribute to a more just and sustainable society.
6H	Integrate mental health services into primary healthcare and implement community-based mental health programmes.
6I	Implement health education campaigns and promote health literacy to empower individuals to make informed decisions about their health.

DOMAIN 7	ENVIRONMENTAL SUSTAINABILITY
7A	Develop standards and undertake regular measurements of the health sector's carbon footprint to expedite sustainable green health facilities.
7B	Build on regional-level environmental sustainability efforts and collaborate with national and international jurisdictions for the integration of efforts into a national Sustainable Development Unit.
7C	Provide advice and guidance to the health sector on best practices for implementing environmental sustainability measures.
7D	Create a reward system for healthcare ecosystems to report their sustainability measures and targets.
7E	Educate health professionals on environmental sustainability in health service beyond energy use and waste reduction.

Introduction

Saudi Vision 2030 was launched on 25 April 2016, under the leadership of His Majesty King Salman, with a roadmap drawn up by His Royal Highness Crown Prince Mohammed bin Salman (Kingdom of Saudi Arabia, 2016). This initiative was driven by three overarching goals: (1) creating a vibrant society, (2) creating a thriving economy and (3) creating an ambitious nation. The objectives of the programme included promoting economic growth, raising living standards, and achieving operational distinction in public services through accelerated deployment of digital infrastructure and improved stakeholder engagement. Large-scale reforms have been initiated across the public sector, in the wider economy and across society. Despite challenges, significant progress has been achieved, and this has enhanced the country's experience and its confidence in pursuing more meaningful and sustainable goals. The health system is no exception to this, and this report embodies a shared ambition for a more resilient, more sustainable health system in Saudi Arabia.

As part of *Vision 2030*, significant steps are being taken in the health sector with the aim of improving health service quality, efficiency and safety (Chowdhury S et al., 2021). The reforms underway seek to promote the financial sustainability of the health system through innovative financing mechanisms, ensure equitable access to care, and secure continuous improvements in the quality of services for Saudi Arabia's population.

Saudi Arabia is the largest economy in the Middle East and North Africa region. Its population of 36 million is growing rapidly. In 2022, it accounted for around 60% of both the total population and total health expenditure of Gulf Cooperation Council countries. The health sector is one of the government's three top priorities, alongside education and defence, and accounts for approximately 15% of total government spending, which continues to be derived predominantly from revenues from oil and gas rather than taxation.

Saudi Arabia's demographic profile poses certain challenges for the health sector. Striking a balance between providing adequate healthcare for a growing older population while meeting the needs of a sizable adolescent population that exhibits comparably higher levels of chronic health conditions and other youth health problems than many other developed countries is one of the biggest challenges.

This report has been undertaken in collaboration with the Partnership for Health System Sustainability and Resilience (PHSSR), a global, cross-sectoral collaboration that works towards improving health systems. PHSSR has supported the report authors, a team of experts and health system stakeholders based in Saudi Arabia, in undertaking a critical assessment of the sustainability and resilience of the health system in the aftermath of the unprecedented local, regional and global challenges presented by the Covid-19 pandemic. By disseminating the findings, we hope to forge solid worldwide connections for knowledge exchange and to seek the most appropriate organisational and executive approaches to respond to our findings. Eventually, we aim to utilise the findings to improve the sustainability and resilience of our own health system and health systems globally.

PHSSR definitions of health system sustainability and resilience

Health system sustainability	A **sustainable** health system improves population health by continually delivering the key functions of providing services, generating resources, financing and stewardship, incorporating principles of financial fairness, equity in access, responsiveness and efficiency of care, and does so in an environmentally sustainable manner.
Heath system resilience	A **resilient** health system is able to prevent, respond to, manage the health system impact of, and recover and learn from, acute and chronic crises (including, but not limited to, pandemic threats, climate change and economic and technological shocks), minimising their short- and long-term impacts on health, social and economic wellbeing.

The seven domains covered in this report are:

Governance: the wide range of steering and rule-making related functions carried out by governments and decision makers as they seek to achieve national health policy objectives

Financing: how health systems generate, pool and allocate financial resources and pay for health services

Workforce: how health systems plan for, train, recruit, reward, and deploy their workforce, and shape the conditions in which health professionals work

Medicines and technology: how health systems make use of medicines and (information) technologies in the delivery of health services

Service delivery: how health services are organised and delivered, including ambulatory and hospital care, and public health

Population health: how health systems address the social determinants of health and meet the needs and demand of the population

Environmental sustainability: how health systems prevent and minimize their carbon footprint and the impacts of pollution on the population's health

Each domain was analysed by a principal expert, using the most up-to-date data available in the public domain and from selected government sources, in combination with sources from the available literature, and input from cross-sectoral expert panels. Drafts of each of the seven domains were circulated among key national policy makers to solicit feedback and consensus during focus group-style workshops. The analysis of each domain includes recommendations for sustainability and resilience that are in line with the ambitions of Saudi Arabia's plan for the transformation of its health system. It should be noted that these recommendations can only be considered provisional, due to the dynamic evolution of the health sector, and the need to consult on proposals more widely.

Furthermore, the report includes two case studies. The first provides an overview of the award-winning Tawakkalna app , an invaluable asset in protecting population health during the Covid-19 pandemic. The second details Saudi Arabia's experience in upholding population health during the mass gatherings of Hajj and Umrah in the context of the pandemic.

1. DOMAIN 1
Governance

1.1 Governance for health system sustainability

Healthcare is a fundamental right for citizens written into Saudi Arabia's constitution. Since its foundation, the country has adhered to this welfare principle, striving to offer its citizens free access to health services in a fair and accessible manner. The Ministry of Health (MoH) was established in 1949 to provide the citizens of Saudi Arabia with free healthcare. For decades, it was the primary governor and provider of the majority of health services and it played a significant role in establishing the direction, regulations and policies of the health service as well as providing ongoing oversight and monitoring of plans and activities. In addition to the 60% of healthcare services provided by the MoH, several independent government organisations and the private sector deliver 17% and 23% of health services, respectively, with the proportion delivered by the private sector is expected to grow significantly in the next decade. The existence of parallel public and privately financed and operated health systems in the country creates some complexity in the governance of the health system.

Several entities are responsible for the regulation (Table 2) and governance of health service activities (Table 3). Currently, these entities are interconnected by one agenda – ensuring the sustainability of the Saudi health system and, directly or indirectly, serving the purposes of the government's *Vision 2030*.

Table 2: Entities other than the Ministry of Health that play a major role in regulating and governing healthcare

Entity	Examples of roles and responsibilities
Saudi Food and Drug Authority (SFDA)	• Regulates and supervises the food and drug industry • Conducts research to ensure the safety and quality of food, drugs and medical devices • Provides food and drug safety education to consumers • Collaborates with international organisations to ensure compliance with global standards and best practices
Saudi Commission for Health Specialties (SCFHS)	• Regulates and accredits healthcare education and training programmes • Establishes and enforces professional standards for healthcare professionals • Evaluates and certifies healthcare professional qualification
The Saudi Central Board for Accreditation of Health Care Institutions (CBAHI)	• Accredits healthcare institutions and evaluates their compliance with national and international quality standards • Develops and implements accreditation programmes to improve the quality of healthcare services and patient safety • Collaborates with other regulatory bodies and healthcare organisations to promote best practices and ensure the quality of healthcare provision • Provides training and support to healthcare institutions to facilitate the accreditation process and improve service quality
Council of Collaborative Health Insurance	• Develops policies and procedures to ensure fair practices and protects the rights of policy holders and insurance companies • Licenses and regulates insurance companies, brokers and third-party administrators (TPAs) to ensure compliance with regulations and standards • Conducts research to improve the health insurance sector and promote innovation in the industry • Collaborates with other regulatory bodies and healthcare organisations to enhance the quality of healthcare services and ensure universal health coverage for all residents

Table 3: Additional entities established through the Health Care Transformation Plan to contribute to healthcare governance

Entity	Examples of roles and responsibilities
Health Sector Transformation Programme (HSTP)	• Improves the quality of healthcare services by promoting patient-centred care, enhancing healthcare provider skills and capabilities and leveraging digital technologies to enhance care delivery • Enhances access to healthcare services by expanding the capacity of healthcare facilities, improving the efficiency of healthcare delivery and promoting preventive healthcare measures • Strengthens the healthcare workforce by developing a comprehensive national healthcare workforce plan, improving healthcare professional training and education and promoting the recruitment and retention of healthcare workers • Promotes innovation and research by investing in new healthcare technologies, supporting research and development in healthcare and fostering collaboration between healthcare providers and researchers to improve patient outcomes
Public Health Authority (PHA)	• Develops and implements public health policies and strategies to prevent and control diseases and health hazards • Ensures the safety and quality of food, water and environmental health through monitoring and inspection programmes • Conducts research to inform public health policy and practice, and to support innovation and excellence in healthcare • Provides public health education and awareness campaigns to promote healthy behaviours and prevent the spread of disease
Centre for National Health Insurance (CNHI)	• Develops and implements national health insurance policies and programmes to ensure access to affordable and high-quality healthcare services for all • Regulates and supervises the health insurance sector to ensure compliance with national standards and guidelines • Provides technical support and assistance to health insurance companies, healthcare providers and other stakeholders in the health insurance sector • Conducts research on health insurance and related topics to inform policy development and decision-making
National Health Information Centre (NHIC)	• Collects, analyses and disseminates health information to support evidence-based decision making and policy development • Develops and maintains national health information systems and standards to ensure the accuracy, completeness and security of health data • Provides technical assistance and support to healthcare providers, researchers and policy-makers accessing and using health information • Collaborates with other national and international organisations to promote the use of health information technology and improve the quality and efficiency of healthcare services
National Centre for Privatisation (NCP)	• Develops and implements privatisation policies and strategies. • Identifies and selects government assets and services that can be privatised • Ensures transparency, fairness and competition in the privatisation process • Collaborates with relevant stakeholders, including government agencies, private sector companies and investors, to achieve successful privatisation outcomes

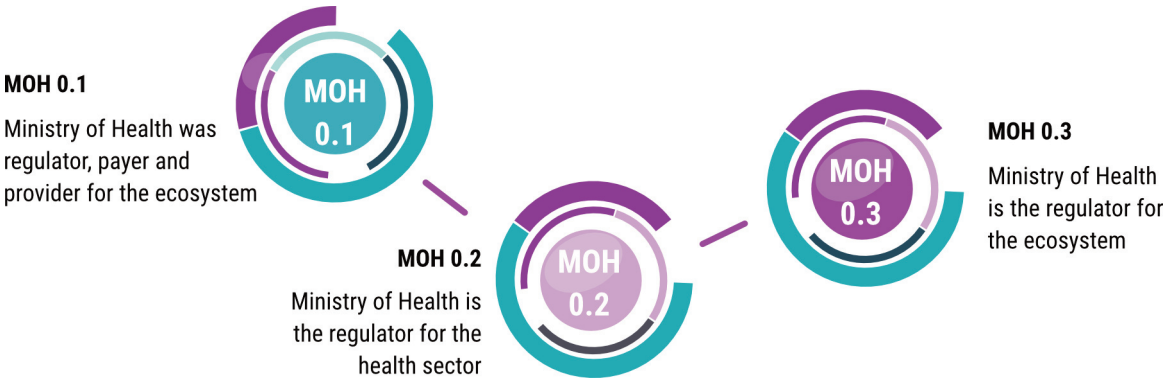
Table 3 (continued): Additional entities established through the Health Care Transformation Plan to contribute to healthcare governance

Saudi Patient Safety Centre (SPSC)	• Develops and implements patient safety policies and strategies in collaboration with other organisations • Promotes a culture of healthcare system safety and raises awareness about patient safety issues • Collects, analyses and disseminates patient safety data to identify areas for improvement and measure progress • Provides technical assistance and support to healthcare facilities to implement patient safety programmes and initiatives

Collectively, these entities and many others report to the Saudi Health Council (SHC), which is the highest governing health body in the country. With membership consisting of government and non-government stakeholders, and chaired by the Minister of Health, the SHC aspires to ensure coordination and integration of all health-related agencies to improve and enhance healthcare planning and delivery.

In 2017, as part of *Vision 2030*, the MoH was tasked with assembling a new reform (later named the Health Sector Transformation Programme (HSTP) to improve value, facilitate access and strengthen prevention, as well as boost health service delivery standards and promote healthy lifestyles (Kingdom of Saudi Arabia, 2021). Numerous public and private sector stakeholders were involved in the HSTP, reflecting healthcare's cross-cutting relevance to all policy areas. This is reflected in the Health in All Policies (HiAP) committee, which integrates health considerations into policy making across sectors to improve health and well-being through improved access to health services via optimal coverage and comprehensive and equitable geographical distribution, and the expansion of e-health services and digital solutions. The aim of these transformations is the creation of a more sustainable health system that is resilient to national and global threats. Most importantly, the role of the MoH will be redirected from that of regulator, payer and provider of healthcare to regulator of a health ecosystem consisting of both public and private payers and providers, as shown in Figure 1.

Figure 1: Transformation of the Saudi Ministry of Health



Alignment and collaboration

Prior to *Vision 2030*, the complexity of healthcare governance structures at the central and local scale posed challenges to effective planning and the implementation of healthcare policies. Misalignment of planning processes across different levels hindered governance, leading to inefficient resource allocation, duplication of efforts and inadequate service delivery. With the implementation of Vision 2030, central government and local authorities have sought to align their planning processes and ensure effective communication and collaboration. This has been intended to streamline governance and promote greater efficiency and effectiveness in healthcare delivery.

Importantly, the health system's governance increasingly prioritises inclusivity and transparency in national decision making. By involving various stakeholders in decision making, fostering dialogue and sharing of information across organisational and sectoral boundaries, the system aims to ensure that diverse perspectives are heard. Such openness is key to enhancing trust and cultivating equitable healthcare policies that cater to the needs of the population. Initiatives to enhance public engagement and involvement in the formation of national policy include the Public Consultation Platform Survey (Istetla'a; translation: survey): an online platform that provides an avenue for public and government bodies to share opinions and input on draft laws in all sectors, including healthcare, before final approval. Despite these initiatives, and as discussed later in this chapter, patient participation in healthcare decision making processes remains limited, which is identified as an issue to address.

Evaluation and monitoring

Evaluation plans are routinely built into major policy initiatives in the health care sector. One such plan is the National Transformation Program (NTP) 2020, which is an integral part of *Vision 2030* (National Transformation Program, website). NTP 2020 includes specific targets and key performance indicators (KPIs) to measure the progress and effectiveness of initiatives to improve the health care sector. This approach enables the government to track the success of implemented policies, adjust them as needed and ensure that the health system continues to develop in line with the goals set forth in *Vision 2030*.The results of these KPIs are publicly disseminated and used to inform policy initiatives. In addition, monitoring and evaluation mechanisms have been put in place to assess the impact of proposed reforms under Saudi Arabia's new Model of Care and *Vision 2030*. Furthermore, the MoH has established the Health Care Information and Management Systems Society (HIMSS) Analytics Middle East, which evaluates the impact of the new Model of Care, discussed in the subsequent chapter, and other health care reforms. HIMSS Analytics Middle East uses a standardised evaluation framework to assess the readiness and maturity of health care organisations in adopting new technologies and processes. Finally, the government has established the Saudi Centre for Evidence-Based Health Care (SCEBH) to conduct research and produce evidence to inform health care policies and practices. The Centre conducts real-world analyses of health care interventions and provides guidance on best practices for health care professionals.

Current challenges

The Health Sector Transformation Programme (HSTP) is currently addressing several challenges that could have a significant impact on the competent governance of healthcare (Al-Abri R & Al-Balushi A, 2014; Alharbi MF et al., 2014; Alkhamis AA, 2017; Almalki M et al., 2011). These include:

- A highly fragmented healthcare system with a plethora of providers and an evident limitation in coordination. This often leads to operational inefficiencies and disparities in standards of care.
- As discussed later in this report, workforce concerns present another considerable challenge. There is a conspicuous insufficiency of healthcare professionals, particularly in rural regions, a problem exacerbated by an over-reliance on expatriate health workers. This situation poses a substantial challenge for the sector's long-term sustainability.

- The health information system is still in the developmental phase, which adds to the complexity of healthcare governance. The absence of a well-rounded information technology framework hampers efficient data management, a critical component for effective healthcare governance and decision making.
- There is a limited level of patient participation in the healthcare decision-making process. This deficiency in patient engagement can negatively impact both patient satisfaction and the overall effectiveness of the healthcare services.
- The healthcare system grapples with regulatory issues. The urgent need for a more stringent regulatory mechanism to ensure quality, safety, and accountability within the system is of paramount importance to improve healthcare governance in Saudi Arabia.

1.2 Governance for health system resilience

Given its geopolitical and economic responsibilities, including Group of Twenty (G20) presidency in 2020, Saudi Arabia intensified its efforts to contain the Covid-19 pandemic beyond the local level. The country engaged in national and international efforts to improve its response and to guarantee the availability of preventative tools, including through its contribution of more than USD $500 million to support global efforts to control the pandemic. According to the 2021–2022 Global Entrepreneurship Monitor (Roomi MA et al., 2022), Saudi Arabia ranked first worldwide in the response of entrepreneurs and governments to the Covid-19 pandemic.

The pandemic affected almost every sector in Saudi Arabia. To supplement early government efforts to fight the pandemic, the Saudi Data and Artificial Intelligence Authority (SDAIA) launched the Tawakkalna application (the name refers to the Islamic concept of reliance on God) to electronically and initially manage curfew permits for government and private sector employees and individuals. The application underwent numerous developmental phases to adapt to the evolving pandemic (see Case Study 1) and won the 2022 United Nations Public Service Award for institutional resilience and innovative responses to the Covid-19 pandemic (United Nations, 2022).

The health system governance challenges faced during the pandemic fall into six categories (Table 4). Solutions to these challenges were readily available for implementation, reflecting the robust resilience of the Saudi health system. These solutions materialised due to the country's long experience of population health risk assessment and mitigation, such as ensuring the security and the safety of mass gathering events, such as the annual Hajj and Umrah pilgrimages. Moreover, prior experience containing Middle East Respiratory Syndrome (MERS-CoV) played a vital role in overcoming historical shortcomings in managing national health crises, by working in close collaboration with international health bodies like the World Health Organization (WHO), investing in strengthening the health infrastructure in Saudi Arabia and implementing strict infection control measures, including quarantine protocols, use of personal protective equipment (PPE) in healthcare settings, and enhanced hygiene practices. These interventions, based on the principles of sound continuity planning, helped to ensure that the disruption caused to routines health services was minimised.

The MoH, in collaboration with several other entities, released a number of publications and resources related to Covid-19, including scientific instructions, manuals and guidelines for healthcare providers. These were utilised at the national level to ensure homogeneity across practices and to avoid jeopardising health outcomes due to outdated practices. In addition, the MoH provided up- to-date information on various aspects of the pandemic, such as including statistics on cases, precautionary measures and the latest scientific findings. The aim of the publications was to ensure that healthcare providers and the general public had access to accurate and reliable information to effectively manage the crisis and protect the population.

During the Covid-19 pandemic, a Command and Control Centre and a Covid-19 Follow-up Committee were established to provide general governance for the pandemic. Together, they

implemented an early warning system for the rapid detection of and response to health threats, utilising syndromic surveillance and event-based surveillance data at the national level. The system generated automated alarms for public health events and facilitated the monitoring of health events, thereby improving situational awareness and timeliness of response. Ultimately, these data drove policy. The system proved helpful in enhancing Covid-19 case detection, monitoring the geographical spread of the virus and assessing the effectiveness of control measures. Researchers also employed epidemiological models, including the susceptible-infectious-recovered (SIR) model,

Table 4: Challenges and solutions during the Covid-19 pandemic

Challenges	Samples of implemented solutions
Infrastructure and logistical support	• Health and care facilities continued to operate at full capacity during the pandemic. • The capabilities and expertise of the private sector contributed to increasing absorptive capacity and infrastructure while meeting growing health service demand. • Integrated mechanisms were implemented to track and monitor the provision of medical supplies and strategic stocks.
Data and technology	• All governmental sectors accelerated the preparation and activation of the unified health file (digital health platform, which provides updated data of patients, showing history and type of disease and medicines dispensed, medical insurance, laboratory testing results, vaccinations, and referrals) and its integration with the Absher system (a smartphone application and web portal that allows citizens and residents of Saudi Arabia to use a variety of government services). This expedited the implementation of virtual care and telemedicine services in all health sectors. • Community interaction apps such as Tawakkalna mobile application (see case study) were introduced by SDAIA to report Covid-19 cases and conduct follow up. • A unified national data source was established to report the status of publicly available cases.
Health and prevention	• The implementation of public health policies was monitored in densely populated areas with increased health risks and the application of the modern health and care model was accelerated at the national level. • Local strategic stockpiles of medicines, supplies and medical devices were increased, as was support for these. • Volunteer programmes were activated at the national level.
Research and development	• A strategy for research, development and innovation was developed and prepared in relevant fields to combat the pandemic. • A National Committee for Covid-19 Research was established. • Covid-19 research priorities were established and published. • A national registry platform to record Covid-19 was launched to produce accurate Covid-19 statistics and to facilitate research.
The individual and society axis	• The quality of awareness information materials was improved to inform the population about healthy behaviour and the importance of periodic check-ups. • Communication channels were diversified to reach the largest number of beneficiaries from different nationalities and to ensure the unification of awareness content and its production in multiple languages. • An official representative was selected to act as official speaker to meet the challenge of the spread of misinformation.

Table 4 (continued): Challenges and solutions during the Covid-19 pandemic

Governance and regulations axis	• The Covid-19 Command and Control Centre was created to mitigate the negative consequences of the pandemic and to drive the major policies. • Unified mandates, protocols, pathways and clinical practice guidelines were implemented during the pandemic to limit the spread of the virus. • All infected individuals, including undocumented immigrants, received free care and were treated with dignity during the pandemic. This was facilitated by the government's substantial investment to mitigate the potential short and long-term negative consequences of limited healthcare coverage during the pandemic.

to predict the spread of Covid-19 in Saudi Arabia and to provide valuable information for policy-makers. Almost all healthcare institutions implemented internal surveillance systems and acted upon them.

Table 5: Pillars of climate and disaster resilience in the Saudi Arabian health system

Pillar	Saudi Response
Foundations	• During the pandemic, the Saudi health system successfully handled daily demand and provided appropriate treatment capacity, fair access to health services and maintained effective supply chains. • Digital information was utilised to assess demand for health services and foresee difficulties.
Individual healthcare facilities	• During the pandemic, most sectors of the health service were equipped with sufficient tools, resources, qualified and trained staff and operating protocols. • This facilitated careful planning, keeping track of essential stocks and improving standards of patient care during surges or emergencies.
Healthcare systems	• During the pandemic, most sectors of the health service created strategies to boost surge capacity, including service delivery models and backup plans to ensure vital supply chains remained open. • Telemedicine provided health services to remote locations and data-driven approaches were used to detect surges in the virus.
Integrated emergency response	• The combined efforts of national disaster management systems, the military, civil protection agencies and the general public helped to maintain an adequate emergency response. • High-level inter-agency communication channels were established to build efficient early warning strategies.
Lifeline infrastructure for resilient healthcare services	• During the pandemic, modern technology and enhanced cybersecurity were used to maximise health facilities and maintain systems.

Source: Rentschler R at al., 2021.

After successfully implementing these solutions during the Covid-19 pandemic, the Saudi health system contributed to the strengthening of five pillars of climate and disaster resilience (Table 5).

Several factors contributed to the success of Saudi Arabia's public health agencies in containing the Covid-19 pandemic:

- **Early precautionary measures**: Saudi Arabia was among the first countries to implement early measures such as travel restrictions and the creation of a national committee to prepare for the possible spread of the virus.
- **Multisectoral plan**: The government adopted multiple measures to limit the spread of Covid-19 transmission, both domestically and internationally, incorporating various public health policies and eliciting the cooperation of the MoH, other government departments and the private sector.
- **Strong governance and decisive policy-making**: Underpinned by centralised authority and strong coordination between sectors of the healthcare system, policies were swiftly implemented to protect the population.
- **Advanced digital healthcare structure**: The healthcare system was already equipped with advanced digital infrastructure, allowing for the fast-paced mobilisation of resources and effective management of the pandemic.
- **Widespread testing**: Over 3.5 million laboratory tests for Covid-19 were conducted, which played a crucial role in identifying and isolating cases to prevent further spread.
- **Suspension of pilgrimages**: Suspending pilgrimages to holy sites significantly reduced the risk of transmission among large gatherings of people.
- **Implementation of public health strategies**: Strategies such as quarantine, travel restrictions, mask-wearing, social distancing and the establishment of clinics for symptomatic patients played a vital role in containing the spread of the virus.
- **Economic stimulus packages**: The government provided economic support to safeguard the economy and ensure the stability of the healthcare sector during the pandemic.
- **Fair and priority-driven vaccine distribution**: The equitable distribution of vaccines was prioritised, ensuring that the most vulnerable received protection first. However, investment to improve national drug and vaccine security to combat future threats and pandemics remains critical.

Saudi Arabia's response to the Covid-19 pandemic was underpinned by existing strong communication and coordination between different sectors, including healthcare providers, public health agencies and government bodies. This played a vital role in the implementation of effective strategies to mitigate the impact of the crisis. In addition, collaboration between the health sector and non-health sectors was critical in addressing the challenges posed by the pandemic. Effective communication between sectors allowed for the rapid dissemination of accurate and up-to-date information, fostering public trust and adherence to preventive measures. Furthermore, coordination between different levels of the health system ensured a unified response, enabling the efficient allocation of resources and the delivery of high-quality care throughout the crisis.

However, the country still lacks a single, nationwide database providing real-time national-level status health updates of communicable and noncommunicable diseases other than Covid-19. In addition, given anticipated growth in the Saudi population – projected to be 45 million by 2050 (Unicef, website) – government investment to integrate and forge successful strategic partnerships with the private sector to achieve national health objectives is essential. This includes, but is not limited to, expanding essential industries at the national level to improve health security and self-sufficiency. Establishing and implementing plans for national health security and self-sufficiency are crucial in safeguarding the well-being of the population and ensuring the resilience of healthcare infrastructure. The development of comprehensive strategies that incorporate preventative measures, emergency response capabilities and robust supply chains will allow Saudi Arabia to

effectively manage and mitigate the effects of future potential health crises. Such plans should be grounded in evidence-based practices and should foster collaboration between government agencies, healthcare providers and private sector stakeholders. Furthermore, promoting self-sufficiency in production of essential medicines and medical equipment manufacturing can reduce reliance on foreign imports, thus enhancing national health security. In summary, it is imperative that Saudi Arabia establishes and implements a multifaceted plan to bolster national health security and to achieve self-sufficiency in order to protect public health and maintain a sustainable healthcare system.

1.3 Recommendations

RECOMMENDATION 1A

Establish and implement plans for national health security and increased self-sufficiency to safeguard the well-being of residents and ensure a resilient healthcare infrastructure.

RECOMMENDATION 1B

Encourage collaborations between public and private organisations to finance and develop healthcare infrastructure, services and innovations.

RECOMMENDATION 1C

Develop a centralised healthcare database to facilitate information sharing among healthcare professionals, institutions and patients.

RECOMMENDATION 1D

Support healthcare research and innovation through funding, infrastructure development and collaboration with international research institutions.

2. DOMAIN 2
Financing

2.1 Financing for health system sustainability

According to World Bank data, in 2019, Saudi Arabia spent 6% of gross domestic product (GDP) on health services, and the majority of this is publicly funded (World Bank, website). Article 31 of the Saudi constitution recommends providing healthcare to all citizens. MoH and independent government bodies provide free comprehensive health services, including preventative, diagnostic and medicine benefits, to all citizens and residents working in the public sector. These services are funded by general government revenues, which account for 70% of total healthcare expenditure in Saudi Arabia. The major source of health financing is the Ministry of Finance (MoF), which allocates funds to the MoH as well as to other ministries and government agencies. The MoF disburses funds to health service providers, such as MoH-run health facilities, university teaching hospitals and other government health service facilities. Collectively, the Saudi Arabian healthcare system offers a broad range of services, including preventative care, primary care, out-patient services, in-patient services and emergency care. The government also provides coverage for some specialised services, such as organ transplants and cancer treatments. Table 6 provides an overview of health spending from 2000 to 2019.

Table 6: Saudi Arabia health spending indicators, 2010–2019

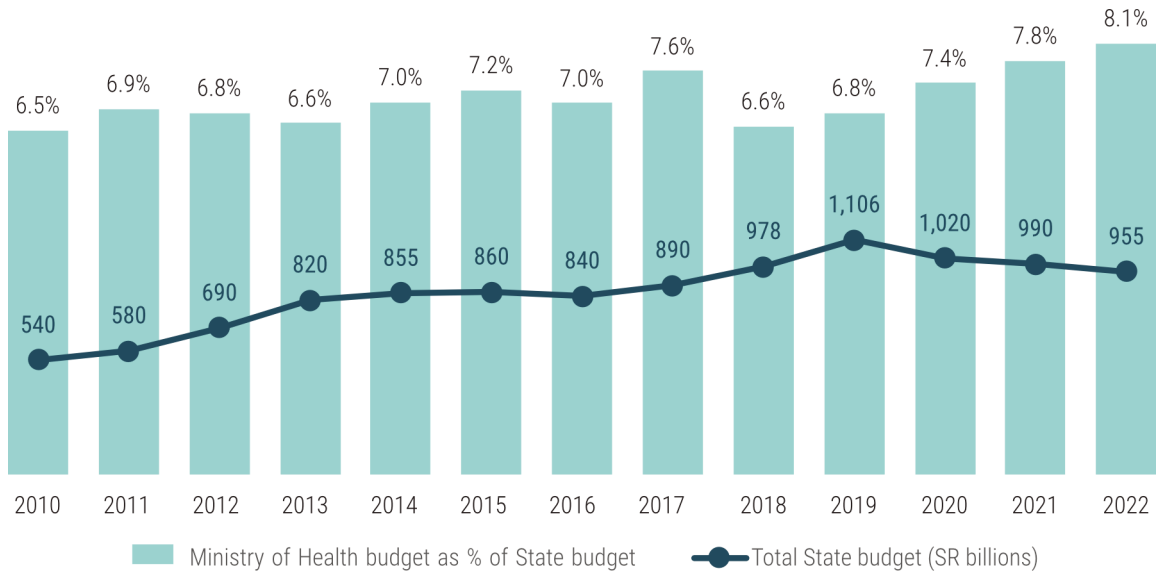
	2010	2015	2019
Current Health Expenditure (CHE)			
as percentage of GDP	4%	6%	6%
CHE in millions (USD)	19,268	39,245	45,106
CHE per capita (USD)	702.67	1,237.33	1,316.26
Domestic private health expenditure			
as percentage of current health expenditure	38.07%	31.53%	30.83%
per capita (USD)	267.49	390.08	405.74
per capita, purchasing power parity (USD)	715.57	919.26	859.89
Out-of-pocket health expenditure			
as percentage of current health expenditure	18.95%	14.38%	16.50&
per capita (USD)	133.12	177.97	217.18
per capita, purchasing power parity (USD)	356.12	419.4	460.28
Domestic general government health expenditure			
as percentage of current health expenditure	61.93%	68.4%7	69.17%
per capita (USD)	435.18	847.25	910.52
per capita, purchasing power parity (USD)	1,164.17	1,996.6	1,929.67

Sources: Ministry of Health, 2022.

Over the past decade, demographic changes have had significant implications for the financing of Saudi Arabia's healthcare sector. Between 2010 and 2022, the population grew from 27 million to approximately 35 million. The working-age population has increased, from 67.2% of the population in 2010 to approximately 70% in 2020, creating a higher demand for primary and specialised healthcare services. The population of people aged 65 years and older has also increased, from approximately 3% in 2010 to approximately 4% in 2020, due to increased life expectancy and declining fertility rates. This demographic shift towards an aging population has placed additional pressure on the healthcare sector, necessitating the development of age-appropriate care mechanisms and formal support systems. The country's evolving demographic composition places a major burden on the healthcare allocation from the national budget, which is derived predominantly from oil and gas revenues.

Over the past few years, the government has reduced overall spending due to a decline in oil-based revenues. However, health service expenditure increased to 8.1% in 2022 (see Figure 2).

Figure 2: Total State budget and percentage allocated to Ministry of Health (2010–2022)



Source: Ministry of Health, website.

With health accounting for a greater proportion of government spending, there is a need for diversified funding sources to ensure both the sustainability and the stability of healthcare financing. Oil revenue constitutes over 50% of national revenue in Saudi Arabia. However, to achieve economic sustainability under *Vision 2030*, the government aims to increase and diversify the economy, reduce dependency on oil revenues and improve public sector services. It aims to raise the share of non-oil GDP from 16% to 50% and increase the contributions of the private sector from 40% to 65% of GDP and the non-profit sector to 5%. The diversification of the Saudi economy will be vital to ensuring the sustainable financing of public services such as healthcare. Meeting the growing and changing needs of the population requires investment in more robust health infrastructure, and the government has the aim of attracting further private sector investment, including through public-private partnerships, to facilitate this. (Alkhamis A, 2021).

Funding sources

In 2019, 30% of the health expenditure came from private sources, with 16% coming from private insurance contributions and 14% from out-of-pocket (OOP) expenditure. Residents working in the private sector are covered by mandatory employer-based health insurance schemes, health insurance providers regulated by the Saudi Council of Health Insurance (CHI) which was established in 1999. Saudi nationals working in the private sector are also covered by these schemes, in addition to their (non-contributory) entitlements to public coverage. The functioning of employer-based health insurance is underpinned by the by the CHI's Saudi Health Insurance Bus (SHIB), a centralised network and processing system that connects all stakeholders in order to manage and monitor standards-based information exchange between healthcare providers and health insurance companies for the benefit of all stakeholders, including beneficiaries. These services are provided by a network of private hospitals throughout the country. Currently, the CHI network consists of nearly 25 insurance companies, with approximately ten million health insurance subscribers who can avail of services from around 5,800 providers (Council of Health Insurance 2022). Over the last few years, due to an exodus of resident workers as a result of measures increase the number of Saudi nationals in the workforce and the negative impact of the Covid-19 pandemic, there has been a decline in the total population covered by private insurance. However, the private health insurance market is expected to grow by about 12% in a base-case scenario and account for 2% of GDP by 2030 (Rahman R, 2020).

OOP expenditure comprises spending by Saudi nationals, residents working in both government and private sectors, and people without coverage. People who are unemployed and those not covered by an employer-sponsored health insurance plan are particularly exposed to OOP, and may find it difficult to afford the user charges required to access healthcare services. While the government provides subsidies for some low- income individuals, coverage is limited, and many people struggle to access the care they need.

Non-citizens who are self-employed may also struggle to access healthcare coverage if they are unable to purchase private health insurance. Undocumented migrants face significant challenges in accessing healthcare services in Saudi Arabia. While the government provides some healthcare services free of charge, coverage is again limited. There are ongoing efforts to improve healthcare coverage for vulnerable groups. In 2019, the government announced plans to expand healthcare coverage to all citizens and residents by 2030 as part of its Vision 2030 plan. However, it remains to be seen how these plans will be implemented and whether they will effectively address existing challenges in providing healthcare coverage to vulnerable groups.

Public healthcare services are provided through MoH, Ministry of National Guard Health Affairs, Ministry of Interior, Ministry of Education (MoE), Ministry of Defence, King Faisal Specialist Hospital and Research Centre, Royal Commission for Jubail and Yanbu, Arabian American Oil (ARAMCO) and many other hospitals and health centres. In recent years, the government has invested heavily in healthcare infrastructure, focusing on underserved regions such as the south and east of the country, and, under *Vision 2030*, the government plans to invest over USD$65 billion in the development of healthcare infrastructure.

The private sector has also grown through investments in specialised services such as cosmetic surgery, fertility treatments and medical tourism. This expansion is largely as a result of the recently launched National Centre for Privatisation, which is one of the executive programmes launched by the Council of Economic and Development Affairs to achieve the objectives of Vision 2030 (International Trade Administration, 2022). The programme seeks to support the development of the national economy and enhance the role of the private sector in the provision of services and the availability of government assets, implying greater autonomy for healthcare providers and a move away from centralised management. This aims to improve in general the quality of services provided and contribute to the reduction of costs. Furthermore, it aims to strengthen the government's focus on its legislative and regulatory role, which at present is somewhat challenged by its responsibility

for care delivery. In addition, the programme seeks to attract local and foreign direct investments. Further investments should be directed towards closing the gap between urban and rural areas.

The National Centre for Privatisation initiative will see an expanded role for the private sector in healthcare delivery with the privatisation of close to 290 hospitals and 2,300 primary health centres, which will continue to deliver publicly-funded services.

The distribution of spending across regions and health system sectors varies depending on the source of funding. The government is the main source of health system funding, with spending distributed as follows:

- Primary healthcare: Approximately 25% of the government health budget is allocated to primary healthcare, including preventative and curative services provided by primary care centres and clinics.
- Hospitals: Approximately 40% of the government health budget is allocated to hospitals, including the operation and maintenance of public hospitals and specialised centres.
- Health administration: Approximately 10% of the government health budget is allocated to health administration, including management and regulating costs.
- Other health services: Approximately 25% of the government health budget is allocated to other health services, including research, training and support services.

Payment mechanisms and models

The payment mechanisms for primary, secondary and tertiary care providers vary depending on the type of provider and the location of the service. Primary care providers are primarily paid through a fee-for-service model. The government provides a subsidy to primary care providers to ensure that services are accessible by all citizens and residents. However, some vulnerable groups such as low-income individuals and undocumented migrants still face financial barriers. Secondary and tertiary providers of specialised services such as surgeries and complex treatments, are primarily paid through a combination of fee-for-service and global budgeting models. The government provides global budgets to hospitals and other specialised providers to ensure they have the resources needed to provide high-quality care. These payment mechanisms have both positive and negative impacts on the healthcare system. On the positive side, the fee-for-service model incentivises activity, and ensures that providers do not have an incentive to skimp on quality or select patients on the basis of risk. The global budgeting model for secondary and tertiary care providers ensures good cost-control. However, the fee-for-service model for primary care providers may lead to the overutilisation of services and increased costs for patients, while the global budgeting model for secondary and tertiary care providers may limit the availability of specialised services, particularly in rural areas.

Value-based payment models are designed to incentivise healthcare providers to deliver high-quality patient-centred, efficient and effective care. These models are increasingly being adopted in healthcare systems worldwide, including in Saudi Arabia. The MoH has introduced a number of value-based primary care payment models, including pay-for-performance and capitation payment models. These models incentivise primary care providers to deliver high-quality care by, respectively, rewarding them for meeting certain quality metrics or by providing a fixed payment per patient, adjusted for patients' risk characteristics, which promotes a focus on preventative care and cost-containment. However, despite ongoing efforts to introduce value-based payment models into secondary and tertiary care, progress has been limited and the global budgeting model remains the predominant payment mechanism. Some hospitals are experimenting with bundled payments based on diagnosis-related groups (DRGs), which incentivise providers to maximise efficiency and deliver coordinated care across the entire care episode. The implications of value-based payment models are both positive and negative. On the positive side, they may incentivise the delivery of high-quality, patient-centred care, which can lead to better health outcomes and lower costs. However,

there are concerns that, if poorly designed or implemented, they may disincentivise providers from treating high-risk patients

or patients with complex medical needs. Overall, there is increasing interest in value-based payment models in Saudi Arabia, and ongoing efforts to implement these models in primary, secondary and tertiary care settings.

Challenges and solutions

The sustainability of health system financing in Saudi Arabia faces several challenges:

- The cost of healthcare is increasing at a faster rate than the increase in national income.
- The current dual service provision and limited coordination between providers have led to excessive costs stemming from the duplication of services for the same case.
- There is further potential for the private sector to play an expanded role in the provision of public healthcare services.

Accordingly, to increase the sustainability of health financing, the government's new Model of Care (MOC) recommends:

- Establishing national health insurance.
- Separating purchaser from providers in order to enhance provider autonomy, competition and accountability, while encouraging the integration of providers.
- Focusing on outcomes rather than inputs.
- Using PPPs to increase private sector health service delivery.

Under the new MOC, and according to international best practices, the CHI is working with different entities to provide affordable, quality and comprehensive health service coverage for all residents. The Centre aims to provide a new financing mechanism for the purchase of health services from service providers by adopting a spending methodology that will ensure the continuity of current services while providing strong incentives for future development. The procurement strategy will be determined based on the health sector's transformation strategy. The new MOC will link providers and regulators under NTP 2020 and *Vision 2030*.

Health system integration, empowerment of the population and increased patient knowledge are all required to meet the above-mentioned goals. The government aims to transform all existing MoH providers into Accountable Care Organisations and improve private health service provision. Along with supporting the establishment of regulations and the improvement of functions and institutions, the government aims to embed strong, delegated and devolved leadership and governance throughout the health system. Health leaders are also focused on building workforce capacity and capability, and developing e-health.

Transformation of health system financing is occurring in three phases. In the first phase (2018–2020), the government aimed to improve the capabilities of the health system, with a primary focus on the clinical system, capacity building and developing preliminary institutional infrastructure. In the second phase (2021–2025), it aims to promote the secure and robust corporatisation of key public entities. In the third phase (2025–2030), the focus will be on strengthening the value and choice of insurance schemes. This will include extending the national health insurance scheme to all citizens and residents in the country, with contributions made via employer and employee contributions, reducing the burden on general government revenues. The new health service payment model will utilise a variety of value-based payment approaches with the aim of providing safe, effective and accessible care, ensuring efficient delivery of health services, reducing waste, making payments based on the quality of service, reducing incentives for physicians to order costly, but not highly effective, diagnostic procedures, and increasing accountability.

Finally, the government established in 2022 the Health Holding Company (HHC) to manage and develop the healthcare sector by improving efficiency, quality and accessibility. It operates under the umbrella of the MoH and plays a significant role in *Saudi Vision 2030*. Its key functions and responsibilities include:

- **Managing public hospitals and healthcare facilities**, ensuring that they operate efficiently and provide high-quality care to patients;
- **Investing in healthcare infrastructure**, such as new hospitals, clinics and specialised healthcare centres;
- **Attracting private investment**, both locally and internationally, through PPPs, joint ventures and other collaborative models;
- **Enhancing the quality and scope of healthcare service**s by adopting the latest medical technologies, best practices and innovative solutions;
- **Developing human resources** through training and development of the healthcare workforce to meet the growing demand for quality healthcare services.
- **Coordinating with other healthcare entities**, such as the Saudi Patient Safety Centre (SPSC) and the Saudi Health Council (SHC), to ensure a unified approach to improving the healthcare system.

It is too early to evaluate the outcomes of the HHC; its integration in the Saudi healthcare system should be revisited and evaluated in the next few years.

2.2 Financing for health system resilience

During the Covid-19 pandemic, the government implemented several mechanisms to rapidly dispense additional funding, with a focus on ensuring sufficient funds were available to public health agencies. It responded to the Covid-19 pandemic by seeking to urgently treat the infected population and prevent the further spread of infection. This demanded additional healthcare expenditure. To achieve this, the Covid-19 Health Endowment Fund was established to support the healthcare sector in its response to the pandemic and to ensure that sufficient funds were available to public health agencies. The MoH increased its budget allocation for the 2022/23 fiscal year, with a particular focus on Covid-19 response efforts, while the government established a Covid-19 Command and Control Centre, to coordinate the national response to the pandemic and ensure that public health agencies had the necessary resources to carry out their work.

The government's expenditure decisions during the pandemic enhanced the resilience of the health system. In addition to increasing health service funding, user fees were temporarily decreased to ensure access to services. At the same time, the transfer of funding from essential services to support the crisis response was kept to a minimum, with funds transferred only where they were most needed. Free treatment was provided to everyone in the country, irrespective of their residency status (including tourists and undocumented migrants) and quarantine expenses were funded for all. The pandemic resulted in a 9% increase in health expenditure, resulting in lower allocation of funding to other public services. The government took steps to mitigate the economic impact of the pandemic, by providing financial support to businesses and individuals affected by the pandemic, including wage subsidies and grants. The Saudi Arabian government also took a proactive role in financially supporting other countries to combat the pandemic. Two agreements were signed between the King Salman Humanitarian Aid and Relief Centre (KSRelief) and the Gavi, the Vaccine Alliance. The first allocated vaccines equally among twenty-two countries and the second allocated USD $965,000 to support Gavi's efforts to combat the pandemic (Gavi, the Vaccine Alliance, website).

The pandemic led to increased demand for healthcare services, while at the same time disrupting supply chains and increasing costs for personal protective equipment (PPE) and other medical supplies. To address these challenges, the government allocated significant additional resources to

the healthcare sector, including funding for new hospital construction, increasing testing and tracing capacity and investing in telemedicine and other digital health technologies. It is likely that the risk of exposure to epidemics and pandemics will continue to be a major concern in Saudi Arabia, and will continue to influence budget planning in the healthcare sector, including investment in new technologies and infrastructure to support remote care, and increased funding for research and development of new treatments and vaccines.

The Saudi Arabian government has also implemented financial risk-management plans to increase reserves and ensure that additional public funds are available during crises. One example is the Saudi Arabian General Investment Authority (SAGIA), which is responsible for attracting foreign investment to the country. SAGIA has implemented various initiatives to encourage investment in key sectors, including health care. These investments help diversify the economy and provide additional sources of revenue during times of crisis. HIMSS and SCEBH also foster improved health care financing practices relevant to crises by emphasising the importance of empowering the national supply chain and localising essential medicines, diagnostics and technologies to strengthen the country's self-sufficiency and resilience in the face of global health challenges.

2.3 Recommendations

RECOMMENDATION 2A
Empower the national supply chain and enhance self-sufficiency in the supply of essential medicines, diagnostics and technologies.

RECOMMENDATION 2B
Implement value-based healthcare financing models that prioritise patient outcomes and allocate resources based on the effectiveness of treatments to promote efficient use of funds and improved patient care.

RECOMMENDATION 2C
Encourage public-private partnerships (PPPs) to increase investment in health care infrastructure and facilitate access to innovative technologies while sharing risks and resources between public and private sectors.

RECOMMENDATION 2D
Leverage the power of funding allocated to research and development to advance national health security in specific areas..

RECOMMENDATION 2E
Diversify funding sources for the Saudi health system to increase financial stability, reduce reliance on a single revenue stream and improve resilience to economic fluctuations.

RECOMMENDATION 2F
Expedite the implementation of a national health insurance system to provide truly universal health care coverage, ensuring equitable access to health services and promoting financial protection for residents.

RECOMMENDATION 2G
Allocate more resources to preventative care and health promotion initiatives to reduce the demand for expensive curative care and thus reduce health care costs and promote a healthier population.

RECOMMENDATION 2H
Implement innovative financing mechanisms, such as social impact bonds or blended finance, to attract private sector investment in public health initiatives to complement public funding.

3. DOMAIN 3
Workforce

3.1 Workforce for health system sustainability

The efficient management of workforce governance and the provision of a talent pool that is 'fit for purpose' and 'fit for practice' are key aspects of healthcare. There are a number of essential elements to ensuring the sustainability of Saudi Arabia's health workforce.

The health workforce pipeline has a long 'factory-to-market' lead time (see Figure 3). Candidates typically take seven to ten years of high school and tertiary-level education before joining the health workforce. Then, depending on their choice of specialty and subspecialty, they may require a further five to ten years to be fully trained to function independently within the system. On average, it takes 16 years to add skilled talent to the health workforce. The Saudi Commission for Health Specialities (SCFHS) is the governmental body responsible for health profession licensing and registration.

Figure 3: Production timeline of the health workforce in Saudi Arabia

Healthcare professionals are expected to remain up-to-date with science and technology that impact the productivity and quality of care offered to patients and the community. To ensure this, the country has strict licensing and re-licensing requirements. Continuous professional development activities are submitted to the SCFHS every two years so that knowledge acquisition can be monitored. However, this neither captures changes in the quality of service delivery nor is it connected to service outcomes or patient safety measures.

Access and quality are closely linked to health workforce density and skills mix. Multimorbidity, chronic conditions and new treatments have led to fundamental changes in the health system, and these changes have impacted on the daily workload of health professionals. Such changes necessitate additional staffing, education, training, licensing and incentive mechanisms, which must be defined and monitored through a unified cross-sectoral national workforce planning and development framework, under the umbrella of the MoH, which is the ultimate regulator and manager of the health service ecosystem.

Challenges

A recent, internal analysis by the SCFHS's National Centre for Health Workforce Planning identified eight challenges in health workforce sustainability:

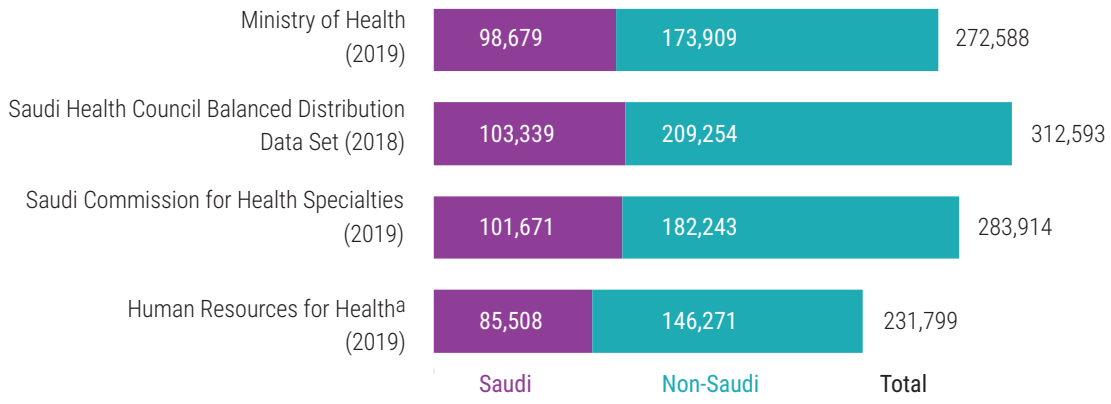
- **Demographic changes and burden of disease**: Longer life expectancies, population growth and an ageing population are increasing the burden of disease and demand for health services and healthcare workers..
- **Rapid technological advances**: Artificial intelligence (AI), robotics, data automation and advanced digital technologies are challenging health service delivery models, as these advancements demand different technological skills from health professionals and other professions.
- **Non-unified vision**: Successful planning and development of the health workforce require a long-term, strategic vision beyond the next three to five years, considering the lead times for workforce education and training, and rapid advancements in the health and care environment.
- **Quality and availability of workforce data**: There is a lack of appropriate and accurate workforce data, especially regarding workforce supply, attrition, private sector characteristics, service outputs and staff productivity.

- **Shortage and maldistribution of workforce**: Demand for healthcare workers overall exceeds supply. A disproportionate number of highly qualified health professionals and an insufficient number of technical and support-level personnel, combined with the geographical maldistribution of the workforce, results in major disparities in health outcomes.
- **Quality of skill set and mix**: A poor definition of competency frameworks and skill mix in the workforce poses considerable risk to the quality of healthcare and the value delivered to patients and to the public.
- **Stakeholder alignment and coordination**: Several distinct factors affecting health workforce planning, such as poor coordination and weak linkages among stakeholders, present challenges in aligning planner responsiveness with decision-maker needs.
- **Changing workforce roles**: Transforming the health service to be more value-based with an integrated MOC through the redesign of care pathways has workforce implications, including adapting and equipping professionals with the skills and capabilities to take on new and dynamic roles and focusing on team approaches rather than individual contributions.

These challenges call for a number of changes to health system's workforce strategy. First, health workforce planning and development should be aligned with the interests of *Vision 2030*, the health transformation agenda and national health security priorities, and should include programmes that tackle capacity building, skill enhancement, retention and motivation, task shifting and optimisation, diversification and inclusion regulation and standardisation, and monitoring and evaluation. Second, there needs to be a clear national health workforce governance structure and strategic direction that leads, empowers and streamlines health workforce planning and development. Third, active stakeholder coordination and systematic engagement are required to understand needs, align interests and ensure that health workforce planning and development outcomes are demand oriented, relevant, evidence-based, trusted and supported by stakeholders. Fourth, the provision of transparent, reliable and timely evidence-based research from comprehensive and systematic data gathering across integrated platforms is essential for effective healthcare analysis and decision-making. Fifth, adaptive and evidence-based health workforce simulation and forecasting models need to be established to routinely monitor the situation of the health workforce and enable informed predictive and scenario-based planning.

Based on the most recent data from a number of government sources, there are approximately 300,000 physicians and nurses in the Saudi Arabia health system, approximately 100,000 of whom are Saudi citizens. Depending on the source, the number of non-Saudi physicians and nurses ranges from 146,000 to 210,000 (see Figure 4).

Figure 4 Number of physicians and nurses, Saudi and non-Saudi

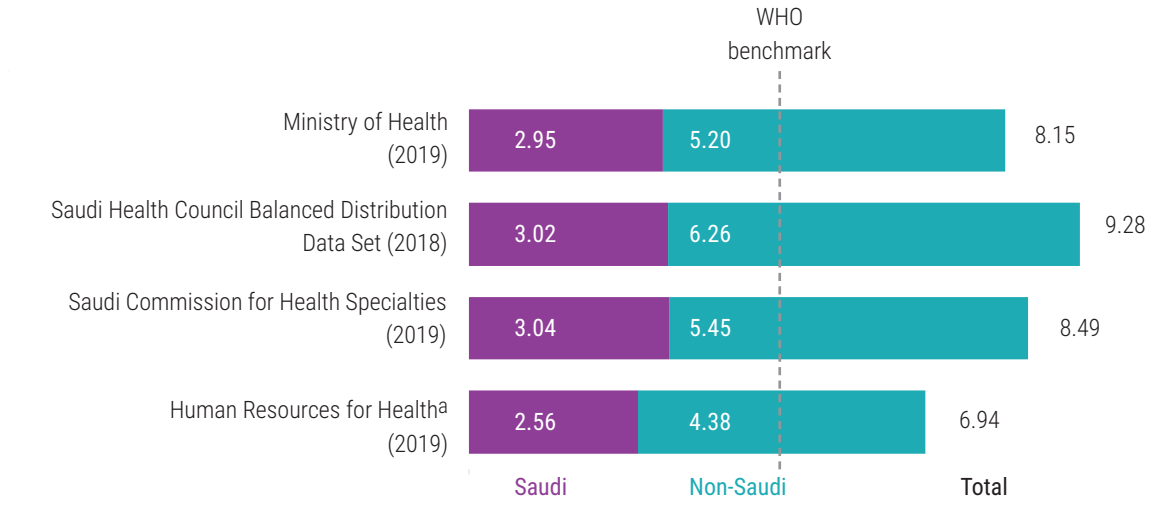


a Excludes medical cities and some university hospitals.

Source: Alghaith T et al., 2021.

When standardised by population size, the country has a density 7–9 health physicians and nurses per 1,000 population, which is greater than the global benchmark of 4.5 set by the World Health Organization for universal health coverage (see Figure 5). However, this density drops to one physician and two nurses when considering only Saudi health workers.

Figure 5: Density of physicians and nurses per 1,000 population, Saudi and non-Saudi

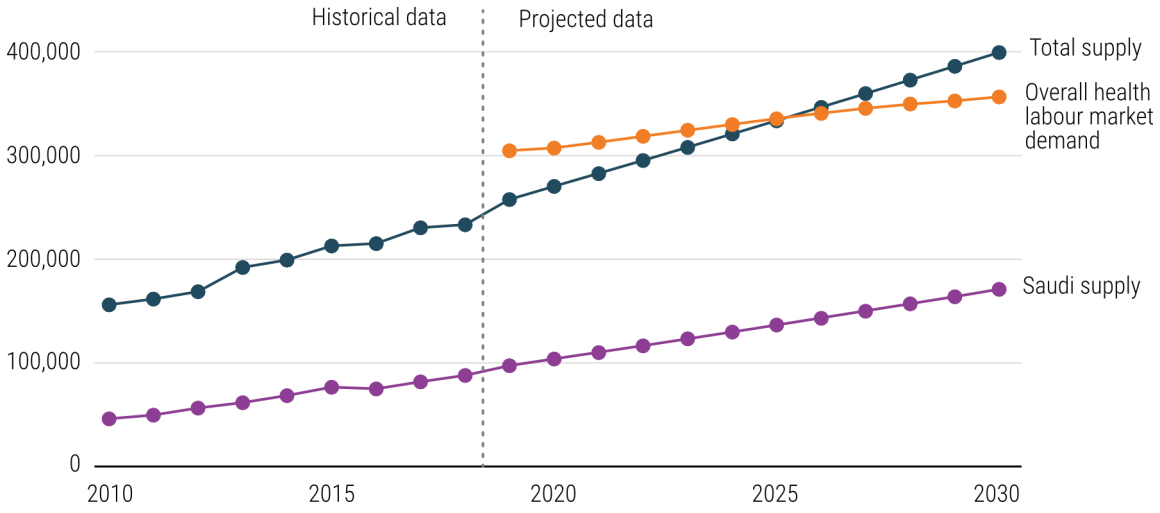


a Excludes medical cities and some university hospitals.

Source: Alghaith T et al., 2021.

The demand for healthcare professionals is expected to increase by 16% over the next decade, with a need for approximately 356,500 healthcare professionals by 2030 (see Figure 6).

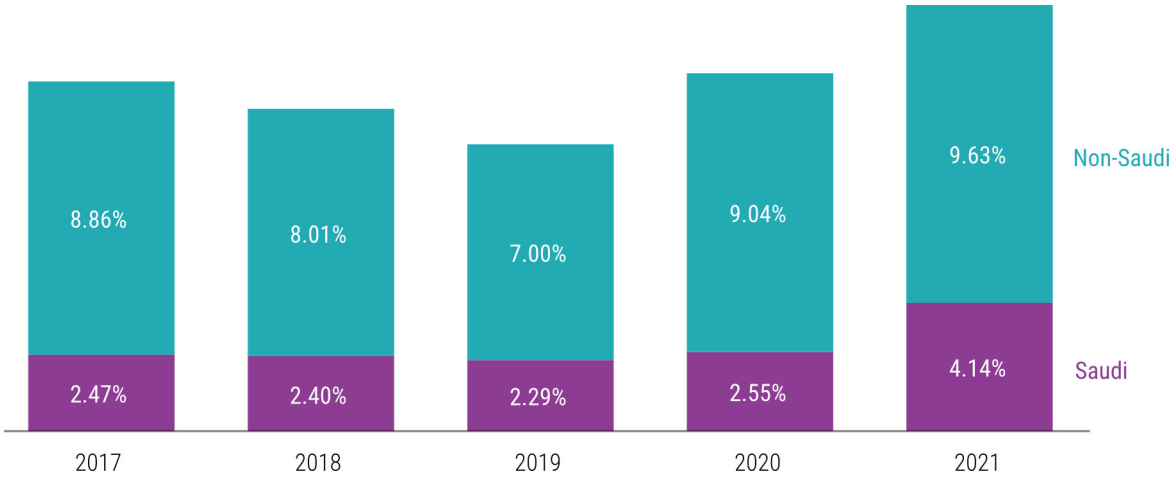
Figure 6: Projected supply and demand for physicians and nurses



Sources: Lin T et al., 2021; Alghaith T et al., 2021.

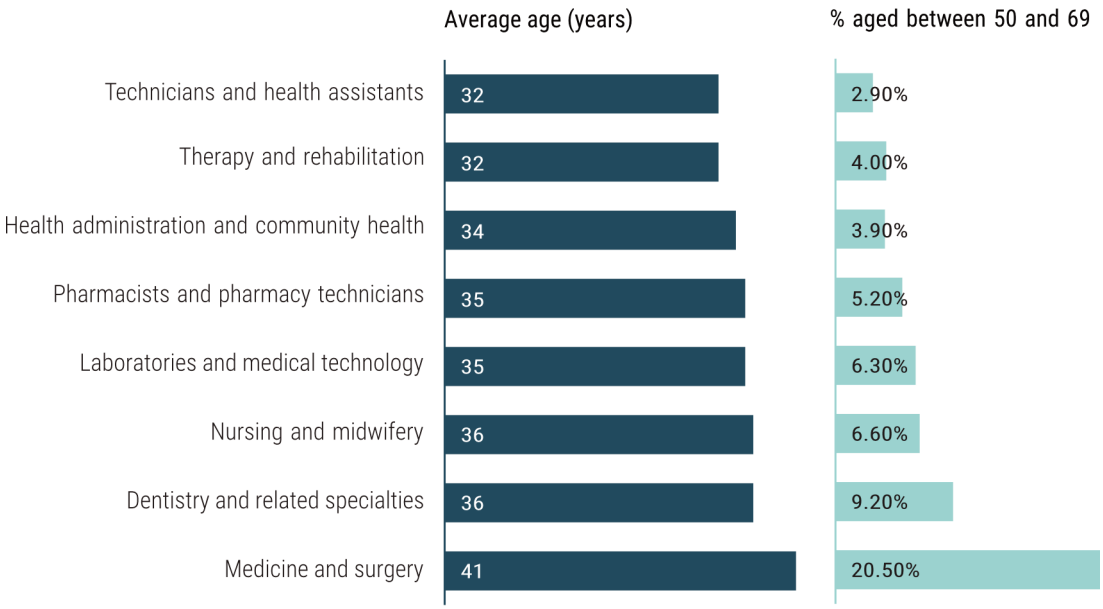
Despite the projected overall surplus of physicians and nurses by 2030, imbalances in skill-mix and geographic distribution of the healthcare workforce will limit progress and efforts should be made to expand the number of Saudi health workers. The current heavy reliance on non-Saudi health professionals, who have a high turn-over rate, threatens the long-term sustainability of the health workforce (Figure 7). In addition, nearly 20% of physicians and 7% of nurses are expected to retire within the coming ten years (Figure 8).

Figure 7: Average annual turnover for all specialties, Saudi and non-Saudi (2017–2021)



Source: National Centre for Health Workforce Planning, 2021.

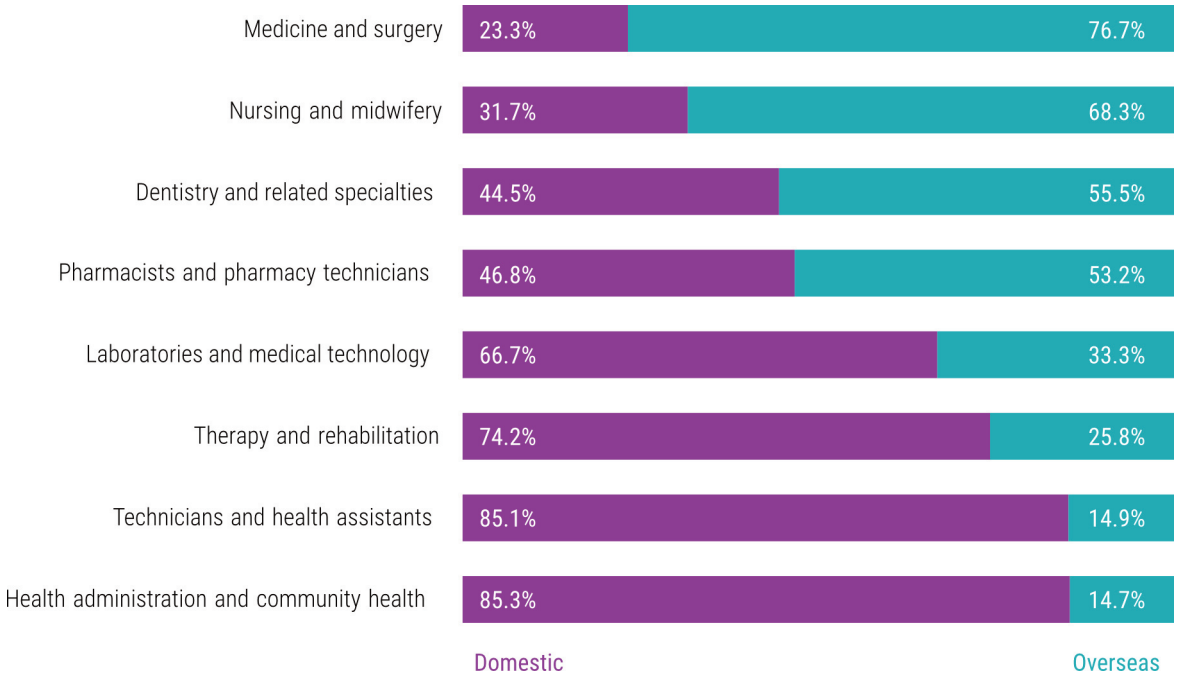
Figure 8: Average age and percentage of healthcare professionals set to retire by 2030



Source: National Centre for Health Workforce Planning, 2021.

Health practitioners from over 120 countries work in different clinical and supportive fields, indicating the country's positioning among the global workforce. The high proportion of non-Saudi healthcare professionals (see Figure 9) can be attributed to several factors. Due to a lack of Saudi professionals historically, the country relied on foreign workers in the healthcare sector. Rapid population growth and an ageing population have also contributed to the demand for more healthcare workers, which has mainly been met by hiring professionals from overseas. In addition, Saudi Arabia's educational and training infrastructure have not produced enough qualified healthcare professionals to meet the growing demand, further leading to a reliance on foreign workers to fill the gap. However, the government recognises these challenges and is actively working to address them through its *Vision 2030* strategic plan which aims to increase the number of trained Saudi healthcare professionals through initiatives such as the Nitaqat programme, which aim to increase the number of Saudi citizens employed in the private and public sectors (PwC, 2021). Across all sectors of the economy, the government plans to shift the current one-third Saudi-to-foreigner workforce ratio to a two-third ratio by 2030.

Figure 9: Percentage of domestic and overseas trained healthcare professionals



Note: For professionals trained in both domestic and overseas settings, the highest accreditable certification was considered.

Source: National Centre for Health Workforce Planning, 2021.

Solutions and opportunities

The Saudi Health Academy was established to fulfil these needs. The aim of the academy is to bridge the job need gap and create health vocational training programmes for the purpose of capacity building and strengthening the competencies of the health workforce in order to raise the efficiency and quality of services provided. It provides career development opportunities to healthcare professionals and offers high-quality healthcare education programmes that focus on competency, ambition, responsibility and excellence. The academy aims to improve patient care outcomes by utilising new techniques and real-world experiences into its educational programmes.As of 2022, 28 programmes were offered and close to 550 individuals were enrolled as active learners in this Academy.

Workforce inflow and outflow can impact health service delivery, funding, quality and equity. Workforce mobility occurs at two levels: (1) the influx and outflux of the workforce to and from the country and (2) the mobility of the workforce among different local health organisations.

Saudi Arabia's international and national workforce is an asset to the health system for several reasons. First, the blend of international and national professionals provides a diverse range of expertise and perspectives, enhancing the quality of care and fostering innovation. Second, the presence of foreign professionals helps to transfer international best practices into the Saudi healthcare system. Third, the commitment to nurturing national talents ensures a sustainable workforce that understands local cultural and social nuances. Lastly, this combination facilitates knowledge exchange, promoting continuous learning and improvement in healthcare provision.

Saudi Arabia maintains strict rules about working simultaneously at different healthcare organisations, with the exception of academics who are permitted to work part-time in private and public health service and in educational institutions. These strict rules were justified by the siloed working culture of academia and care provision. The transformational approach of *Vision 2030* and the experience of crisis management during the Covid-19 pandemic made way for new rules that allow a subset of healthcare practitioners to work within other organisations. Although the aim of workforce mobility is the improvement of workforce morale and well-being, it also helps to address issues such as staff shortages, maldistribution and skill mismatches, all of which can have immediate and long-term impacts on the efficiency and equity of healthcare delivery.

Health workforce planning and development efforts are expensive and time-consuming, and they require the integration and collaboration of multiple stakeholders in the health service, education, human resources and labour sectors. Such massive investments call for an evidence-based approach to workforce planning to efficiently and effectively reach the target goals of the existing and future health workforce. Striking a dynamic balance between workforce supply and demand is a huge undertaking. Workforce planning and development activities need to be justified with regard to producing an adequate number of professionals, with the required skills, in the right time and place and for a justifiable cost. The national workforce planning platform currently contains data on the health workforce throughout the talent pipeline. It provides data-driven insights based on (1) integration with the MoE, SCFHS, MoH, different healthcare providers and the General Statistics Authority; (2) predictive modelling of supply and demand based on multiple variables; (3) cross-validation through the exchange of data between participating organisations; and (4) confidentiality, integrity and availability of data, governed by the best practice standards of the National Data Management Office.

However, there are multiple opportunities to build on including (1) a national health workforce strategy to define the number of professionals needed, directions and priorities and (2) the horizontal expansion of the Saudi standard classification of occupations to include new occupations and its vertical expansion to adapt to more flexible and standardised career paths.

3.2 Workforce for health system resilience

During Covid-19, the Saudi Arabia health system was challenged on multiple fronts. The most significant of these challenges was having a sufficiently skilled workforce to deal with the pandemic within health facilities and communities. A national multi-organisation effort between the MoH, Ministry of Human Resources and Social Development, MoE, SCFHS, SHC and many other organisations was set up, resulting in the creation of the National Rapid and Emergency Response Programmes. One outcome was an online platform with multi-modal learning delivery targeting three goals: (1) augmenting the health workforce by training volunteers to participate in management, tracking confirmed and suspected Covid-19 cases and tracking people who had been in contact with individuals with confirmed or suspected Covid-19; (2) Reskilling critical-care service delivery personnel to operate efficiently in intensive care units; and (3) Upskilling the health

workforce to handle increased utilisation of emergency departments across the country. Facilitated by a rapid response training programme, these National Rapid and Emergency Response programmes delivered standardised task shifting experiences to over 280,000 professionals in more than twenty cities across the country.

During the Covid-19 pandemic, the health system workforce played a crucial role in managing and mitigating the adverse effects of the pandemic. Several factors contributed to the effective handling of the crisis:

- **Rapid response**: The health workforce quickly adapted to the rapidly evolving situation by implementing new protocols, guidelines and best practices to ensure the safety of both healthcare professionals and patients.
- **Capacity building**: The MoH expanded the capacity of its health workforce by recruiting and training additional healthcare professionals, including doctors, nurses and support staff, to meet the increased demand for care.
- **Collaboration**: A strong emphasis was placed on collaboration and teamwork among healthcare professionals, ensuring efficient coordination between different sectors of the health system, including hospitals, primary care centres and public health agencies.
- **Telemedicine**: To reduce the risk of transmission and maintain healthcare accessibility, the MoH expanded its telemedicine services, enabling healthcare professionals to provide remote consultations and follow-up care for patients with chronic conditions or those requiring routine check-ups.
- **Infection prevention and control**: Rigorous infection prevention and control measures were implemented to protect the health workforce from Covid-19 transmission. This included the provision of personal protective equipment (PPE), regular testing and vaccination for healthcare professionals.
- **Mental health support**: Recognising the psychological toll of the pandemic on individuals in the health sector, mental health support services, including counselling, stress management and resilience-building programmes, were made available to healthcare workers.
- **Public health campaigns**: The health workforce was actively involved in promoting public health awareness campaigns, educating the public on preventive measures such as hand hygiene, social distancing and vaccination.
- **Continuous learning and adaptation**: The health workforce demonstrated a commitment to continuous learning and adaptation, regularly updating their knowledge and skills based on the latest scientific evidence and global best practices.

The physically and mentally demanding nature of provisioning health services is a global phenomenon, which also affects individual health practitioners, health service quality and the community. It also drains the system of human capital and financial resources. In the United States, a conservative base-case model estimates that, each year, physician turnover and reduced clinical hours are attributable to burnout cost approximately USD $4.6 billion (Han S et al., 2019).

Addressing burnout is becoming an urgent priority at the national level. In a survey of the satisfaction of trainees with their medical education, (Housawi et al., 2020) found that almost two-thirds of SCFHS postgraduate trainee respondents "feel that they experience a significant rate of burnout in their lives that has a key impact on their professional conduct and their lives." Among the survey participants, representing all specialties, all levels of training and all provinces in Saudi Arabia, 56% reported burnout, defined as high emotional exhaustion and/or high depersonalisation. Moreover, 40% of participants met the criteria for having the symptoms of depression.

An SCFHS national well-being support programme, Da'em (meaning support) has added well-being to the accreditation of all healthcare training institutions. The Da'em framework is based on the

conviction that "well-being is a system issue, not an individual burden for those suffering from it," as illustrated in Table 7. The programme is growing, with more than 550 counselling sessions in 2022, compared to 300 in 2019.

Table 7: SCFHS Da'em health professional framework of institutional causes of burnout and contributions to well-being

Trainee	Training Programme	Training Institution	Regulator (SCFHS)
Demands			
• Sleep deprivation • Moral distress • Interprofessional communication	• Mental workload • Ideal/high expectations • Poor task distribution	• Institutional and internal regulations • Productivity targets • Administrative burden • Patient load and complexity	• Compliance with regulations • Holding active institutional/programme accreditation status • Maintaining professional registration and licensing • Time pressure related to training completion • Training tuition
Bidirectional			
• Personal values • Personality traits • Psychological capital • Professional habits • Socioeconomic status	• Specialty • Team dynamics • Balance between professional duties and training • Autonomy	• Institutional values • Physical environment • Safety • Staffing • Scheduling • Workload • Professional community • Information • Technologies • Sponsorship • Rewards	• Legislative function • Quality assurance • Corporate efficiency • Governance • Matching system for selection of best applicants
Resources			
• Mindfulness • Resilience • Family support • Healthy lifestyle	• Curriculum • Supervision • Mentorship • Coaching • Peer support • Recognition	• Learning opportunities • Well-being and support • Administrative support • Corporate excellence	• National well-being programme (Da'em) • Quality assurance and monitoring • Regulations and resources supporting trainee rights and well-being • Institutional/programme support • Faculty development • Trainee empowerment programme

Source: Saudi Commission for Health Specialties, 2022.

3.3 Recommendations

RECOMMENDATION 3A
Establish mechanisms to forecast future health care workforce supply and demand, with projections taken into account in national workforce training strategies..

RECOMMENDATION 3B
Design and implement a mechanism for the routine evaluation of health workforce performance, productivity and wellbeing to inform interventions for their improvement.

RECOMMENDATION 3C
Develop and enforce a national health competency framework aligned with the plans to implement a value-based health system.

RECOMMENDATION 3D
Ensure prioritisation of the well-being and psychological safety of healthcare workers, involving service providers, regulator and accreditation organisations and in the health ecosystem in general to reduce burnout and staff turnover.

RECOMMENDATION 3E
Meet targets for the number of Saudi Arabian nationals in the health workforce, especially in the nursing profession.

RECOMMENDATION 3F
Incentivise services to rural and underserved areas to help address disparities in access to care.

RECOMMENDATION 3G
Expand and diversify the healthcare workforce by investing in education and training programmes to meet the needs of a growing population.

4. DOMAIN 4

Medicines and Technology

4.1 Medicine and technology for health system sustainability

At present, 20% of the Saudi Arabia health service budget is spent on pharmaceuticals and technology, and the government is faced with the challenge of rising costs in this domain. Therefore, streamlining this expenditure is an important step towards transforming the health system. Adopting appropriate value-based policies in all areas of the health service, including a formulary review process and economic evaluation to establish agreements with pharmaceutical and health technology companies, will ensure substantial and more resilient improvements to health system financing and meet *Vision 2030* goals and directives. In recent years, Saudi Arabia's economic evaluations of new medical technologies have begun to take social and economic impacts into account. Building health economics research capability and improving the quality of evaluations will lead to better decision-making and the more efficient allocation of healthcare resources.

Saudi Arabia's adoption of high-cost new medical technologies requires central planning and capital funding. Central planning involves decision-making at a higher organisational level and the strategic allocation of resources to ensure that the adoption of new technologies aligns with a hospital's overall goals and objectives. This process, which is currently being adopted by a number of hospitals, involves assessing the potential benefits, costs and long-term impacts of new technologies on patient care and on how the hospital operates. Capital funding, meanwhile, refers to the financial resources allocated for the acquisition of new technologies, equipment or infrastructure. In Saudi Arabia, this funding comes from a variety of sources, including government grants, donations, hospital-generated revenue and external investors. These resources are crucial for the successful implementation of high-cost new technologies, covering expenses such as purchasing equipment, staff training, maintenance and upgrading existing facilities. To overcome the barriers to adopting new technologies in hospitals, numerous healthcare institutions have established central innovation budgets to allocate funds to innovative technologies that benefit multiple units, promote collaboration and reduce the financial burden on individual departments. This approach streamlines the decision-making process and ensures that the hospital's resources are used more efficiently when adopting new technologies that have the potential to improve patient care and overall hospital performance. Another option is to take a more decentralised approach by providing high-volume medical treatment units with budgets and greater autonomy, giving individual units greater accountability and flexibility in investing in innovative technologies that directly benefit patients and improve the quality of care. Both approaches would facilitate the adoption of high-cost technologies, ultimately leading to better patient outcomes and more efficient healthcare delivery.

The Saudi Food and Drug Authority (SFDA) regulates most of Saudi Arabia's medicines and health technologies (Saudi Food & Drug Authority, website). Regulation includes the safety of technologies and the accuracy of manufacturer-provided specifications. In 2020, SFDA evaluated 76,418 health technologies, completing 99% of these evaluations within the set policy period of 35 days (Saudi Food & Drug Authority, 2020).

SFDA also investigates the efficacy of and issues with certain health technologies before and after their release onto the health market. Moreover, it operates a programme that receives and analyses health technology and medicine safety reports from the country's health organisations and disseminates safety reports concerning those technologies, including safety alerts issued by internationally recognised organisations such as the Emergency Care Research Institute, which has been providing such services for over 50 years. In 2020, the SFDA issued 1,991 healthcare technology safety alerts to healthcare providers (Saudi Food & Drug Authority, 2020).

The National Unified Procurement Company (NUPCO) was founded in 2009 to assist government health providers in acquisition and delivery of cost-effective health technologies. It is entirely owned by the government's Public Investment Fund (National Unified Procurement Company, website). Combining orders from several government health providers helps NUPCO to negotiate affordable prices for health technology and medicines suppliers, enabling the adoption of innovative health technologies. NUPCO also has an established supply chain system with warehouses that have the capacity to

fulfil 380,000 orders. This stock of medical supplies, medications and medical equipment acts as a buffer, thus avoiding the ramifications of production interruptions to the supply chain.

e-health

The Saudi government is currently implementing an e-health system to provide accessible health services for its population. Electronic health records are being expanded to include more accurate disease and condition information. Given the predicted increased demand for health professionals in the next decade, the adoption of medical technologies should improve efficiency and quality of care.

The integration of digital health services with existing services is part of the MoH's Digital Health Strategy which aims to provide easier patient access to medical consultations at cost-effective rates. Among the key technologies being integrated into the healthcare sector are the Internet of Things, 5G, artificial intelligence, electronic medical records (EMR), picture archive and communication systems (PACS) and health portals. In response to the Covid-19 pandemic, Saudi Arabia introduced digital applications such as SEHHA, Sehaty, Tetamman and Tabaud (see section 4.2). Digital health services regulation is overseen by the MoH and falls under the country's Digital Health Laws and Regulations Framework, which defines digital health as "the cost-effective and secure use of information and communication technologies in support of health and health-related goals." The potential economic benefits of digital healthcare are significant. The Centre for Improving Value in Health estimates that it could generate economic benefits of up to $27 billion by 2030, potentially unlocking up to 15% of Saudi Arabia's total projected health expenditure for 2030, which could be used to enhance patient outcomes (McKinsey & Company, 2022). These potential savings come from five areas of economic benefit: (1) virtual interactions, (2) self-care and self-service, (3) decision intelligence systems, (4) paperless operations and (5) automated workflow.

Electronic patient records (EPR) have been implemented in almost all health care facilities in Saudi Arabia, although adoption has been slow at the national level owing to challenges such as resistance from some health care professionals, poor computer literacy, lack of system customisation and poor support and training from information technology personnel. (AlSadrah SA, 2020), However, in 2008, the MoH launched an initiative to expand and optimise the use of EPRs in governmental health care institutions, demonstrating its efforts to improve the situation. Currently, EPRs are readily accessible across primary and secondary care settings in Saudi Arabia. Efforts to expand and optimise the use of EPRs in governmental health care institutions are currently underway, with the aim of improving the management of noncommunicable diseases (NCDs) at primary health care centres. Staff training in the use of EPRs is an important component of such efforts.

The extent and rate of adoption of mobile technologies in Saudi Arabia has the potential to enable and accelerate the utilisation of digital health solutions, including telehealth, patient portal and remote patient monitoring. For example, the main Saudi payment network, Mada (meaning 'horizon') has reported that use of mobile payment services, such as Apple Pay, increased by 71% in June 2022 compared with the previous year. Saudi Arabia is also ranked 39th in the list of countries with the fastest internet speeds for fixed connections and ninth fastest for mobile connections, likely due to the high rate of 5G adoption in the country (SpeedTest, website).

The adoption of these digital technologies benefits health service providers and the health system and can assist in tackling key health service challenges, including access, quality and patient safety, cost-effectiveness and system resilience. Therefore, many private and public health organisations in Saudi Arabia have accelerated the implementation of digital technologies, such as EMR systems, and have reached a high level of digital maturity. According to the Health care Information and Management Systems Society (HIMSS), several of Saudi Arabia's hospitals are equipped with the highest level of EMR digital maturity, measured using the HIMSS EMR Adoption Model (EMRAM). EMRAM consists of eight stages ranging from stage zero, indicating the non-existence of even basic IT and digital health components, and increasing to stage seven, indicating the meaningful adoption

of the most advanced digital health technologies, such as paperless clinical documentation, closed-loop clinical workflows and secure IT infrastructure. Nevertheless, a sizable proportion of Saudi Arabia's health service providers represent low digital maturity, thus impeding certain holistic digital health solutions that target the entire health sector.

The National Health Information Centre (NHIC) governs digital health maturity and oversees initiatives to improve the entire health system in the short- and long-term, in line with Vision 2030. As such, NHIC has launched an initiative to establish a national digital health maturity model that will indicate each health care organisation's digital maturity status and provide a blueprint for enhancing digital maturity. The blueprint encapsulates best practices, recommendations and guidelines from subject matter experts to assist health care organisations in the process of developing digital health maturity. Furthermore, it allows health care organisations to benchmark each other and offers a general insight into the status of digital maturity across various stratifications.

New medicines and technologies

The Saudi health system is currently undergoing a paradigm shift, wherein the expectations of all stakeholders are moving towards a value-based model. The major drivers of this transition are the development of innovative medicine with promising health outcomes, the ability to digitally capture high-quality health data and the economic burden posed by a limited budget. To aid the smooth transformation, the Saudi Arabian government has identified seven fundamental areas of focus: (1) MOC, (2) health financing, (3) private sector participation, (4) workforce optimisation, (5) corporatisation, (6) e-health and (7) health sector governance. These focus areas are interlinked, and their combined evolution can contribute to a more value-based health system.

Adopting an appropriate economic evaluation is essential to the efficient allocation of resources in a health system with a constrained budget. The two most widely used economic evaluations in Saudi Arabia are budget impact analysis (BIA) and cost-effectiveness analysis. BIA is an integral part of the MoH assessment process for novel interventions and formulary inclusion. BIA is especially relevant to formulary 'class reviews' performed at regular intervals to ensure that the formulary content remains relevant to national health care needs.

Some initiatives that have already been established or initiated involve the adoption of value and evidence in formulary decision-making processes, including pharmacoeconomic evaluation and the adoption of managed entry agreements with a specific focus on value-based agreements (VBA).

The MoH pharmacy and therapeutics committee is a policy-recommending body that develops formulary systems to ensure access of clinically appropriate, safe and cost-effective medicines, aligned with the roles set by the SFDA. The current formulary review process is comprehensive and includes value-based processes. The five criteria for subjecting a drug to impartial evaluation are: drug information, safety data, published clinical efficacy data, pharmacoeconomic analysis and local BIA. This comprehensive review process streamlines the inclusion of only relevant drugs, helping health professionals to choose the best available treatment option with desired clinical outcomes and minimal risk.

Managed entry agreements (MEAs) promote access to new medicines and technologies in the context of uncertainty regarding cost-effectiveness, real-life clinical benefit and potential impact on health expenditure. They also promote innovation and R&D in value-adding therapeutic areas. These arrangements use mechanisms such as financial-based agreements, VBAs and, in certain cases, a hybrid of the two to manage the adoption and maximise the cost-effectiveness of new medicines. The majority of MEAs in Saudi Arabia are finance-based agreements, possibly because of the immediate gains they offer to all stakeholders, with no requirement for long and complex monitoring and follow-up of health outcomes. However, the MoH is seeking to shift to more VBAs that prioritise performance and outcome. Therefore, it has developed its first MEA implementation policy to facilitate and regulate the introduction of similar agreements. In addition, multiple hybrid MEAs with

a financial component and an outcome-based focus have been introduced across multiple therapy areas, including, but not limited to, multiple sclerosis, asthma and psoriasis.

A cost-effectiveness threshold (CET) initiative to estimate health opportunity costs has been established by the MoH, in collaboration with York University, SFDA and other key institutions and academics. The estimated CET will reflect the maximum ability of a health system to pay for the health benefits offered by a new health technology, without compromising total population health. It will also inform resource allocation decisions to improve overall population health. Furthermore, a CET will be considered for rare diseases and other potential specialty areas, including oncology.

A Centre for Health Technology Assessment will be formed as part of *Vision 2030.* This major initiative will provide evidence-based recommendations and inform policy regarding specific medicines and technologies. Health Technology Assessment (HTA), which mainly focuses on evidence and value-based approaches, should facilitate improved and equitable quality of care with reduced disparities across the population and ensure a sustainable health service through the rational utilisation of health system resources. Although the implementation of HTA is in its nascent stage, roadmaps and activities for its successful implementation are rapidly progressing.

These value- and evidence-based initiatives rely heavily on high-quality data and information on all aspects of health, which need to be effectively collected, organised, monitored and stored. Therefore, a reliable platform, containing disease registries and national formularies, needs to be developed and improved to address challenges related to limited lack of reliable data.

4.2 Medicines and technology for health system resilience

As part of the broader transformation of the health system, Saudi Arabia is currently working on a national medicines policy which aims to improve the resilience of the health system through changes in the use of medicines and technologies. The establishment of the Centre for Health Technology Assessment will allow systematic assess the effectiveness, efficiency and safety of new medical technologies and medicines to ensure that best medical practices are adopted. This will ultimately enhance the resilience and quality of the Saudi Arabian health system.

The Health Electronic Surveillance Network (HESN), operated by the Public Health Division of the MoH was one of the key digital platforms in the effective management of information during the Covid-19 pandemic. The HESN is a public health solution for disease surveillance and disease management, based on data submitted by health service providers across the country. The platform is web-based and supports both manual data entry and interoperability with digital health systems, such as EMRs and Lab Information Systems. During the height of the pandemic, the platform played a key role in enabling surveillance of Covid-19 across the nation in a timely manner, allowing public health policy and decision-makers to effectively implement actions. A study of platform satisfaction found that 71% of end-users were generally satisfied with the solution and 87% believed it to be better than the traditional paper system. (Eddine IS & Zedan HS, 2021).

The Tawakkalna mobile application was another transformational digital health technology heavily employed during the peak of the Covid-19 pandemic which provided several health solutions (see Case Study 1). Real-time data were used to inform and fine-tune the pandemic response using several strategies. First, real-time local and global data provided actionable information for decision-makers. This data-driven approach allowed the government to monitor the spread of the virus, identify hotspots and effectively allocate resources. Second, social and behavioural science was employed to support the pandemic response. This involved analysing data on public behaviour and attitudes towards the pandemic, helping authorities craft targeted messaging and interventions to encourage adherence to safety measures, such as social distancing and mask-wearing.

The National Cybersecurity Authority (NCA) of Saudi Arabia has both regulatory and operational functions. It works closely with public and private entities to improve cybersecurity and safeguard

the country's vital interests, national security, critical infrastructures, high-priority sectors, government services and government activities in line with *Vision 2030*. NCA regularly evaluates the compliance of government organisation portals against set cybersecurity controls. The resulting evaluation reports help to improve preparedness against cybersecurity threats. This increases the resilience of health organisations and assists in preventing interruptions of services due to cybersecurity attacks.

Adoption of telehealth in clinical practice is a key policy initiative currently materialising in Saudi Arabia. This was essential in controlling the spread of Covid-19. A major telehealth success metric has been increased patient satisfaction. A study of 277 providers found that 68% of patients reported positive responses to the service. Moreover, the majority of physicians were satisfied with telehealth services (Alsaleh MM, 2021).

Telehealth has facilitated the launch, in 2022, of Seha Virtual Hospital which is entirely based on delivering telehealth services. It supports 130 hospitals across the country and provides over thirty specialised clinical services. Moreover, the use of telemedicine services allows for better disease control and prevention, as patients can easily consult with their physicians and receive timely medical advice. This, in turn, has led to fewer emergency admissions and improved patient outcomes. The total annual capacity of the hospital is more than 400,000 virtual visits. The hospital also employs remote patient monitoring via medical devices that stream vital signs data and clinical results remotely from the patient to the virtual hospital. This enhances operational efficiency and a proactive health service, enabling the identification of clinical issues and offering treatment in a timely manner. Overall, the implementation of telehealth, if scaled out, can substantially contribute to the resilience to the Saudi Arabia healthcare system in the face of future pandemics similar to the Covid-19 pandemic.

Procurement during the Covid-19 pandemic: Saudi Arabia took proactive measures to stockpile emergency health supplies. The government and health authorities focused on obtaining essential medical equipment, such as ventilators, PPE and medicines required for the treatment of Covid-19 patients. They collaborated with local and international manufacturers to ensure a steady supply of these items. In addition, the SFDA expedited the approval process for medical devices and equipment to facilitate their entry into the market.

To prevent waste and ensure the efficient use of resources, a stringent inventory control system was implemented. This included real-time monitoring of supplies, regular audits and strict adherence to expiry dates for medicines and other perishable items. Hospitals and medical facilities were required to maintain up-to-date records of their stock levels and promptly report any discrepancies or shortages. Furthermore, the government encouraged healthcare providers to adopt best practices in inventory management, such as the first-in first-out (FIFO) method, to minimise waste and optimise the use of available resources.

During the pandemic, Saudi Arabia actively participated in collective purchasing agreements to leverage economies of scale and secure better pricing for essential medical supplies. By collaborating with other countries and international organisations, the government was able to pool its resources and negotiate lower prices for bulk purchases. This strategy proved to be highly effective in ensuring a steady and affordable supply of vital medical supplies during a time of crisis.

The impact of shortages in vital medical supplies during the Covid-19 pandemic was significant but manageable. The health system managed the situation through effective hospital exchange programmes and increased public healthcare spending. In light of the country's focus on technological advancements and infrastructure improvements, previous analysis proposes the establishment of a centralised inventory management system to anticipate and mitigate potential future challenges and risks (Al-Hanawi MK, 2019). Implementing this system would significantly enhance the resilience of the healthcare supply chain, potentially creating a transition from a moderately to a mildly affected state, or even one completely unaffected by future disruptions.

Saudi Arabia's response to medicine and vaccination procurement and distribution during the Covid-19 pandemic was marked by strong coordination, effective planning and a commitment to public health. This approach allowed for the rapid and efficient distribution of essential medicines and vaccinations to the population, ultimately contributing to the country's ability to manage and mitigate the effects of the pandemic (Assiri A, 2021). The approach included the following:

- Centralised procurement of medicines and vaccines to ensure effective and efficient distribution. The MoH worked closely with international organisations such as WHO and the Global Alliance for Vaccines and Immunization (GAVI) to secure vaccines for the population.
- A vaccine prioritisation plan focused on high-risk groups such as healthcare workers, older people and individuals with chronic illnesses. This approach helped to protect the most vulnerable population groups and reduce strain on the healthcare system.
- Public-private partnerships enhanced the distribution of medicines and vaccines. Several logistics companies, such as Saudi Post and Aramex, were involved in the transportation and delivery of medical supplies and vaccines, ensuring efficient and timely distribution.
- Digital platforms, such as the SEHA app, were introduced to facilitate vaccine registration and distribution. Residents could use the app to book vaccination appointments and receive notifications about vaccine availability. This streamlined approach helped to manage the large-scale distribution of vaccines across the country.
- Mass vaccination campaigns, including the establishment of mass vaccination centres in various cities, allowed for the rapid administration of vaccines to large numbers of people and ensured that the population received protection against Covid-19 as quickly as possible (Faisal K et al., 2022).
- Continuous communication kept the public informed about vaccine availability and distribution plans while and public awareness campaigns educated the public about the importance of vaccination and dispelled misinformation and vaccine hesitancy.
- Participation in international vaccine initiatives such as COVAX which aimed to ensure equitable access to Covid-19 vaccines worldwide. Saudi Arabia also provided financial and logistical support to neighbouring countries, helping to ensure the wider availability of vaccines in the region.

4.3 Recommendations

RECOMMENDATION 4A

Establish public–private partnerships (PPPs) in medicines and health technologies in order to pool resources and expertise, thus improving access, affordability and innovation.

RECOMMENDATION 4B

Increase the digital maturity of health service providers, especially in relation to clinical documentation using EMR systems, disease registries and national formularies to reduce medication errors, improve patient safety and enhance the efficiency of the healthcare system.

RECOMMENDATION 4C

Enhance national security stockpiles of essential medicines, equipment and supplies to ensure the timely and efficient distribution of medicines and health technologies, reduce stockouts and improve accessibility.

RECOMMENDATION 4D

Accelerate health technology assessment (HTA) capacity to determine the value and effectiveness of new health technologies and medicines, enabling evidence-based decision-making and resource allocation.

RECOMMENDATION 4E
Encourage research and development (R&D) in medicines and health technologies to foster innovation and development to address the evolving healthcare needs of the population.

RECOMMENDATION 4F
Foster the use of cost-effectiveness analysis in the evaluation of medicines and health technologies to improve resource allocation and ensure value for money.

RECOMMENDATION 4G
Promote cost-effective use of generic medicines and biosimilars to improve affordability and accessibility, without compromising quality.

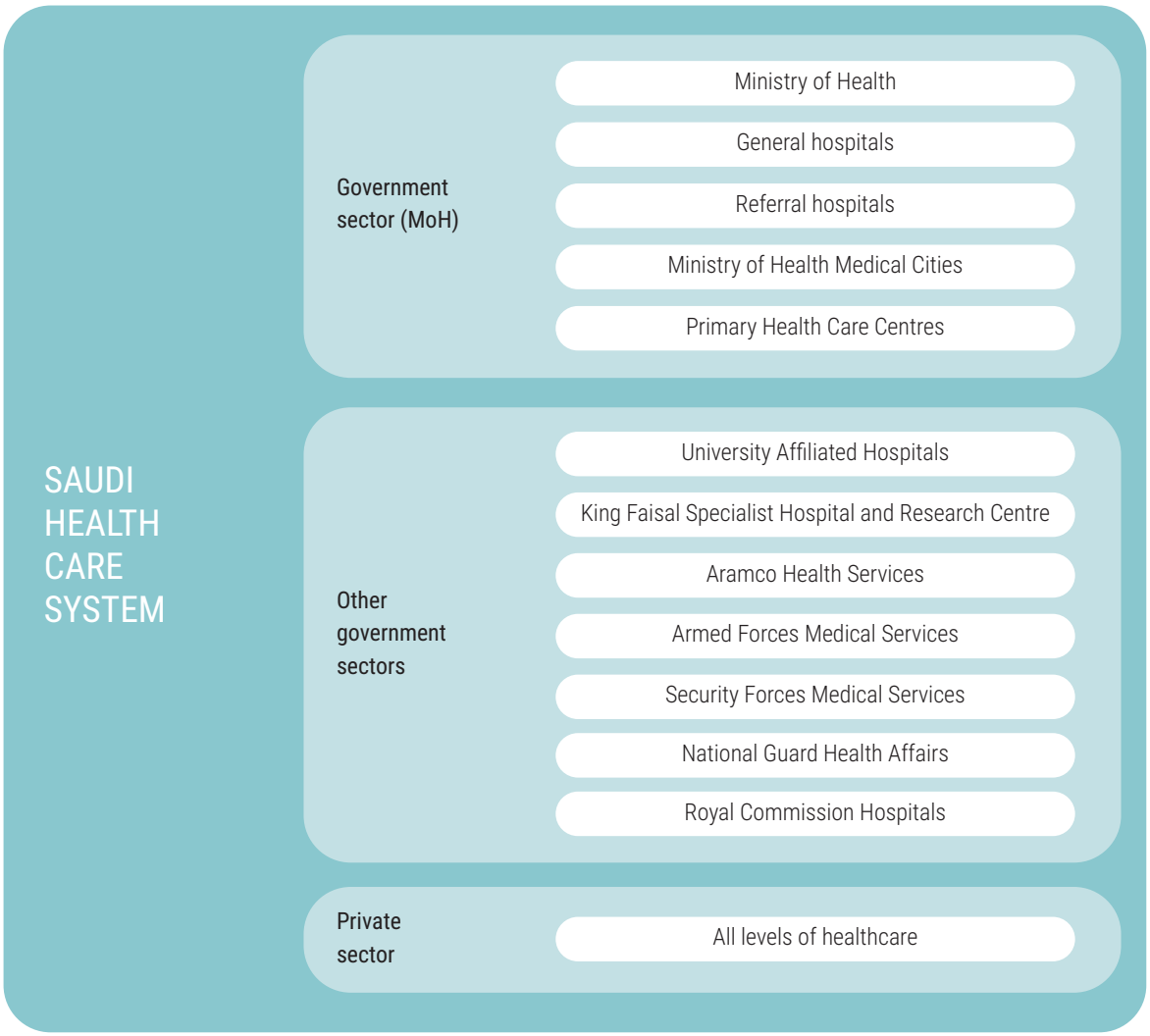
5. DOMAIN 5
Service delivery

5.1 Service delivery for health system sustainability

The primary focus of Saudi Arabia's health system is equitable access and quality of care to all of its residents. Through its Integrated and Comprehensive National Health Care Project, the MoH takes an integrated and comprehensive approach to providing and implementing health services, with governing bodies, clinical guidelines and quality standards in place to guide service delivery across the country. Global standards and metrics are utilised to guide the advancement in health service delivery. For example, the country has seen a remarkable improvement in its maternal mortality ratio, with twelve deaths per 100,000 live births recorded in 2018 and 2020, compared to fourteen deaths per 100,000 live births in 2010, constituting a 15% decline in maternal mortality. This is significantly less than other countries in the Eastern Mediterranean region and globally, which reported 164 and 211 deaths per 100,000 live births, respectively, in 2020 (Ministry of Health, 2021). The rate for Saudi Arabia reflects strong service delivery from the early stages of pregnancy and throughout the life course.

Delivery of healthcare services in Saudi Arabia can be categorized according to whether they operate under the aegis of the MoH, other government entities which manage their own services (such as the armed) forces and the National Guard) or the private sector (see Figure 10).

Figure 10: Organisation of Saudi Arabia health service delivery



A comparative analysis between 2012 and 2021 reveals a significant growth in the number of hospitals within the MoH (11% increase), the Government sector (31%), and the private sector (16%). This increase in hospital numbers across the sectors reflects the evolution in healthcare infrastructure in Saudi Arabia. As a result of this expansion, there has been a significant increase of 26.5% in the total number of hospital beds. This growth has been fairly consistent across both the private and public sectors, with only slight variations between the two. In 2021, it has been reported that a total of 77,224 beds were available across all health-related facilities. This translates to an estimated rate of 22.6 beds for every 10,000 population and average length of stay of 3.8 days (4.9 days in 2017). This data underscores the extensive capacity and growth of the healthcare infrastructure. The average waiting period for securing an appointment in outpatient settings has seen a remarkable improvement, decreasing from 35 days in 2017 to 13 days in 2021. This substantial reduction underscores the increased responsiveness of the healthcare system to meet patient needs in a timely manner. The proportion of patients discharged successfully from the emergency rooms also shows improvement, increasing from 85% in 2017 to an impressive 92% in 2021. This positive trend indicates significant advancements in emergency care protocols and patient management strategies (Ministry of Health, 2021).

Clinical quality and patient safety standards are addressed through various initiatives and organisations, such as the Saudi Central Board for Accreditation of Healthcare Institutions (CBAHI), which is responsible for setting quality standards and accrediting healthcare facilities in the country, and the MoH Saudi Patient Safety Centre (SPSC), which seeks to improve patient safety culture, practices and outcomes in healthcare settings.

Some specific examples of clinical quality and patient safety standards include:

- **Implementation of electronic health records** to reduce medical errors and improve patient care;
- **Adoption of the WHO's Safe Surgery Checklist** to enhance surgical safety and reduce surgical complications;
- **Promotion of hand hygiene practices** to prevent hospital-acquired infections;
- **Use of incident reporting systems** to monitor and learn from adverse events, near misses and other safety incidents;
- **Implementation of medication management systems** to prevent medication errors and improve patient safety.

These initiatives and standards aim to improve overall quality of hospital care and patient safety, in line with international best practices.

Vision 2030 seeks to expand the role of primary healthcare centres (PHCCs) with primary care prioritized as a key element of the new MOC to tackle the increasing burden of NCDs.

In 2021 there was a PHCC density of 0.74 per 10,000 population, a reduction from 0.62 in 2017. However, PHCCs are quite fairly distributed throughout 20 health regions of Saudi Arabia, although there are still some disparities between provinces and efforts must be made to ensure equitable distribution across the country (Al-Sheddi A, et al. 2023).

General medicine, family medicine and obstetrics and gynaecology physicians make up the majority of PHCC personnel. Within PHCCs, general practitioners can refer cases to secondary or tertiary hospitals. Ehalah and Ehalati (meaning 'referral') are recently introduced innovative online referral programmes that enable referrals between different institutions and organisations, facilitating timely clinical care and access to specialist care. The programme consists of three referral types: (1) life-saving cases (immediately accepted based on nearest location and availability of the required medical service), (2) emergency cases (appropriate action is taken within a maximum of 12 hours) and (3) in-patient cases (handled within 24 hours). All hospitals and healthcare centres in Saudi Arabia are currently incorporating this platform for all referral requests.

In the past two decades, primary health services have improved significantly, this is reflected in patient satisfaction scores of, for example, 71.7% in March 2018 and 75.1% in March 2019 (Al-Khashan et al., 2021).

A study of the impact of socioeconomic determinants and inequalities on the prevalence of chronic non-communicable diseases (NCDs), using data from a 2018 national survey, found that prevalence varied significantly according to age, gender, education level, monthly income and region of residence, indicating disparities in access to healthcare across different socioeconomic groups. Another study examined the relationship between socioeconomic inequalities and undertaking preventive health check-ups and found that the uptake of such check-ups was concentrated among people with greater wealth (Al-Hanawi MK & Chirwa GC, 2021). Income and education were identified as the primary drivers of the associated inequality. These findings suggest that policy-makers may need to address certain socioeconomic disparities in access to care.

Over the past two decades, the MoH has implemented four national initiatives to address the country's high rates of NCDs. In 2001, a specialised committee was assigned to develop the programme. The second and third initiatives, in 2006–2011 and 2012–2016, respectively, were Country Cooperation Strategies which recommended the prioritisation of health promotion and the development of an integrated programme for health education and research. The fourth, and current, initiative is the National Executive Plan for NCDs (2014–2025), which is a comprehensive national plan to combat NCDs that aligns with Gulf Cooperation Council (GCC) decisions on NCDs and with the WHO Global NCD Action Plan 2013–2020. This plan aims to control and prevent NCDs from becoming more complicated, with guidance from 'best buy' interventions, including promoting physical activity, raising tobacco taxes and reducing salt consumption. According to the WHO, these interventions are evidence-based, cost-effective and appropriate for implementation within health systems. (World Health Organisation, NCD Country Capacity Survey, 2019).

Over the past five years, the government has instituted transformational changes that focus on the integration of wellness services into the provision of clinical care, steering towards a more value-based health system. The new health service model will consider the needs of the population, the contribution of stakeholders and experiences shared with the international health community. The holistic integration of primary, secondary and tertiary health services across the country utilises existing health service units and moves from a provider-centric to a people-centric system, called Health Clusters and Accountable Healthcare Organisations. Since health system transformation is an ongoing process with multiple initiatives being rolled out, it is difficult at the present time to report the outcomes of these initiatives; we recommend that this matter is revisited in the future.

The Saudi Arabian government has implemented several national policies and programmes to reduce both the incidence of chronic diseases and socioeconomic disparities. The *Vision 2030* plan is one such initiative that aims to raise awareness and control chronic diseases, reduce complications and improve overall public health. HSTP is a key *Vision 2030* programme that focuses on reducing the prevalence of chronic diseases through preventative healthcare measures, including promoting healthy lifestyles, increasing access to healthcare services and improving the quality of care. Another initiative is the MoH supported Healthy Lifestyle Promotion Programme, which focuses on promoting physical activity, healthy eating and tobacco control. This programme has made significant progress in reducing the prevalence of chronic diseases. The Saudi Arabian government is collaborating with the US Centers for Disease Control (CDC) to strengthen the capabilities of the Saudi public health workforce for investigate and respond to disease outbreaks, including NCDs. This collaboration is helping to building disease surveillance and response capacity, contributing to a reduction in the incidence of NCDs. While these programmes have made strides in improving public health, reducing the incidence of chronic diseases is an ongoing process. The government's continuous efforts to raise awareness, promote healthy lifestyles and invest in healthcare infrastructure are expected to yield positive results in the long run.

Different areas of the Saudi Arabia healthcare system work together to coordinate care to improve quality through a combination of government-led initiatives, technological advancements and collaboration among healthcare providers, including:

- **The National Transformation Programme (NTP) and Model of Care (MOC) initiatives** focus on enhancing healthcare infrastructure, increasing the availability of trained professionals and streamlining service delivery. By working together, public and private healthcare organisations ensure continuity of care and improved patient outcomes.
- **The implementation of electronic health record (EHR) systems** across Saudi Arabia allows healthcare providers to easily access and share patient information, leading to better coordination among different areas of the healthcare system. As a result, providers can make more informed decisions and deliver higher-quality care.
- **Interdisciplinary teams of physicians, nurses, pharmacists and other healthcare professionals** are increasingly working together in Saudi hospitals to provide comprehensive, coordinated care, ensuring that patients receive the necessary treatment and support at each stage of their recovery.
- **Quality improvement programmes and patient safety initiatives** have been implemented in hospitals, such as the Safe Surgery Checklist, hand hygiene practices and incident reporting systems. These programmes foster collaboration among different areas of the healthcare system, leading to improved patient outcomes and a reduction in medical errors.

Overall, coordination of care among different areas of the healthcare system is crucial to achieving and sustaining improvements in quality and patient safety. By working together, healthcare providers and organisations can address challenges and ensure the delivery of high-quality patient care.

5.2 Service delivery for health system resilience

Saudi Arabia exhibited high resilience during the Covid-19 pandemic. The country returned to pre-Covid-19 status with all restrictions lifted within 73 days of the outbreak. The public health emergency Control and Command Centre (CCC) monitored the pandemic, reaching out to the WHO and other relevant organisations, taking several precautionary measures before Covid-19 was declared a pandemic. This approach used preventative measures to minimise the health crisis, thus ensuring adequate service delivery with regard to the workforce, medicines, technology and equipment. Health clusters were launched in all regions to facilitate access to healthcare services, and information about the virus and precautionary measures was disseminated through a number of platforms. Vaccination centres were established in multiple areas. The private healthcare sector played a significant role in reducing the Covid-19 burden, providing critical support to the government in managing the pandemic, including setting up private Covid-19 testing and treatment facilities, providing medical supplies and equipment and increasing the number of hospital beds. The private sector also worked with the government to develop and implement Covid-19 prevention and control measures, including infection control programmes and telemedicine services to minimise the risk of transmission while continuing to provide healthcare services. During the pandemic, hospitals in Saudi Arabia faced some limited disruptions to specific services, including deferred diagnostic services, elective surgeries and other interventions. This was due to the need to prioritise treatment of patients with Covid-19 and to minimise the risk of transmission of the virus. The surge in Covid-19 cases also put a strain on hospital capacity, including ICU capacity. The activation of many virtual telemedicine modalities alleviated some of the pressure imposed on these hospitals.

National response measures and health preparedness in response to Covid-19 were robust in all of the WHO's proposed nine pillars (see Table 5 in Governance section) to combat the pandemic due to the roadmap that was prepared and implemented by the different sectors, including the healthcare sector and supported by the government during all phases of the pandemic. This proactive and

coordinated response resulted in the continuation of basic and specialised health service delivery to all citizens and residents at all levels without discontinuation or fragmentation.

Throughout the pandemic, health services were offered equitably to all individuals within the country, including undocumented migrants. As this significant population was at high risk of acquiring and transmitting Covid-19, the government allocated resources for testing and delivering free care, ensuring that legal or legitimacy status had no impacts on health outcome. Recognising the many health hazards that undocumented migrants face, preventing the spread of illness and granting access to those most in need were priorities for the country as a whole. As a result, Saudi Arabia had a low Covid-19 fatality rate of 1%.

One of the nine WHO pillars for combatting the pandemic was the maintenance of essential health services. Up until 31 December 2020, a number of initiatives were instituted in this regard, including, but not limited to:

- The Saudi Patient Safety Centre issued guidelines on determining priorities when dealing with health conditions;
- Remote consulting clinics were established for patients with cardiac disease and for patients with diabetes, reaching 15,000 of the former and 60,000 of the latter;
- More than 21,000 people were reached by out-patient geriatric services and 5,000 were reached by virtual clinics;
- Virtual clinics were activated in 19 psychiatric hospitals, reaching more than 40,000 patients;
- Delivery of medications from health facilities to patients in their homes was established to reduce the spread of infection, reaching 445,308 patients;
- Medication delivery services and home vaccinations were provided by health centres in several regions, reaching over 20,000 people per month.

The Covid-19 pandemic has accelerated the deployment of novel care delivery methods, such as remote consultations, which reduce the risk of virus transmission and ensure continuity of care. Telehealth can have impacts on nursing practice and quality, including fostering nurse-patient communication and promoting positive outcomes, continuation of nursing care and positive experiences (Banjar WM & Alfaleh A, 2021). The SEHA app provided two million remote medical consultations with an almost eight-fold increase compared to pre-pandemic, while other apps, such as Mawid, also saw significant increases in users and consultations. Remote consultations were found to be effective in maintaining a high standard of care during the pandemic for ENT surgery, with no statistically significant difference detected between remote and face-to-face groups for rates of investigation, listing for surgeries, referral to other specialties and initiating treatment (Banjar WM & Alfaleh A, 2021). These novel care delivery methods helped to ensure that patients had access to timely and quality healthcare during the pandemic, while reducing the risk of virus transmission. They will likely continue to be valuable tools for clinicians in the remobilisation of health services in the post-pandemic era.

Several policy initiatives intended to improve the resilience of the health system through changes to health service delivery are currently in the planning stages. One major policy initiative, the Health Sector Transformation Programme (HSTP), seeks to improve health system resilience. The aim of the programme is to restructure the health sector to be comprehensive, effective and integrated, with a focus on updating and expanding primary care, rehabilitation and long-term care. The HSTP seeks to address challenges in the healthcare system, such as barriers to implementing PPPs, developing the Saudi workforce, effectively managing healthcare reimbursement and ensuring vulnerable populations have access to high-quality tertiary healthcare. Another initiative is the ongoing reform of the primary health care (PHC) system, which started in 2016. This reform aims to strengthen PHC to improve trust, utilisation of services and to address the growing burden of NCDs. This aligns with the targets of the UN Sustainable Development Goals and Saudi Arabia's *Vision*

2030. The reform has already resulted in increased PHC visits, patient satisfaction and rural community coverage, but continuous improvement is needed to tackle challenges related to human resources, cultural and lifestyle behaviour, geography, intersectoral collaboration and infrastructure.

5.3 Recommendations

RECOMMENDATION 5A

Target evidence-based, preventative interventions based on intelligence on individual and population health risks in order to reduce reliance on curative care.

RECOMMENDATION 5B

Enhance primary health care (PHC) services to reduce the burden on secondary and tertiary care facilities, improve early detection and management of diseases and promote preventative healthcare

RECOMMENDATION 5C

Integrate telemedicine and digital health solutions in health service delivery to expand access to healthcare services, particularly in remote areas, reduce waiting times and improve the overall efficiency of the healthcare system.

RECOMMENDATION 5D

Develop a patient-centred approach and integrate care across the patient pathway and provider boundaries, to reduce variation in practice and to improve clinical outcomes and patient experience

RECOMMENDATION 5E

Invest in health workforce development to address shortages, improve quality of care and contribute to a more resilient healthcare system.

RECOMMENDATION 5F

Foster public-private partnerships (PPP) to improve access to healthcare services, leverage private sector expertise and enhance overall healthcare system efficiency.

6. DOMAIN 6

Population health and public awareness

6.1 Population health and public awareness for health system sustainability

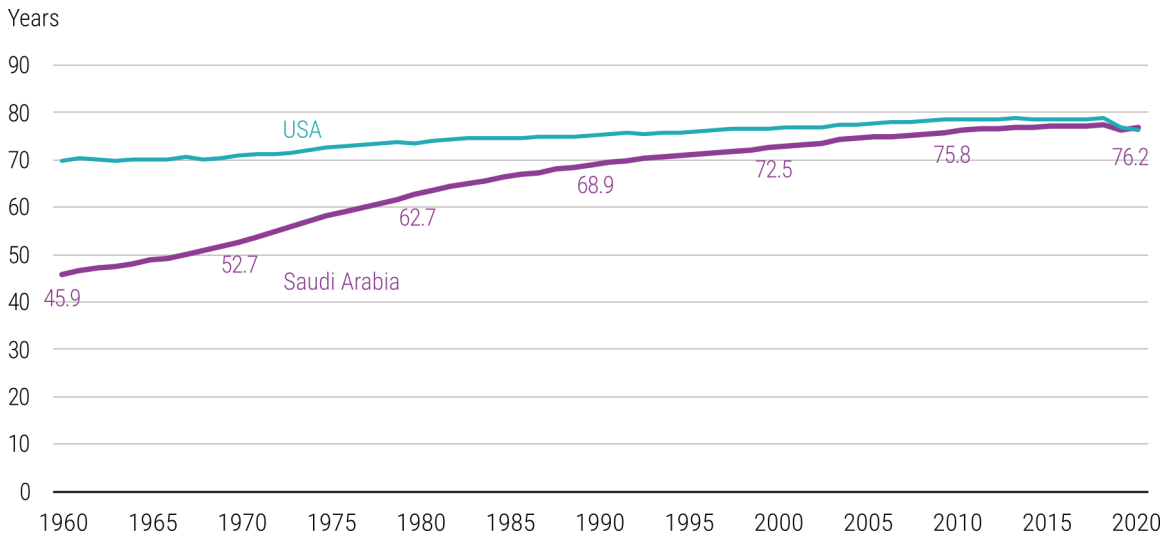
Prior to 2016, the Saudi health system focused on improving treatment and access to and quality of healthcare. Treating illnesses alone is not sustainable and inevitably leads to suboptimal population health and staggering health costs. Recognising this, the government started to address population health and to reduce expenditure by transitioning to a value-based health service model. This shift has significantly intensified investment in preventative programmes and improvements in health. As a result, progress has been made in a number of population health indicators over the past five years, such as an increase in the number of Saudis reporting being physically active from 20% in 2019 to 30% in 2021 (Kingdom of Saudi Arabia, 2020).

Key health indicators

Although there have been significant improvements to Saudi Arabia's health service in recent years, numerous public health threats persist, including the prevalence of chronic health conditions and unhealthy behaviours. Therefore, targeted prevention programmes are required as soon as possible to achieve the desired health goals of *Vision 2030*. The HSTP focuses on improving population health indicators, such as disease prevalence, mortality rates and life expectancy.

The Kingdom of Saudi Arabia has made significant strides in enhancing the quality of their health services, as evidenced by the substantial improvements in key population health indicators. Life expectancy has increased from 45.9 years in 1960 to 76.9 years in 2021– an increase of 31 years over six decades – and is now comparable with that in the United States as shown in Figure 11 (Bah S, 2018). This upward trajectory reflects improvements in living conditions and in quality and access to healthcare in the country during this period.

Figure 11: Life expectancy in Saudi Arabia and USA, 1960–2020



Source: World Bank (Databank).

Over the period from 2010 to 2018, the infant mortality rate showed a reduction from 6.19 to 6.0 deaths per thousand live births, a decline of 64.5%. The most recent maternal mortality ratio also shows a significant improvement at 11.9 per hundred thousand live births when compared with 14 deaths per hundred thousand live births in 2010, a reduction of 15%. This reflects Saudi Arabia's commitment to infant and maternal healthcare and overall healthcare standards. The mortality rate

for children under the age of five has also significantly reduced, now standing at 8.5 deaths per thousand live births. This is a marked improvement when contrasted with the average child mortality rates for the Eastern Mediterranean Region and on a global scale, which were 46 and 38 per thousand live births respectively. A range of healthcare indicators are shown in Table 8.

Table 8: Selected population health indicators

	2017	2018	2019	2020	2021
Mortality indicators					
Crude Death Rate (per 1,000 population)		2.4			
Neonatal Mortality Rate (per 1,000 live births)		3.6			
Infant Mortality Rate (per 1,000 live births)		6.0			
Under-5 Mortality Rate (per 1,000 live births)		8.5			
Maternal Mortality Ratio (per 100,000 live births)		11.9			
Basic immunization coverage in the last five years (%)					
Hexavalent Vaccine[a]	98.0	96.0	97.0	97.4	97.3
Oral Polio Vaccine	96.0	98.0	97.5	97.0	97.6
BCG Vaccine[b]	97.0	98.0	92.3	96.0	94.1
MMR Vaccine (measles, mumps & rubella)	96.0	96.0	96.5	96.4	97.0
Pneumococcal Conjugate Vaccine	98.0	98.0	97.0	97.0	96.7
Incidence rates of selected immunization targeted diseases in the last five years (per 100,000 population)					
Poliomyelitis	0.00	0.00	0.00	0.00	0.00
Whooping Cough	0.07	0.03	0.75	0.28	0.13
Measles	1.40	3.50	2.99	0.10	0.96
Pulmonary Tuberculosis (TB)	6.44	7.61	6.62	5.42	5.78
Extra-pulmonary TB	2.29	2.46	2.16	1.75	1.94
Pulmonary and Extra-pulmonary TB	8.73	10.07	8.78	7.17	7.72
Neonatal Tetanus (per 1,000 live births)	0.009	0.000	0.000	0.000	0.016
Injuries and deaths from road traffic accidents in the last five years (per 100,000 population)					
Injuries	102.00	94.00	96.17	74.70	72.23
Deaths	22.96	18.03	16.82	13.19	13.64

a Diphtheria, pertussis, tetanus, Hib, hepatitis B & polio inactivated vaccine.

b Immunization date changed in August 2019 from 0 day to 6 months.

Source: Ministry of Health, 2022.

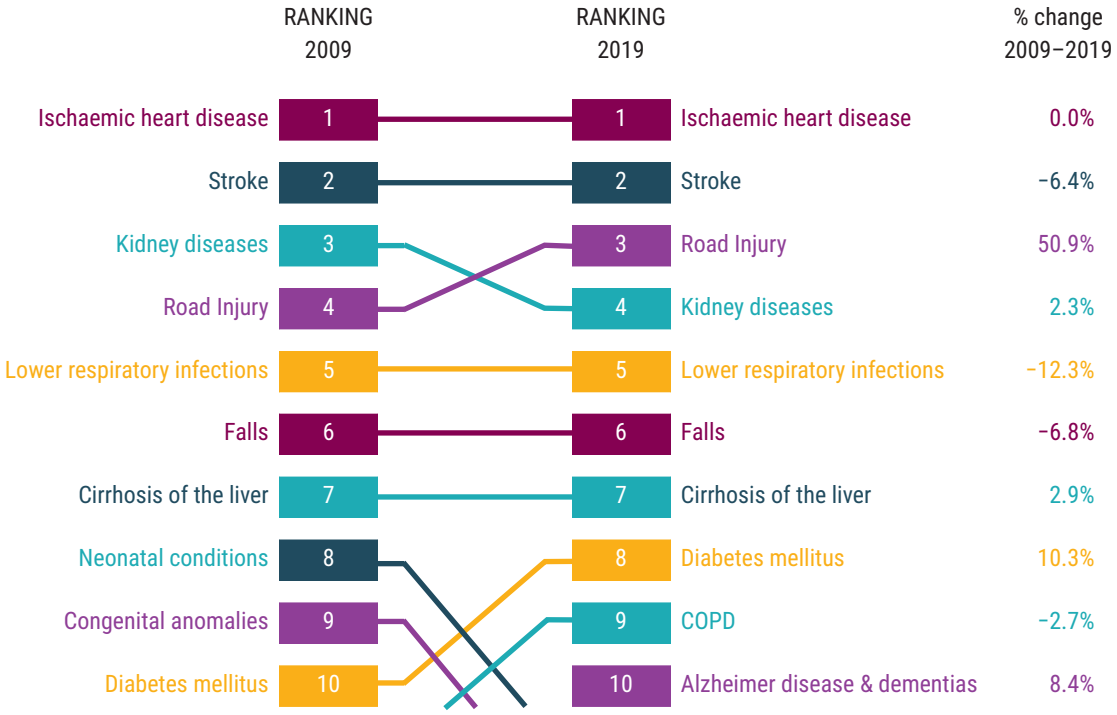
Challenges and solutions

Despite recent increases, life expectancy remains lower than most other G20 countries. The HSTP aims to achieve a life expectancy of 80 years by 2030 through establishing baselines for various risk factors, including disease burden and unhealthy behaviours, so that plans for prevention can be put in place. The MoH sponsors over 3,000 health centres across the country, which focus on prevention and primary care and which act as gatekeepers for the healthcare system, providing essential healthcare services to citizens and residents working in the public sector. The primary healthcare sector has played a vital role in improving health outcomes and reducing infant and maternal mortality rates. One reason for this success is decades long universal access to healthcare. The government also provides free health services to pilgrims visiting the Holy Mosque in Makkah. Overall, primary care is a crucial component of promoting health outcomes in Saudi Arabia, and the government is continuously working to improve and reform the primary healthcare sector.

The MoH releases a Statistical Yearbook which reflects the activities and achievements of the health sector in the preceding year. It reviews health status features, including health resources, financial allocations, activities and health services provided by the ministry during the Hajj season and other data. It offers the possibility to incorporate the effect of socioeconomic variables, such as education, occupation, income, ethnicity and place of residence, on health resource utilisation and outcomes.

The leading causes of death are shown in Figure12. NCDs, which account for 73% of deaths worldwide, remain a major public health challenge in Saudi Arabia. As in many developed and developing countries, the burden of NCDs is increasing, representing the leading cause of disability-adjusted life years with hypertension, diabetes and cardiovascular diseases among the leading causes of death. The HSTP recognises the importance of this category of diseases and focuses on ways to address NCD threats.

Figure 12: Top 10 causes of deaths in 2009 and 2019, and percentage change in rates, (all ages combined)



Source: The Global Heath Observatory, website.

Unintentional injuries are another threat to public health, with road traffic accidents also among the leading causes of death. The country has made significant efforts to reduce traffic-related mortality rate from 36 deaths per 100,000 population in 2019 to 14 deaths per 100,000 population in 2020. This improvement is partly due to speed and traffic controls. In addition, social media is being used to increase awareness of road traffic safety and reduce injuries.

Furthermore, understanding and addressing unhealthy behaviours such as smoking and physical inactivity are a priority for the country. The nationwide prevalence of smoking is 12%, with a 20% higher prevalence among men than women (2%). However, this gender variance is expected to diminish as smoking other types of tobacco, such as Shisha, becomes less of a social taboo among women (Almogbel YS, 2021). In 2019, many outdoor restaurants and cafes offered smoking services, although a 100% tax is imposed on the final bill at all restaurants and cafes that offer smoking services.

Some mental health conditions subsumed under NCDs have emerged as new public health threats in recent years. One in five Saudi Arabian adults has a mental health condition (Altwaijri Y et al., 2020). Common mental health challenges include stigma associated with diagnosis, treatment and access to health services. To address these challenges, Saudi Arabia has invested in raising awareness of the symptoms of common mental illnesses and facilitating access to appropriate health services. For example, the MoH has established the unified 937 telephone number, allowing individuals to speak with health professionals about any medical condition and be referred to the necessary services, including mental health services.

In the past decade, there have been many initiatives that have enhanced population health. The Saudi Sports for All Federation was established in 2018 with the goal of "inspiring all members of society to be physically active." This and other organisations work towards promoting health equity by reducing gender disparities in physical activity. The health system has recognised the need to focus on factors outside of health to address modifiable risk factors, undertaking four initiatives to address public health threats: (1) the Public Health Authority or Weqaya (meaning prevention) complements existing entities working to reduce health risks and invest in health promotion; (2) recognising that 80% of health determinants are social, the Ministerial Committee on Health in All Policies (HiAP) works across all government ministries to guide policy legislation, implementation and evaluation, taking into account the role of the social determinants of health. Among HiAP-informed initiatives are several to improve health literacy and reduce health disparities among marginalised communities and the provision of and free health services to pilgrims during the Hajj season regardless to ethnic or socioeconomic background; (3) the Quality-of-Life Programme which focuses on enhancing quality of life by focusing on wider determinants of health; and (4) the Saudi National Institute of Health which provides research funding and support and investigates health determinants aligned with the national burden of disease.

Unhealthy diets and lack of physical activity are critical factors framing population health promotion policies. The SFDA has introduced several policies effective from January 2019, including (1) necessitating restaurants to display the calorie content of meals and (2) banning the use of trans fats. Meanwhile, other agencies are also contributing to changes in health behaviour. The Tax and Customs Authority (ZATCA), for example, has implemented 50% and 100% taxes on sweetened beverages and tobacco products, respectively.

Population health plays an instrumental role in religious events. The Hajj, one of the largest mass events worldwide, is the annual pilgrimage to Makkah, which takes place on specific dates according to the Islamic calendar. During Hajj, up to two million people from around the world spend four to five days in a relatively small area. The Umrah, meanwhile, is an abbreviated pilgrimage that can be performed at any time of the year. To ensure the safety of both these forms of pilgrimage, mass-crowd management strategies are used to reduce the risk of the spread of infectious diseases and public health programmes ensure the management of chronic conditions among pilgrims performing the rituals. Moreover, crowds move on foot or by public transport from one area to

another, necessitating strategies to reduce the risk of threats such as stampede or traffic injuries (see Case Study 2).

People under the age of 30 years make up 70% of Saudi Arabia's total population, and this demographic has helped raise awareness about healthy lifestyles and disease management. A 2019 individual and family survey of communication and information technology found that approximately 95% of the population uses social media, which serves as an efficient and sustainable method of disseminating health promotion messages to a large population (General Authority for Statistics, 2019). Several ministries have organised health campaigns to promote sports and physical activity. Currently, population health is a national priority, but there are limitations to some enabling factors. Despite a solid infrastructure for digital transformation, there is limited investment in standardised data collection, such as national disease registries or data on the social determinants of health. The integration of health programmes and policies in schools has been an ongoing effort to promote student well-being. One key policy is an evidence-based school nutrition policy, which aims to increase the availability and accessibility of healthy foods in schools. This policy is part of a wider health education initiative that have been in place since the 1970s. Another aspect of this integration is the promotion of physical activity and health education programmes to help students acquire the necessary information and skills for making healthy choices. These programmes, along with the national transformation programme to modernise the country's healthcare system, contribute to the overall improvement of healthcare in Saudi Arabia. While there have been significant strides in integrating health programmes and policies in schools, there is still room for improvement, especially in targeting marginalised communities and further enhancing the effectiveness of existing initiatives.

Efforts are being made to address low health literacy, particularly among minority ethnic communities, individuals from underprivileged socioeconomic backgrounds and those with low educational attainment through a variety of health literacy programmes and initiatives, including the development of culturally sensitive health education materials that are accessible and easy to understand for individuals with low health literacy. These materials are provided in various formats and languages to cater to the needs of the diverse population, including ethnic minorities. In addition, community-based health education programmes for the socioeconomically underprivileged and those with low educational attainment have been established. These programmes often involve partnerships with local community organisations, religious institutions and schools to ensure their effective delivery. Furthermore, the Saudi Arabian government is committed to improving the overall education system in the country, with a focus on health literacy as a key component. This includes incorporating health literacy education into the national curriculum and providing specialised training for teachers and health professionals to better understand and address the issue of low health literacy. Overall, these initiatives aim to raise awareness about the importance of health literacy and empower individuals to make informed decisions regarding their health, ultimately contributing to the resilience and quality of the country's health system.

6.2 Population health and public awareness for health system resilience

A resilient health system should be able to effectively maintain its core functions and adapt, prepare for, absorb and respond to major public health emergencies and crises. One of the goals of the Saudi government is to build a strong and resilient health system that maintains health service quality and routine during unprecedented events. The remarkable transformation of the health system over the past six decades has significantly improved the health of the population. Increased overall spending on health, the introduction of universal health coverage and the ambitious *Vision 2030* plan, all of which focus on improving health, health service delivery and value, have contributed to better population health.

Under *Vision 2030*, the HSTP strategy, which aims to mitigate key threats to the Saudi population, promote healthy lifestyles, reduce the incidence of NCDs, improve injury prevention and ensure the long-term sustainability of universal health coverage, demonstrates the intention to create a resilient health system, which in turn promotes population health. The number of public health undergraduate and postgraduate programmes has increased, training individuals to implement the HSTP strategy, and their high enrolment rates highlights the population's response to health service goals.

Public health emergencies such as Covid-19 have highlighted the need to reduce the vulnerability of health systems around the world, and the need for resilient approaches that respond to dynamic situations, combining health security with disease-specific and life course programmes to achieve desired outcomes. In response to the Covid-19 pandemic, the government established a High Committee, followed by a Concerned Committee, chaired by the Minister of Health, which was responsible for taking the necessary precautionary measures to contain the spread of the virus. To implement these decisions, the MoH created a hierarchical organisation for pandemic response. Decisions were based on risk assessment and reliable global and national statistics. Some important decisions were taken, ranging from the suspension of schools, social events and five times daily prayers in mosques; the closure of all points of entry to the country, suspension of international and domestic air travel and of public transportation; and the imposition of a partial, and then a full, curfew in several cities. In addition, nationwide hotel-based, government funded and monitored quarantine was implemented for travellers returning to the country. The goal was to flatten the epidemic curve and equip the health system with sufficient capacity to treat infected cases. As the pandemic progressed, the MoH operated with a clear plan shared with nineteen key entities, including clearly defined tasks for integrated decision-making and implementation, assignation of tasks to each entity and performance monitoring through daily indicators. In addition, it issued regular alerts and reports, monitored hospital performance and recommended and enforced public health measures to control the pandemic.

A multi-phase national mass screening campaign was launched to assess the spread of the disease and make appropriate decisions (Khan AA, 2020). In the first phase, active screening, both symptomatic and asymptomatic suspected cases and their contacts were screened. Participating MoH teams targeted neighbourhoods and workers' residences in several cities to locate and contain local outbreaks. The second phase, community screening, targeted low to moderate risk groups, identified using the Mawid (meaning appointment) electronic application and samples were collected at scheduled appointments in primary care centres. In the third phase, asymptomatic individuals were screened upon registration in the electronic appointment system.

Effective public communication was initiated to increase compliance and close the knowledge gap. Daily reports on the progress of the pandemic were delivered by high ranking MoH officials on traditional media, such as television, and on social media. This official source of information helped to prevent the spread of misinformation. Guidelines for different social groups were posted in public places, such as schools, mosques, workplaces, markets and public transportation to prevent the spread of the virus. Field education in rural and underserved areas was conducted by MoE-trained employees to educate individuals on the disease, methods of transmission and basic precautionary measures. All citizens, residents, refugees and undocumented migrants were encouraged to seek medical care for free when they suspected infection, without any penalty or blame. An educational guide on the prevention of Covid-19, in collaboration with the Health Awareness Team, was published in multiple languages.

The country proactively prepared for the availability of a Covid-19 vaccine. When vaccines emerged, larger quantities were made available to ensure herd immunity, limit the spread of the virus and protect the population. More than 68.5 million doses of the Covid-19 vaccine had been administered as of 20 September 2023. (World Health Organization, website). Assuming that each individual received two doses, approximately 97% of the population has now been vaccinated. Many aspects related to the delivery of the vaccine were carefully planned, including governance, supply chain,

operations, clinical care, digital communication and education, customer experience and quality assurance. A plan to monitor and escalate vaccine delivery through an electronic system linked the MoH with the SFDA. All adverse events and other delivery issues were investigated by a panel of experts. The vaccine distribution plan was based on the population size of each city and maximum priority was given to the most populous cities. It was also ensured that all citizens, residents and undocumented migrants had equal access to vaccines. The government announced the introduction of a public registration system, prioritising vaccination appointments based on predetermined conditions and the distribution of vaccines followed three phases, with priority given to different groups in each phase, starting with the most vulnerable. The first dose of the vaccine was administered according to vaccine availability, based on the characteristics of each vaccine, disease epidemiology, vaccine supply and community factors. Regular updates by the MoH strongly encouraged the public to get vaccinated and reported individuals who were reluctant to get vaccinated and eventually developed Covid-19, with poor clinical outcomes. In addition, the results of Covid-19 vaccine acceptance surveys were used to further raise awareness and encourage the public to get vaccinated. While the mass screening programme successfully flattened the Covid-19 epidemiology curve and allowed health facilities to absorb the number of infected cases, the vaccination campaign improved population immunity and reduced the Covid-19 death rate from 267 deaths per 100,000 population during the first wave of the pandemic to 99 deaths per 100,000 during the second wave and only one death per 100,000 during the third wave.

6.3 Recommendations

RECOMMENDATION 6A
Enable and encourage cross-sectoral work to measure and address the social determinants of health in order to promote a healthier and more resilient population.

RECOMMENDATION 6B
Support and enhance national disease registries that reflect the major burden of disease, particularly NCDs, taking account of socioeconomic status.

RECOMMENDATION 6C
Invest in technologies, social media and online engagement platforms to promote healthy behaviours.

RECOMMENDATION 6D
Develop and implement targeted health promotion and disease prevention programmes focusing on key health issues prevalent in the Saudi population.

RECOMMENDATION 6E
Establish a robust monitoring and evaluation system to assess the impact of population health interventions and inform future policy development.

RECOMMENDATION 6F
Strengthen the health information system and leverage data analytics to inform evidence-based decision making to identify population health needs, allocate resources and monitor outcomes will ensure a more efficient and effective health system.

RECOMMENDATION 6G
Address and report health disparities among different population groups by ensuring equal access to healthcare services and resources to improve overall population health outcomes and contribute to a more just and sustainable society.

RECOMMENDATION 6H

Integrate mental health services into primary healthcare and implement community-based mental health programmes.

RECOMMENDATION 6I

Implement health education campaigns and promote health literacy to empower individuals to make informed decisions about their health.

7. DOMAIN 7

Environmental sustainability and resilience

Environmental sustainability, as defined by the United Nations, is "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs". (United Nations/WECD (1987). The WHO defines a climate-resilient and environmentally sustainable health system as one that will “anticipate, respond to, cope with, recover from and adapt to climate-related shocks and stresses, while minimising negative impacts on the environment and leveraging opportunities to restore and improve it, so as to bring ongoing and sustained healthcare to their target population and protect the health and well-being of future generations” (World Health Organization, 2020).

Globally, the health sector has a negative impact on the environment due to atmospheric carbon emissions, waste production and natural resource consumption. Given their causative relationship to climate change, carbon emissions are considered detrimental to the environment and to human health. In addition to devastating environmental impacts, climate change is linked to adverse health impacts, including heat-related injuries and deaths and increased mortality from extreme natural disasters and vector-borne diseases.

Saudi Arabia faces many environmental sustainability and resilience challenges, including, but not limited to, continuing pressure on the environment and the depletion of natural resources due primarily to remarkable population and economic growth in recent decades. Although the complexity of these challenges demands significant planning and intervention, building environmental sustainability and resilience through reduced carbon emissions, the curtailment of waste and efficient resource management is fundamental. The national industrial development strategic goals and the national transformation agenda of *Vision 2030* both target greenhouse gas emissions (GHGE) reductions to improve health and life satisfaction. Notwithstanding these goals, achieving environmental sustainability and resilience demands increased coordination at the national level, regular monitoring, transparent and accountable targets for reducing the ecological footprint, a commitment to behavioural change and established guidelines for health service providers. Hence, environmental sustainability and resilience are multi-faceted and not limited to the health sector.

Understanding the current status of environmental sustainability and resilience in Saudi Arabia is an essential first step. The extent of the changing climate and the levels of GHGE are commonly used measures of environmental sustainability and resilience and are integral to the environmental footprint of the health service and to measuring negative health impacts.

Countries such as the United Kingdom, United States, Australia, China and Japan have recently calculated the climate footprint of their health services. (Pencheon D, 2018; Chung JW & Meltzer DO, 2009). To the best of our knowledge, the carbon footprint of the Saudi health system has not been measured and there is currently no centre for climate studies in the region. However, data on the country’s environmental footprint covers all sectors of the economy and shows that greenhouse gas emissions (GHGEs) per capita are just behind those of Australia, which is the second highest of the G20 countries. As a result, Saudi Arabia is working to decrease its emissions below 389 metric tons of carbon dioxide equivalent (MtCO2e) by 2030 and to below 263 MtCO2e by 2050 to be compatible with the global target of 1.5°C warming.

Efforts to mitigate the environmental impact of Saudi Arabia’s health system are an important component of broader initiatives to reduce pollution, waste and emissions. Between 1990 and 2017, Saudi Arabia’s GHGEs increased by 197%, with the industrial sector contributing the most significant increase, followed by the energy and transport sectors. Emissions per capita from the building sector are more than double the G20 average, although building sector emissions per capita decreased by 12% from 2014 to 2019. Similarly, transport sector emissions remain high, but have seen a significant decrease per capita of 25% from 2013 to 2018. Saudi Arabia continues to implement environmental plans, such as renewable energy initiatives, and is intensifying its emissions targets to align with global thresholds, including decreasing fossil fuels as a share of the global primary energy mix to 67% by 2030 and 33% by 2050.

Environmental impacts of the health system

Waste management is a key factor in health system environmental sustainability and resilience. Each year, millions of tons of waste are generated from across all sectors. A recent health sector study found that hospitals produce 1.7kg of hazardous medical waste per bed and 6.8kg of municipal solid waste per bed, while PHC clinics produce approximately 0.029 and 0.116 kg of hazardous medical waste and municipal solid waste per visit, respectively (Climate Transparency (2020). Moreover, it is estimated that public hospitals dispose of 27,000 tons of paper, 15,000 tons of plastic, 10,000 tons of food, 8,000 tons of glass and 7,000 tons of metal annually. (Alharb NS et al., 2021). These waste materials are not recycled and ultimately end up in landfill. Indeed, there is an urgent need to empower the recycling sector in Saudi Arabia as it lacks firm direction, with recycling rates below 10% overall. Waste management companies in Saudi Arabia primarily use microwave, autoclave and thermal incineration technologies to treat medical waste. However, they are confronted by significant challenges to improving outcomes due to limitations around waste training, limited coordination among operators and lack of social responsibility. Therefore, in order to enhance sustainability and environmental protection, an integrated approach to waste reduction, management, recycling and reuse is needed.

Waste from Saudi Arabia's health facilities is managed through a combination of policies, regulations and practices. In 1998, the MoH passed regulations defining healthcare medical waste (HMW) handling, treatment and disposal. These regulations were later endorsed by the GCC as a unified HMW regulation among all member states. To promote good practice in hospital and health facility waste disposal, the Saudi Arabian government established the National Centre for Waste Management, which regulates and supervises waste management activities and promotes the principle of the circular economy. This includes recycling, resource retrieval and safe disposal to achieve better environmental and economic results. In addition, in 2022, the government allocated $50 billion to municipal services, including health facility waste management. Key stakeholders in the waste management sector, such as the Ministry of Environment, Water, and Agriculture (MEWA), Saudi Investment Recycling Company, National Environmental Recycling Company and others, collaborate to ensure the proper disposal of health facility waste. These combined efforts help to reduce waste and promote good practice in hospital and health facility waste disposal, contributing to the overall goal of an environmentally sustainable health system.

Developing sustainable built infrastructure is another critical aspect of health sector environmental sustainability. Globally, health sector resilience and environmental sustainability assessment frameworks, known as sustainable green hospitals or green health facilities, are increasingly common. WHO has developed guidance for resilient and sustainable healthcare facilities (World Health Organization, 2020) and Global Green and Healthy Hospitals has developed a 10-goal framework (Global Green and Healthy Hospitals, website)) that includes guidance for sustainable design and use of health service buildings. In Saudi Arabia, ten health service projects applied for international Leadership in Energy and Environmental Design (LEED) certification from 2011 to 2020. The Saudi Mostadam (meaning sustainable) rating system for existing and new buildings, with categories that include site sustainability, efficient use of energy and water and the transportation of materials and waste, was recently introduced to improve sustainable building standards. However, this rating system does not include international standards for sustainable hospitals and green healthcare. Thus, a new domestic rating system for healthcare facilities needs to be developed in Saudi Arabia.

Air quality is a key environmental sustainability and resilience factor and is also critical to the health sector's focus on wellbeing. Air quality data show that average NO_2 concentration in Saudi Arabia is 95 µg/m, which is lower than the 100 µg/m set by the General Authority of Meteorology and Environment Protection (GAMEP). It is, however, much higher than the 40 µg/m recommended by WHO. In cities such as Riyadh, average yearly O_3 concentrations of 160 µg/m^3 surpass standard levels. However, due to decreases in the sulphur content of diesel, SO_2 exposure rates in major cities have fallen to within acceptable limits (Ministry of Environment, Water and Agriculture, 2017). Major

cities in Saudi Arabia also record high PM2.5 concentration levels, with Riyadh recording 71µg/m^3, which exceeds the acceptable limit of 10µg/m^3 by the World Bank and 15µg/m^3 set by GAMEP. However, the distinction between air pollution and degraded air quality should be noted as PM2.5 is linked to anthropogenic sources while PM10 is linked to natural sources such as sandstorms. It is also important to observe warnings from MEWA that available data on air quality are incomplete and unreliable, given the lack of source emission monitoring and inventory.

Electricity generation in Saudi Arabia emits 703g of CO_2 per kilowatt-hour, exceeding the G20 average of 449g. Carbon emissions have fallen slightly due to increased natural gas use, but energy intensity has decreased more slowly than in G20 countries. Energy use is high at 253GJ per capita, but decreased by 15% from 2014 to 2019. The share of renewables in power generation increased by 1521% from 2014 to 2019, with the target threshold increased to 58.7GW by 2030. The country is currently intensifying its emissions targets and transitioning to renewable energy sources to align with global 2050 decarbonisation goals.

National environment strategy and actions

Saudi Arabia has implemented a number of changes to improve environmental sustainability and resilience. This includes restructuring regulatory bodies and establishing five centres under MEWA. National waste policies have been updated and revised, resulting in the establishment of the Saudi Waste Management Centre. The Saudi National Environment Strategy has developed sixty-four strategic initiatives and twenty-five key performance indicators to cover diverse environmental suitability domains. The *Saudi Vision 2030* has introduced several initiatives to achieve environmental sustainability outcomes, including managing GHGE and climate change effectively (Figure 13).

Through multiple initiatives, projects and policy areas, Saudi Arabia has sought to meet its domestic and international commitments to environmental sustainability. To create solutions, Saudi Arabia has set binding GHGE reduction targets for key sectors, including health, and pledges to reduce carbon emissions to net zero by 2060. Therefore, it is diversifying and transforming its economy away from oil to support sustainable growth. The approach is multidimensional and aims to reduce GHGEs through such initiatives as the implementation of programmes to improve energy efficiency (e.g., smart meters and reviewing building codes and electrical appliance standards), developing public transportation networks (e.g., metro, buses, electric vehicles (EV) and installing EV charging stations), building and transitioning its renewable energy capacity, expanding desalination programmes, developing research, raising awareness, building liveable and sustainable cities and utilising carbon capture technology.

As a result, initiatives and indicators have been implemented in multiple sectors to build environmental sustainability and resilience and to achieve national GHGE targets that are compatible with international standards. Among these interventions is the Saudi Green Initiative SGI, which encompasses the following three ambitious targets: five initiatives to reduce GHGEs by 278mtpa by 2030 (Table 9), twenty-four initiatives to plant ten billion trees across Saudi Arabia, and four initiatives to increase the protection of marine and terrestrial areas by 30% to ensure more than 20% of land is protected by 2030.

Figure 13: Saudi Arabia's pathway to a sustainable future – key initiatives

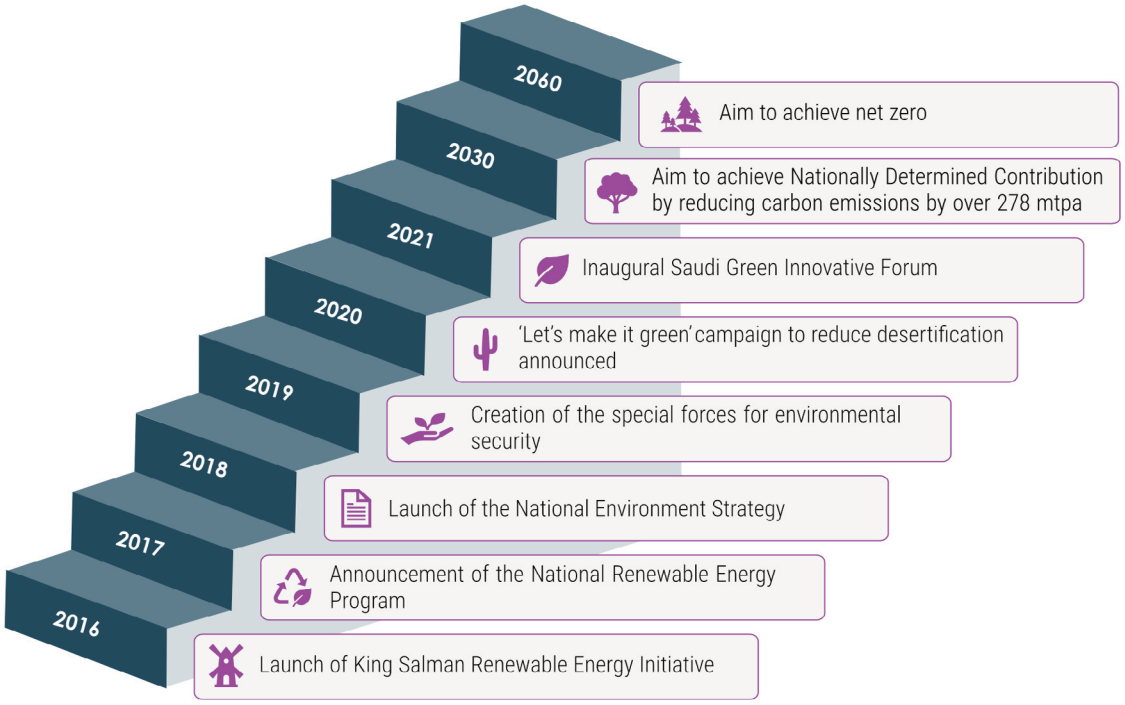


Table 9: Key initiatives to lower carbon emissions by more than 278 Mtpa

Initiative	Target	Date	Led by
Waste management transformation in Riyadh	Diverting 94% of waste generated in Riyadh away from landfills and composting more than 1.3 million tons of biodegradable waste to reduce CO_2 emissions by 4.1 Mtpa and create a proven waste management model to be rolled out nationally	2035	National Centre for Waste Management Saudi Investment Recycling Company
Enhance Saudi Arabia's Energy Efficiency Programme (SEEP)	Applying new energy efficiency standards in power generation, water desalination and electricity transmission and distribution	2025	Saudi Energy Efficiency Centre Ministry of Energy
Use captured carbon to produce chemicals and synthetic fuels	Utilising novel technologies to convert captured CO_2 into 12 tons per day of small-scale green methanol	2030	Ministry of Energy Saudi ARAMCO SABIC
Creating a more sustainable energy mix	Achieving 50% of domestic energy needs from renewables, reducing emissions by 175 Mtpa and displacing ~1 million barrels of liquid fuel per day	2030	Ministry of Energy
Become the world's leading hydrogen producer and exporter	Capturing >27 million tons of CO_2 by producing 3 million tons of blue hydrogen and 1 million tons of green hydrogen per year	2030	Ministry of Energy Saudi ARAMCO SABIC ACWA Power Air Products Qudra

7.1 Recommendations

RECOMMENDATION 7A
Develop standards and undertake regular measurements of the health sector's carbon footprint to expedite sustainable green health facilities.

RECOMMENDATION 7B
Build on regional-level environmental sustainability efforts and collaborate with national and international jurisdictions for the integration of efforts into a national Sustainable Development Unit.

RECOMMENDATION 7C
Provide advice and guidance to the health sector on best practices for implementing environmental sustainability measures.

RECOMMENDATION 7D
Create a reward system for healthcare ecosystems to report their sustainability measures and targets.

RECOMMENDATION 7E
Educate health professionals on environmental sustainability in the health service beyond energy use and waste reduction.

8. CASE STUDY 1

Digital Health Innovation

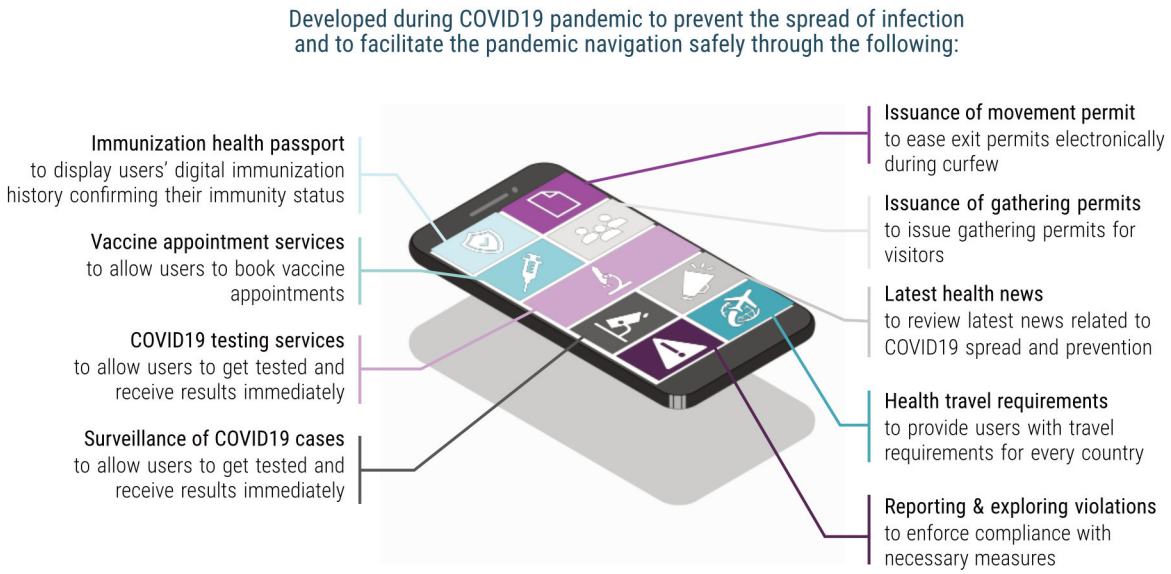
Efficacy of the Tawakkalna App in Saudi Arabia's healthcare response to Covid-19

In May 2020, the Saudi Data and AI Authority (SDAIA) launched Tawakkalna mobile application to identify the Covid-19 status of all residents in Saudi Arabia irrespective of their legal status in the country and log contact-tracing information.

The app aimed to manage movement permits and monitor the spread of the virus in the country. It is still in use with many enhancements beyond combating the pandemic. An overview of user experience of the Tawakkalna application included the following:

- **Ease of download and use:** The Tawakkalna app is available for download on both Android and iOS devices. Users generally find it easy to download and install. The user interface is designed to be user-friendly, with clear instructions and easy navigation.
- **Registration and verification**: Some users have reported difficulties during the registration process, particularly in the identity verification stage. There have also been reports of the app not recognising national ID However, these issues tend to be resolved with updates or by contacting customer support.
- **App performance**: The app has had occasional performance issues, such as slow loading times, server outages and difficulties obtaining permits during peak hours. These issues have been addressed over time, and the app's performance has improved with subsequent updates.
- **Multilingual support**: The app was initially launched with support for Arabic only. However, it has since been updated to include English support, making it more accessible to non-Arabic speaking users.
- **User feedback**: Users often suggest improvements for the application, such as adding more language options, improving the registration and verification process and enhancing the overall performance of the app to reduce server issues.

Figure 14: Ten key characteristics of the Tawakkalna app



The Tawakkalna app played a significant role in managing the Covid-19 pandemic in Saudi Arabia. A study of it and a number of other technologies reported a reduction of 61% in Covid-19 cases (Khan A et al., 2021). While there are no specific data indicating a direct correlation between the app and a reduction in hospitalisations or deaths, it is reasonable to assume that the app's impact on mitigating the spread of the virus had indirect effects on health outcomes. By enabling users to access their health status, report symptoms, book vaccination appointments and obtain movement permits during lockdowns, the Tawakkalna app contributed to better management of the pandemic. This likely led to a decrease in the number of infected individuals, which, in turn, could have reduced the burden on healthcare facilities and potentially lowered the number of hospitalisations. Moreover, the app's role in facilitating contact tracing allowed health authorities to quickly identify and isolate individuals who may have been exposed to the virus, thereby preventing further spread. This proactive measure may have indirectly contributed to a reduction in Covid-19-related deaths.

Since its release, the number of Tawakkalna users had reached 27 million people or approximately 77% of the population of 34.81 million by 2021. A study of public perception of certain mobile applications, including Tawakkalna, used during the Covid-19 pandemic found that public sentiment was mostly neutral (Alghareeb M et al., 2023).

In 2022, the Tawakkalna app won the United Nations Public Service Award in the category of institutional resilience and innovative responses to the Covid-19 pandemic due to its significant contribution to mitigating the impact of the pandemic. SDAIA continues to maintain the Tawakkalna app and is continuously expanding its features.

The Tawakkalna app was instrumental in managing the Covid-19 pandemic. As the situation evolved, developers expanded and refined the app's features to better serve the public and adapt to future health crises. Future plans for the Tawakkalna app include:

- **Expanding its scope** to incorporate more health-related services, such as telemedicine consultations, prescription refills and access to electronic health records, making it a comprehensive health management platform;
- **Enhancing user experience** by improving the app user interface and overall user experience based on feedback and evolving technologies. This may include adding support for more languages, making it more accessible to Saudi Arabia's diverse population;
- **Integration with international platforms** to facilitate travel and ensure the safety of travellers, allowing users to share their health status and vaccination records with authorities in other countries;
- **Adapting to future health crises**, including infectious disease or public health emergencies, helping authorities make data-driven decisions and enabling users to take necessary precautions;
- **Collaboration** with the private healthcare sector and other stakeholders to expand the app's reach and improve the quality of services offered. This could help ensure the app remains relevant and valuable to users in the long term;
- **Data analysis** collected through the app can offer valuable insights into public health trends and patterns. The developers may work with researchers and health experts to analyse these data, allowing for better understanding of disease transmission and informing effective public health policies.

By implementing these future plans, the Tawakkalna app can continue to play a vital role in Saudi Arabia's health management landscape, safeguarding public health and ensuring a swift response to future health crises.

9. CASE STUDY 2

Mass Gathering Management

An in-depth assessment of Saudi Arabia's strategic approach to mass gathering management amid the Covid-19 pandemic

Each year, Saudi Arabia hosts two major mass gathering events – the Hajj and the Umrah – attracting millions of Muslim pilgrims from around the world. The Hajj is one of the world's largest annual mass events, attracting more than 2.5 million pilgrims from 180 countries over a 10-day period determined by the Islamic calendar. The Umrah, meanwhile, is considered an abbreviated pilgrimage that can be performed at any time of the year.

These gatherings pose a significant public health threat to Saudi Arabia which has developed a multi-pronged plan to contain the spread of disease both locally and internationally. During the Covid-19 pandemic, Saudi Arabia leveraged inherent uncertainty and demonstrated its resilience in preparing for these mass events.

The government responded to the crisis with a strategic plan that included the implementation of several public health measures. To contain the spread of Covid-19, the 2020 Umrah was suspended and the Hajj was restricted to a limited number of domestic pilgrims. In light of a clear relationship between vaccination and lower incidence of Covid-19, capacity for Hajj and Umrah pilgrims increased again over time.

The Covid-19 pandemic had a profound public health and economic impact on both forms of pilgrimage. Before the suspension of the Hajj and Umrah, there were concerns about the potential for Covid-19 outbreaks among the large gatherings of pilgrims. While no major outbreaks were directly associated with the events, their suspension was a precautionary measure to prevent the spread of the virus.

However, their suspension had significant economic repercussions. The Hajj and Umrah contribute billions of dollars to the Saudi Arabian economy annually, providing employment and supporting local businesses. The suspension led to job losses, decreased tourism revenue and financial hardship for businesses reliant on pilgrim spending. Pilgrims planning to attend these events were also affected. Many had travel plans disrupted, faced financial losses due to non-refundable bookings and experienced deep disappointment at the indefinite postponement of their religious obligations. The suspension also had an impact on countries with large Muslim populations, as they too rely on the income generated by the participation of their citizens in these pilgrimages.

Despite these challenges, Saudi Arabia took steps to gradually resume the Hajj and Umrah, implementing strict health protocols and limiting the number of pilgrims to minimise the risk of Covid-19 transmission. These measures aimed to protect public health while gradually restoring the socioeconomic benefits of these two events.

The MoH and WHO conducted a risk assessment of the 2020 Hajj, leading to extensive preventative measures, including the exclusion of foreign pilgrims and a reduction in the number of pilgrims. Significant differences in disease control between countries contributed to the implementation of evolving controls for the Hajj during different waves of the pandemic. Hajj participation was permitted based on the vaccine and health status of potential pilgrims, while event capacity was limited, allowing the Hajj to take place while reducing the spread of disease. Table 10 summarises the Saudi Arabian government's policies regarding the Hajj, reflecting resilience to the evolving pandemic and the immunity level of the population.

Overall, the government implemented a number of preventative measures to ensure the safety of Hajj pilgrims during the Covid-19 pandemic. Some of these measures included:

- **Health screening**: Pilgrims were required to undergo health screening and Covid-19 testing before embarking on their journey. They were also tested upon arrival in Saudi Arabia. Only those with negative test results were allowed to proceed;

- **Limited capacity**: To maintain social distancing, the government significantly reduced the number of pilgrims allowed to participate in the events. During the 2020 Hajj, only around 10,000 pilgrims were permitted, compared to the usual 2–3 million;
- **Age restrictions**: Pilgrims within specific age groups, deemed to be at lower risk, were allowed to attend the events. The elderly and those with pre-existing health conditions were excluded as a precautionary measure;
- **Quarantine measures**: Upon arrival in Saudi Arabia, pilgrims were required to quarantine for a designated period before being allowed to participate in the religious events;
- **Social distancing**: During the Hajj, strict social distancing guidelines were enforced. Special markings and barriers were placed in the holy sites to ensure that pilgrims maintained the recommended distance from one another;
- **Face masks**: Wearing face masks was mandatory for all pilgrims and staff throughout the duration of the events;
- **Sanitisation**: Regular cleaning and sanitisation of the holy sites were carried out. Pilgrims were also provided with personal hygiene kits that included sanitiser, gloves and masks;
- **Health monitoring**: Health authorities closely monitored the pilgrims for any symptoms or signs of illness. Medical facilities and dedicated health teams were made available around the clock to address any health concerns.

By implementing these preventative measures, the Saudi Arabian government aimed to minimise the risk of Covid-19 transmission and ensure the health and safety of all pilgrims attending the Hajj. Since the resumption of the pilgrimage, there have been no reports of major outbreaks directly linked to the event. This can be attributed to the stringent measures taken by the authorities to ensure the health and safety of the pilgrims.

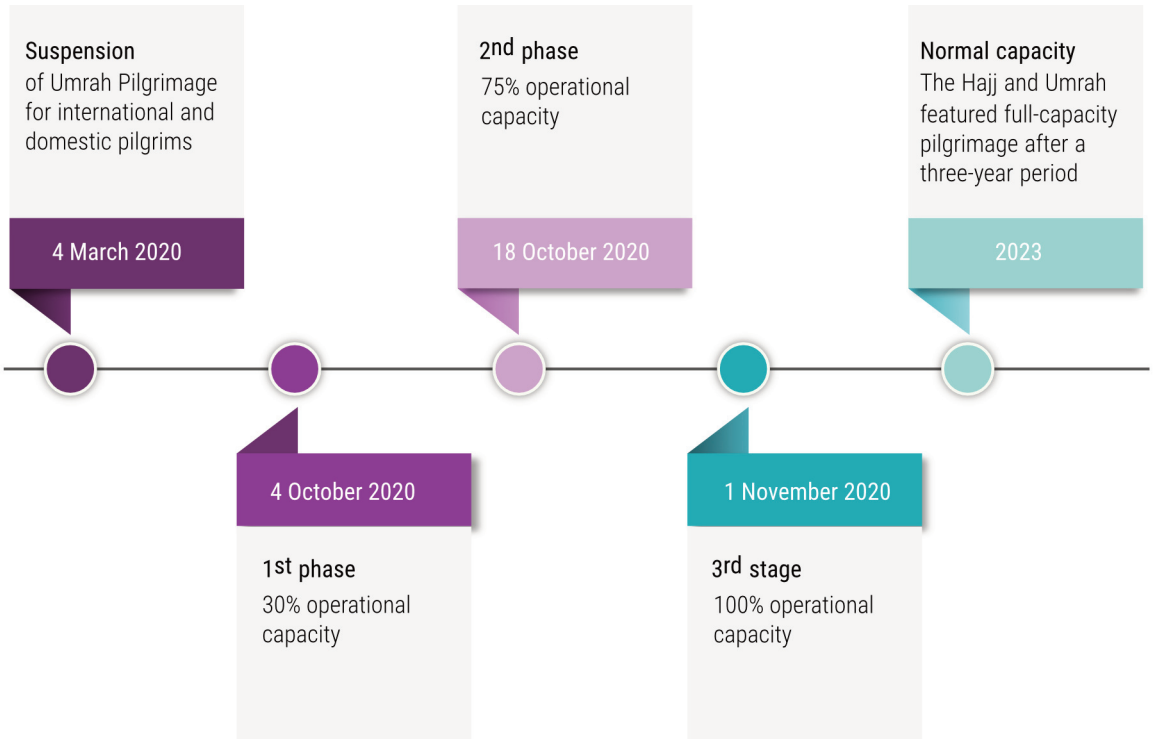
Table 10: Summary of the decisions made by the Saudi Arabian government regarding the Hajj during the Covid-19 pandemic

	2020	2021	2022
Rules and regulations	Saudi citizen or resident aged 65 and under Must follow an electronic path for pilgrims	Saudi citizen or resident aged 65 years and under Must follow an electronic path for pilgrims	Saudi citizen, residents and those from outside the country aged 65 and under. Pilgrims from certain countries must meet several requirements. All pilgrims must follow an electronic path for pilgrims
Numbers	No more than 10,000 pilgrims	No more than 60,000 pilgrims	No more than one million pilgrims
Preventive protocols	Wear face masks at all times while performing the ritual, maintain a distance of at least 1.5 meters between pilgrims No social gathering or meeting Disclose any respiratory symptoms	Receive approved Covid-19 vaccinations by the Saudi MoH The health status of those wishing to perform Hajj should not include any chronic diseases	Complete vaccination with accredited vaccines Submission of a negative Covid-19 test result from a sample collected not more than 72 hours prior to departure time to Saudi Arabia

Note. All pilgrims must follow the health instructions and come with all precautionary measures to preserve their health and safety while performing the Hajj rituals

On 4 March 2020, the Saudi Arabian government also suspended the Umrah. Its resumption, organised and approved by the Ministry of Hajj and Umrah, consisted of four phases (see Figures 15 and 16).

Figure 15: Timeline of the resumption of Umrah in 2020



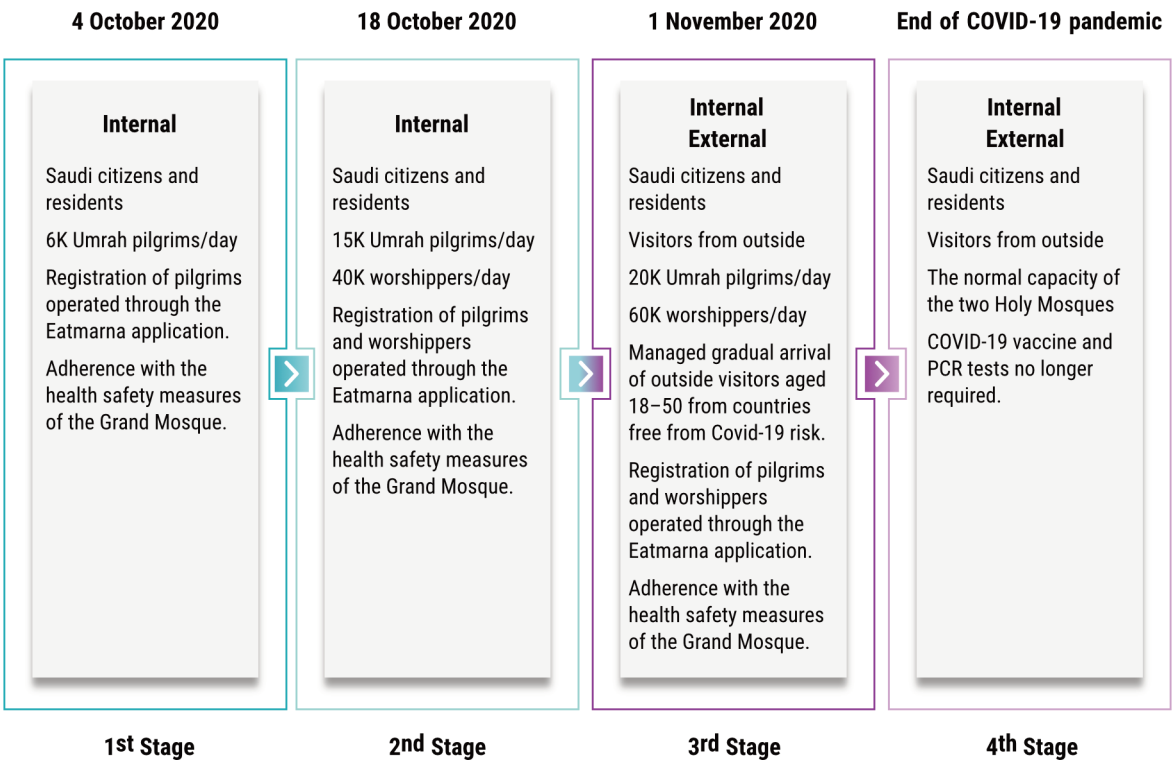
The first phase, on 4 October 2020, only permitted pilgrims who were Saudi citizens or residents. Participation was limited to only 20,000 pilgrims per day and use of the Eatmarna (meaning 'Let's perform Umrah') application to obtain permits was mandatory to further control the number and health status of those attending. The wearing of face masks was mandatory and social distancing was strictly enforced.

The second phase, from 18 October 2020, permitted Saudi citizens and residents to perform Umrah and pray in the Grand Mosque, with capacity limited to 75%, allowing 15,000 pilgrims and 40,000 worshippers (e.g., prayers and visitors) per day.

The third phase, from 1 November 2020, allowed pilgrims from abroad to perform Umrah with a full capacity of 20,000 pilgrims and 60,000 worshippers per day.

The final phase allowed Umrah and prayer to be performed at the two Holy Mosques at normal capacity in 2023.

Figure 16: The gradual stages of resuming Umrah



Note: Worshippers are able to pray at the two Holy Mosques, but cannot perform Umrah as unable to enter the Tawaf area.

The app played a vital role in ensuring compliance with the preventative measures. Its functioning and impact on the overall experience can be summarised as follows:

- Functionality: The Eatmarna app allowed pilgrims to book Umrah permits, prayers in the Grand Mosque and visits to the Rawdah in the Prophet's Mosque. It also provided reservation options for transportation and other necessary services related to the pilgrimage;
- Ease of use: The app was designed to be user-friendly, with simple navigation and a straightforward booking process. National ID or Iqama number, mobile number and email address were required for sign up. Once registered, users could select the desired service and book their slots. The app was available in multiple languages, making it accessible to a wide range of pilgrims;
- Compliance with preventative measures: The app played a crucial role in ensuring adherence to the preventative measures by monitoring the health status of pilgrims and controlling the number allowed at any given time. Users were required to input their health information and confirm that they met the necessary criteria, such as age restrictions and a negative Covid-19 test result.

Overall, the Eatmarna application proved to be an effective tool in managing and controlling the number of pilgrims, ensuring compliance with health protocols and providing a convenient and efficient method for booking Umrah permits and related services.

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