

Strategic Priorities for Advanced Medical and Health Research



Kingdom of Saudi Arabia

King Abdulaziz City for Science and Technology

Ministry of Economy and Planning



Strategic Priorities for Advanced Medical and Health Research



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Executive summary

The National Policy for Science and Technology, approved by the Council of Ministers in 1423 H (2002 G), defined programs for localization and development of strategic technologies that are essential for the Kingdom's future development. The King Abdulaziz City for Science and Technology (KACST) was given responsibility for developing 5-year strategic and implementation plans for each of these 14 technologies programs. In

addition, KACST facilitated strategic planning in key applied technology areas that draw upon fundamental and applied research and their impact on human lives.

Health is an important factor in the social and economic development of any nation. Ill-health leads to impoverishment, regressive cost burdens and slower economic growth. These concerns have placed health at the center of economic development discourse.

While Saudi Arabia has a young population, there are many non-communicable and communicable diseases that threaten the future well-being of the nation's population. Realizing the impending challenges and the urgency in addressing those challenges, medical and healthcare sciences are given utmost priority in the country's science policy agenda.

In keeping with its national policy making and technology planning responsibility, KACST collaborated with the King Faisal Specialist Hospital and Research Center (KFSHRC) and other relevant stakeholders to develop a National Medical and Health Research Strategy (NMHRS) for the Kingdom. This document embodies the product of that stakeholder-driven strategic planning endeavor.

This plan is based on input from the users and stakeholders of medical and



healthcare science and technology in the Kingdom, including research organizations, government agencies, universities and industry. The plan received extensive input, review, and comment from stakeholders as well as experts from reputed global institutions.

The planning process

- Identified the key national health issues and associated priorities for research and innovation in the Kingdom
- Assessed the strengths, weaknesses, opportunities, and threats for the program, including an analysis of KSA publications and an assessment of international models of national research agencies and institutes
- Defined a mission and vision for the Kingdom's medical and health research program
- Defined key strategic goals and related tactical objectives to achieve the vision

Executive summary

In addition to the technical needs, participants of the planning committee and strategic planning workshop identified a large number of areas where policies need to be changed or barriers removed to facilitate technology innovation.

Vision of the National Medical and Health Research (NMHR) Program, as collectively developed all relevant stakeholders, is:

The NMHR Program will advance the health and wellbeing of people in Saudi Arabia by developing the requisite national manpower, expertise, and infrastructure for sustainable, high quality, cutting-edge and competitive research; by fostering and facilitating the performance of novel, interdisciplinary and collaborative research; and by effectively communicating to both policy-makers and the public, findings of research and significance of promotion of health, prevention of disease and delivery of healthcare.

The NMHR Program's **mission** is:

To promote research in the medical and health sciences to further health and wellbeing in Saudi Arabia.

Based on the detailed assessment of current prevalence and projected incidence of diseases, the following initial list of medical and health **priority areas** have been selected for strategic intervention:

- Non-Communicable Diseases
 - Cardiovascular Diseases
 - Diabetes

- Cancer
- Allergy and Asthma
- Neurodegenerative Diseases
- Communicable Diseases

The following strategic goals were identified and agreed upon by the stakeholders:

- Development and retention of national manpower and expertise in medical and health sciences research
- Development of infrastructure for sustainable, cutting-edge and competitive research in the medical and health sciences
- Facilitate the performance of novel, competitively-funded and high quality research in the medical and health sciences
- Effective communication of research findings and significance of those findings to policy-makers and the public

The National Medical and Health Research Program consists of a program leadership function, responsible for overall planning, management, and cross-cutting issues, and priority technical areas corresponding to major health issues outlined above.

Background

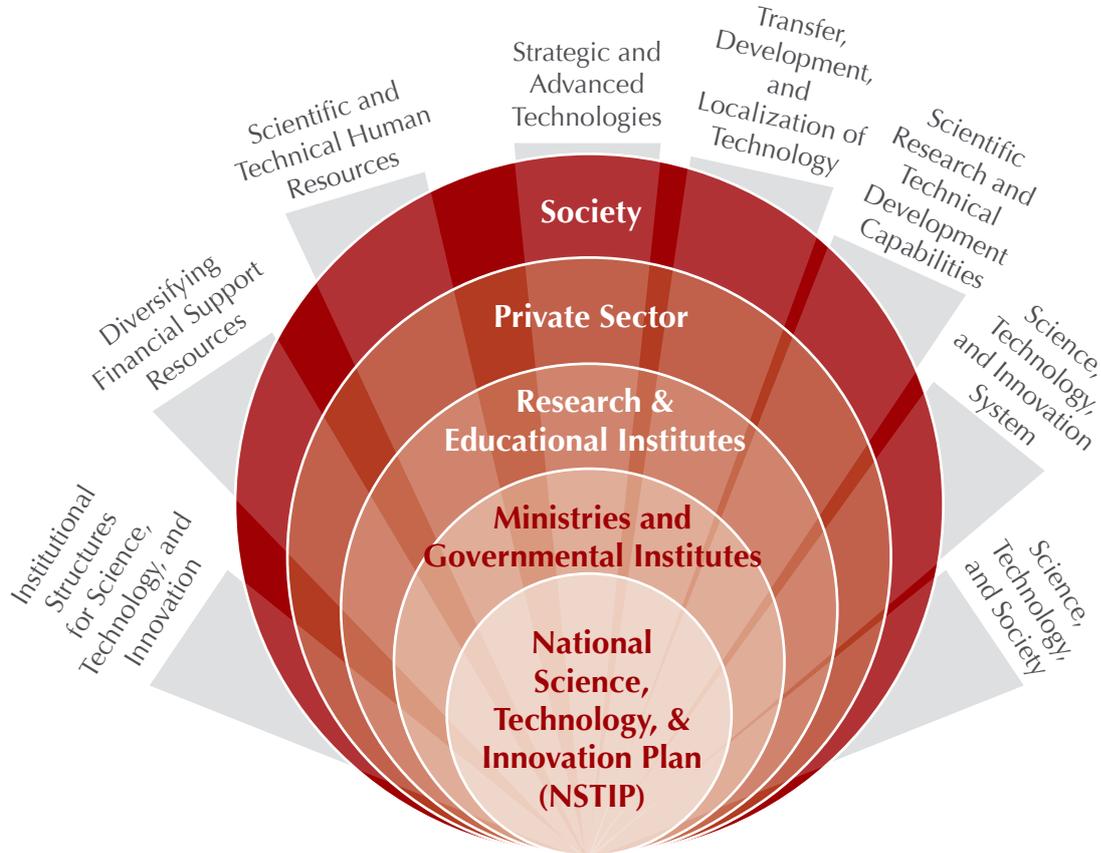
The King Abdulaziz City for Science and Technology (KACST) was directed by its charter of 1986 to “propose a national policy for the development of science and technology and to devise the strategy and plans necessary to implement them.” In accordance with this charter, KACST launched a comprehensive effort in collaboration with the Ministry of Economy and Planning (MoEP), to develop a long-term national policy

on science and technology. In July 2002, the Council of Ministers approved the national policy for science and technology, entitled “The Comprehensive, Long-Term, National Science and Technology Policy.”

KACST and MoEP embarked on a national effort in collaboration with stakeholders to develop the national plan for science, technology and innovation (STI), which drew up the future direction of science, technology and innovation in the Kingdom, considering the role of KACST as well as that of universities, government, industry, and society at large. The plan encompasses eight major programs, depicted in figure 1, as follows:

1. Strategic and advanced technologies
2. Scientific research and technical development capabilities
3. Transfer, development, and localization of technology
4. Science, technology, and society
5. Scientific and technical human resources
6. Diversifying financial support resources
7. Science, technology, and innovation system
8. Institutional structures for science, technology, and innovation

Figure 1: Science and Technology Programs



In the “Strategic Technologies” area, KACST is responsible for 5-year strategic and implementation plans for 14 technologies. In addition, KACST facilitates strategic planning in key applied technology areas that draw upon fundamental technologies and impact human lives.

In keeping with this responsibility, KACST collaborated with the King Faisal Specialist Hospital and Research Center (KFSHRC) and other relevant stakeholders to

develop a National Medical and Health Research Strategic Priorities (NMHRS) for the Kingdom.

This document embodies the product of that stakeholder-driven strategic endeavor. It establishes a mission and vision, identifies stakeholders and users, determines the highest priority areas for the Kingdom, and sets ambitious, yet realizable goals for the program.



Scope

The scope of this plan is national. It is a research and innovation plan for the medical and health sciences field in the Kingdom of Saudi Arabia. The plan involves universities, industry, and government stakeholders. KACST supported the development of this plan financially, technically and logistically, while KFSHRC provided project management, subject matter expertise and planning leadership with overall responsibility for coordination with stakeholders.

Plan Development Process

The development of this plan began with mobilization of resources. This included identification of the stakeholders and users of medical and health research and innovation in the Kingdom, domain experts and key members of the planning team. Extensive literature review and assessment of current status of the medical and health field in the Kingdom was followed by creating vision and mission statements, and conducting background research on the experiences of leading countries around the world. The plan development methodology is summarized in figure 2.

Figure 2: Plan Development Methodology



The plan received extensive input, review, and comment from the stakeholders through conducting workshops as well through a digital platform.

As part of the communication strategy a secured website was designed with an embedded blog and capability for documents upload and download. As a part of the research strategy a questionnaire was designed and made available from the website for completion by researchers and medical professionals. This questionnaire was also distributed among the attendees of the planning workshop that was conducted at KACST. The workshop was used to brainstorm research priorities and other strategy elements including the SWOT analysis and vision and mission statements.

The website also offered various research related links to relevant information on medical and health research throughout the world.

KSA Demographics

As of July 2008, Saudi Arabia's population exceeded 28 million. The Saudi population is young, with around 50% under the age of 20. Approximately 55.3 % of Saudi nationals are males and 44.6% are females. Nearly 88% of the total population is urban. Population growth rate is estimated to be around 2.06% with a birth rate of 2.91 births per 1,000 population,

and a death rate of 2.55 deaths per 1,000 population.

Infant mortality rate is around 12.4 deaths per 1,000 live births¹. For males it is 14.2 deaths per 1,000 live births and for females it is 10.4 deaths per 1,000 live births. The life expectancy at birth is estimated to be 75.8 years for males and 73.8 years for females. As per a 2007 estimate, total fertility rate is around 3.94 children born per woman.

The Global Human Development report ranked Saudi Arabia 71st out of the 177 nationals (GHD 2002). An improvement was recorded to 61st rank (overall Human Development Index) in the 2007–2008 report. This puts Saudi Arabia at a disadvantage against competing nations with regard to health of population, accomplishment in healthcare services delivery and availability of local talent capable of spearheading medical/health research.

The healthy life expectancy for Saudis is 60 years for males and 63 years for females. The average healthy life expectancy for other Arab nations (61 ± 1.10 and 63 ± 0.80 years for males and females respectively) is not much different from that of Saudi Arabia. This contrasts significantly with the averages of nations like UK and USA where the average healthy life expectancy is 66.67 ± 1.45 and 69 ± 2.52 years for males and females respectively.

¹ Healthcare in Saudi Arabia, Wikipedia



The same source indicates that the ratio of health care providers per 1000 populations falls short of the average in the UK and USA. Similarly, the age-standardized mortality rate per 100,000 of population is higher in Saudi Arabia for non-communicable diseases than that of the indicated nations above. Cardiovascular diseases are the major cause of death amongst Saudis.

The Kingdom spends around 4% of its GDP on health services. The expenditure for all research activities stayed around 0.2% of GDP, but is expected to change dramatically in the coming years due to the commitment generated through the National Science, Technology and Innovation Policy.

Major National Health Issues

The following key needs of the Kingdom were identified through workshops with the stakeholders. Assessment of the severity of these issues, their current prevalence and future projections are based on limited existing statistics and assumptions made collectively by subject matter experts.

Ill-health can contribute to impoverishment, broadly defined as processes of household asset depletion and income loss that cause consumption levels to fall below minimum needs. Concern about the links between ill-health and impoverishment has placed health at the center of poverty reduction discourse and strategies, and strengthened arguments for a substantial increase in health sector investment to improve access for the people to combat poverty as well as reduce disease burdens².

The costs people incur due to illness, are central to the design and performance of health care interventions, particularly their coverage and equity implications. Health services can also impose regressive cost burdens, with poor households spending a higher portion of their income on health care than better-off households.

Understanding the key health issues faced by the Saudi population and assessing the economic burden generated by those issues on the country is a critical step in the development of nation health research strategy. For the purpose of this strategic plan, non-communicable diseases such as diabetes, cardiovascular diseases,

² World Bank, 2000. World Development Report: Attacking Poverty. Washington DC: World Bank.

Strategic Context

asthma, neurodegenerative diseases and cancer, and some infectious diseases were selected for detailed study because these are major sources of morbidity and mortality in Saudi Arabia. Their severity and duration of impact are likely to have large economic implications.

Non-Communicable Diseases

Cardiovascular Diseases

The NMHRS planning team estimates that in 2006 there was 26% prevalence of all cardiovascular diseases. The total estimated cases of Coronary Heart Disease (CHD) was 4.8%. The following table estimates the number of patients by category of disease:

| Category | Number of Patients |
|---------------------|--------------------|
| CHD | 1,200,000 |
| Stroke | 404,000 |
| High Blood Pressure | 5,000,000 |
| Heart Failure | 400,000 |

■ **Peripheral Arterial Disease (PAD):** The prevalence of PAD was 11.7%. Patients with PAD were slightly older than patients without PAD, suffered more often diabetes, hypertension, lipid disorders, smoking, cerebrovascular event, and coronary artery disease.

■ **Coronary Artery Disease (CAD):** The overall prevalence of CAD in KSA is 5.5%, a figure midway to those reported from other countries. Classical risk factors for CAD are older age, male gender, overweight, hypertension, smoking, diabetes mellitus, hypertriglyceridemia, and hypercholesterolemia are important risk factors in Saudi population. Moreover, metabolic syndrome is playing an active role in the development of CAD in Saudi population.

It is estimated that by the year 2032, the economic burden arising from Cardiovascular Diseases will be close to SR 80 billion.

Diabetes

Since the turn of the new millennium, the number of people with diabetes has more than doubled. Diabetes is now a global epidemic with devastating humanitarian, social and economic consequences. More than 230 million people worldwide are living with the disease. This number is expected to rise to a staggering 350 million within 20 years. In the entire Middle Eastern countries it is expected that if unchecked the percentage change in the number of people with diabetes will be 163% by the year 2030.

It is believed that around 6 Million Saudis are Pre-diabetic/diabetics with an estimated cost per year of around 36 Billion Riyals. Figures suggest that up to 30% of over 40 year old Saudi population may suffer from diabetes, costing the government \$800 a month/patient in treatment. This together with the assessment that 50% of the population is considered over weight or obese indicates the vulnerable number of future diabetics is set to rise. It is estimated that the burden of Diabetes may exceed SR 120 billion by 2035.

Cancer

The National Cancer Institute (NCI) of the United States highlights that cancer is now becoming more of a global burden than it was before. Greater attention should be given to the disease because of the increase in the incidence in the developing countries. This increase can be attributed to increased life expectancy in highly populated countries like China and India, a rise in the number of smokers in developing nations and an increase in lung cancer-inducing pollution. In the U.S. and other developed countries, cancer is presently responsible for about 25% of all deaths. On a yearly basis, 0.5% of the population is diagnosed with cancer.

The cumulative incidence of all cancer types adjusted over all ages in Saudi Arabia in the years 1998 to 2004 as reported in the GCC cancer report indicated an increase in the number of cases. In addition, the age-standardized mortality rate from cancer is estimated to be around 100 per a 100,000 of the population and this is set to increase. It is estimated that the cost per patient is about SR82,500 (\$22,000) per year per patient. Based on a series of assumptions, it is estimated that the total burden of cancer on Saudi Arabia will exceed SR 2 billion per year by the year 2030.

Allergy and Asthma

It is estimated that as many as 300 million people of all ages and all ethnic backgrounds suffer from asthma and the burden of this disease to governments, healthcare systems, families and patients is increasing worldwide. Asthma has become more common in both children and adults around the world in recent decades. The rate of asthma increases as communities adopt Western life styles and become urbanized.

It is estimated that the annual rate of increase in the prevalence of asthma in Saudi Arabia is 1.175%³. The data regarding the cost per patient is obtained from the US and is estimated to be SR 7,500 per year per patient. Assuming an annual inflation rate at 4%, it is estimated that the total burden on Saudi Arabia will exceed SR 20 billion by the year 2032. In the year 2015 alone the estimated number of people affected will be 4.25 million while the total cost of treatment will near SR 10 billion.

Neurodegenerative Diseases (Alzheimer as a case in point)

Under Neurodegenerative diseases, Alzheimer disease

(AD) is the fourth leading cause of death in adults worldwide. The incidence of the disease rises steeply with age. Generally it is diagnosed in people over 65 years of age, although the less-prevalent early-onset Alzheimers can occur much earlier. An estimated 26.6 million people worldwide had Alzheimer's in 2006; this number may quadruple by 2050. AD is twice as common in women as it is in men. Using baseline data from published sources in the United States, the planning team estimates that the total burden of AD on Saudi Arabia accruing from patient care and lost productivity may exceed SR 22 billion by 2030 as number of patients may exceed 22,000.

Communicable Diseases

Communicable disease such as TB, Malaria, and Hepatitis place an extraordinary burden on those afflicted by the disease, their families, communities, and on government budgets. For example, the greatest burden of TB falls on productive adults who, once infected, are weakened and often unable to work. The burden of taking care of sick individuals usually falls to other family members and, in addition to putting them at greater risk of infection, can lower their productivity.

Estimation was made for some infectious diseases on Saudi population for the year 2006. Different rates of incidence are observed for different communicable diseases and across different regions of the country. For example, amoebic dysentery is a major communicable disease in the region of Makkah (Al-Taif). On the other hand, Salmonellosis is apparent as a major communicable disease is the entire Kingdom. Dengue fever is more apparent in the regions of Makkah and Jizan. This

³ Al Frayh AR. Asthma patterns in Saudi Arabian children. J Royal Soc Health 1990; 110: 98-100



requires focus on initiating measures for the treatment and prevention of this deadly disease in these specific parts of the Kingdom.

The aforementioned health issues were identified and discussed in detail by the strategic planning committee and stakeholders. The National Medical and Health Research Strategy draws upon the above assessment. This plan is focused on the technical needs but also includes steps to address the non-technical needs, although some of these are primarily the responsibilities of other organizations.

Overall Economic Burden of Diseases on Saudi Arabia Coordination, Monitoring and Funding for Healthcare

The Ministry of Health (MOH) is the major government agency entrusted with the provision of preventive, curative and rehabilitative healthcare for the Kingdom's population. The Ministry provides primary health care (PHC) services through a network of over 1,900 centers throughout the kingdom. The MOH is considered the lead government agency responsible for the management, planning, financing and regulating the health care sector. The MOH also undertakes the overall supervision and follow-up of health care activities carried out by the private sector. It is therefore reasonable to view the MOH as a national health service agency (NHS) for the entire population.

There are also three other mini-NHS agencies which finance and deliver primary, secondary and tertiary care to specific enrolled security and armed forces populations: the Ministry of Defense and Aviation (MODA), the Ministry of Interior (MOI) and the Saudi Arabian National Guard (SANG). In addition to these agencies, there are several government ministries that are responsible for the delivery of health care services in the KSA. For example, The Ministry of Education provides immediate primary health care to students.

The Government also finances and provides care on a referral basis in its major specialized national tertiary care referral hospitals - King Faisal Specialist Hospital and Research Center (KFSHRC) and King Khalid Eye Specialist Hospital. The KFSHRC uses highly advanced technologies and acts as a referral hospital for cases that require advanced and specialist treatment, while it also conducts research on health issues in general and those related to the Kingdom in particular.



National Expenditure on Public Health

The 2006 MOH report estimated that 11% of the Government budget is devoted to healthcare⁴. This accounts for 80 percent of all health spending. The basic mechanism for paying public providers is through budget transfers from the Ministry of Finance based on line item allocations for specific expense categories such as salaries, maintenance, new projects, etc. Managers are generally prohibited from switching funds across line items.

While private spending on health accounts for an estimated 20 percent of all health spending, such spending also includes that by the Saudi population and expatriate working in the public sector.

Moreover, private sector expatriates often seek free care in public facilities through special permissions. Private sector providers are generally paid on a fee-for-services rendered. Such payments are often based on contracts between the provider and the insurer or employer. Preliminary estimates by the Ministry of Health indicate that some 68 percent of private spending is paid for by employers (who insure either through purchase of private health insurance, direct provision through company owned facilities, or pay providers directly) and 32 percent is paid out-of-pocket by the patient himself. The following table provides a breakdown of spending on health by both the public sector and the private sector in 1421/1422H (in thousands SR)

⁴ Health Indicators, 2006. Ministry of Health, Department of Statistics
<http://www.gov.sa/statistics/S1427/Chapter%201.pdf>

Strategic Context

| Ministry of Health | Other Public Sector | Private Sector | Total |
|--------------------|---------------------|----------------|------------|
| 13,046,528 | 10,970,053 | 5,633,320 | 29,649,901 |
| 44% | 37% | 19% | 100% |

The total health expenditure amounts to approximately 4% of Saudi Arabia's gross domestic product (GDP). Saudi Arabia's public share of total health spending is well above the regional average and at a level comparable to the high public share seen in other Gulf countries. Its public share of total health spending is well above the average for the countries worldwide that have comparable income levels.

Saudi Arabia's per capita total health spending is above the regional average but below the average per capita spending found in other GCC. The country's per capita total health spending is slightly below the level found in other countries worldwide that have similar income

levels. Saudi Arabia's total health expenditure-to-GDP ratio is slightly below that found in other countries worldwide that have comparable income levels, while the public health expenditure-to-GDP ratio is above the global average.

Stakeholders Roles

The stakeholders for the Medical and Health Research Strategic Program include KACST, KFSHRC, KSA universities, various independent or specialized health research institutes, health service providers, other government agencies, and private companies. The following table shows the roles of each of the stakeholders in the program.

Strategic Context

Stakeholder Roles

| Stakeholders | Roles |
|---|--|
| KACST | <ul style="list-style-type: none"> Plan, coordinate and manage the program |
| | <ul style="list-style-type: none"> Conduct applied research, technology transfer and prototype development |
| | <ul style="list-style-type: none"> Manage and participate in national projects |
| | <ul style="list-style-type: none"> Provide support for university and industrial participation in national projects |
| | <ul style="list-style-type: none"> Provide and manage national research facilities |
| | <ul style="list-style-type: none"> Provide advice and services to government on science and technology. |
| | <ul style="list-style-type: none"> Establish Technology Innovation Centers in cooperation with Universities and Industries. |
| Universities | <ul style="list-style-type: none"> Create new basic and applied scientific knowledge |
| | <ul style="list-style-type: none"> Train students in science and engineering |
| | <ul style="list-style-type: none"> Host and participate in Technology Innovation Centers |
| KFSHRC and other Independent or Government Specialized Research Centers | <ul style="list-style-type: none"> Participate in collaborative projects |
| | <ul style="list-style-type: none"> Create new applied scientific knowledge |
| | <ul style="list-style-type: none"> Collect, compile, analyze and disseminate key data and information on human health |
| | <ul style="list-style-type: none"> Acquire, improve, and deliver medical solutions and health care technologies to health service providers |
| Ministry and Government Agencies | <ul style="list-style-type: none"> Conduct researches and studies leading to solving operational and implementation challenges of projects |
| | <ul style="list-style-type: none"> Provide input to program on government R&D needs |
| | <ul style="list-style-type: none"> Reduce regulatory and procedural barriers to R&D and innovation |
| Private Sector | <ul style="list-style-type: none"> Support R&D in universities and industry |
| | <ul style="list-style-type: none"> Develop and commercialize products & processes resulting from the program. |
| | <ul style="list-style-type: none"> Support and participate in collaborative R&D projects. |
| | <ul style="list-style-type: none"> Support and participate in the Technology Innovation Centers |

Analysis of National Models in Medical and Health Research

Biomedical and health sciences research, in all its variant forms from basic, clinical to translational and public health, contributes significantly toward improving people's health, minimizing burden of disease, containing healthcare cost, and, more importantly, improving quality of life. Most developed countries such as the USA, Canada and Japan as well as Western Europe have national health research institutes that are dedicated to improve human health. The mission of such institutes is to conduct basic, clinical and public health research in all human diseases, recommend important national medical and health sciences research priorities, help address public health problems, and respond rapidly to emergent risk or health crisis through research.

Different models of organizational structure for medical and health sciences research institutes exist internationally. The best known model is the US National Institutes of Health (NIH). Five other models are worth describing as possible alternate models – namely the French, Canadian, British, Japanese and Singaporean models.

The American Model

The National Institutes of Health (NIH) in the United States traces its origins back to 1798 with the inauguration of the Marine Hospital Service under an Act signed by President John Adams. Currently, twenty seven different Institutes and Centers each having its own specific research agenda comprise the NIH. The overall administrative body of the NIH is Office of the Director, which serves as the central office responsible for NIH policy, planning, managing, and coordinating its programs and activities. The office of the NIH Director houses several specific interest units that include AIDS Research, Behavioral and Social

Sciences Research, Disease Prevention, and Research on Women's Health, among others.

The NIH institutes include the National Cancer Institute, National Eye Institute, National Heart, Lung, and Blood Institute, National Human Genome Research Institute, National Institute on Aging, National Institute on Alcohol Abuse and Alcoholism, National Institute of Allergy and Infectious Diseases, National Institute of Arthritis and Musculoskeletal and Skin Diseases, National Institute of Biomedical Imaging and Bioengineering, National Institute of Child Health and Human Development, National Institute on Deafness and Other Communication Disorders, National Institute of Dental and Craniofacial Research, National Institute of Diabetes and Digestive and Kidney Diseases, National Institute on Drug Abuse, National Institute of Environmental Health Sciences, National Institute of General Medical Sciences, National Institute of Mental Health, National Institute of Neurological Disorders and Stroke, National Institute of Nursing Research, and the National Library of Medicine. Centers housed within the NIH include the Center for Information Technology, Center for Scientific Review, John E. Fogarty International Center, National Center for Complementary and Alternative Medicine, National Center on Minority Health and Health Disparities, National Center for Research Resources, and the NIH Clinical Center.

The NIH receives about \$29 billion USD annually. It spends 80% of its budget on medical research in fulfillment of its mission. Annually, the NIH awards about 50,000 grants based on a nationally administered competitive funding mechanisms. About 325,000 researchers representing 3,000 universities, medical schools, and other research institutions in the US and around the world benefit from the NIH's research funding

programs. About 10% of the NIH's budget is used to support intramural projects conducted by nearly 6,000 scientists employed by the NIH and conduct research at its laboratories.

The French Model

The French National Health Research Institute, better known by its French acronym as the INSERM, reports to both the ministers of research and health. It is chaired by a general director and supported by three committees that jointly form its governance structure. The three supporting committees are:

1. The Steering Committee – composed of top notch internationally recognized scientists and clinical researchers in their field. The members are charged with identifying priority areas for medical and health research. They present their recommendations to a strategic committee.
2. The Strategic Orientation Committee – constituted public and private partners, including members of the steering committee, representatives of other research bodies, medical societies, patients association and industry. The Committee promulgates the research and training policy. It also ensures follow-up of approved projects and evaluates the results of each program.
3. The Scientific Council - a consultative body composed of international experts who have full autonomy to evaluate and select scientific projects based on recommendations of the two committees mentioned above.

The budget for 2007 was 660 million Euros, 80% of which was devoted to research. The institute employed 13,000 staff and scientists. The INSERM comprises research units that are organized around thematic initiatives based on research priorities. It also includes a clinical research

and epidemiological centers.

The INSERM research units are composed of one or more research teams coordinated by a unit director. The unit is housed either in a hospital or university site. Clinical research centers serve as the interface structures between the national health institute and ministry of health. Their role is to conduct clinical protocols in patients and healthy volunteers under technical, ethical and legal conditions. An epidemiology clinical center offers research support for large clinical trials and public health studies.

The INSERM cooperates with universities, hospitals and cancer centers, industry, charitable associations and foundations, patients' advocacy associations, disabled persons and their families. It also maintains partnerships with health agencies, medical societies, insurance agencies, local and regional authorities, international scientific communities, and other research organizations.

The Canadian Model

The Canadian Institutes of Health Research (CIHR) report to the Parliament through the Minister of Health. The CIHR's governance structure calls for a president, who is a recognized health researcher. The president is assisted by four deputies. In the 2005/2006 fiscal year, CIHR's operating budget was \$700 million Canadian Dollars. It employed a total of about 10,000 staff. The CIHR discharges its responsibilities through a governing council of 20 members representing a wide range of backgrounds and disciplines, including:

1. 13 scientific directors each leading a research institute
2. Each research institute has scientific directors assisted by an advisory board of 15-18 members

3. Each institute is charge with a specific theme that are: Peoples' Health, Cancer Research, Circulatory and Respiratory Health, Gender and Health, Genetics, Health Services and Policy Research, Aging, Human Development and Child and Youth Health, Infection and Immunity, Musculoskeletal Health and Arthritis, Neurosciences, Mental Health and Addiction, Nutrition, Metabolism and Diabetes, and Population and Public Health.

The British Model

In the UK, research is promoted and governed by the Medical Research Council (MRC). The MRC Council directs scientific strategy and policy. The council decides all issues of corporate strategy, goals and objectives, and makes all major decisions in relation to the allocation of financial and other resources. The council consists of a Chairman, Deputy Chairman and 10-18 members, at least half of whom have been appointed based upon their scientific qualifications. Council members are appointed by a Minister for Science and Innovation. MRC policies are implemented through strategy boards, overview groups and expert advisory bodies. Day to day management is overseen by a management board. The MRC Management Board is a decision-making body and discussion forum chaired by the Chief Executive. The terms of reference for this Board are to manage operations where policy and decisions have major importance for the delivery of the MRC's objectives and/or for key stakeholder relationships.

The main areas of responsibility are to:

1. Monitor performance delivery and establish strategies to mitigate risks
2. Take policy/operational decisions or make recommendations to the MRC Council as appropriate.
3. Exchange, generate, develop ideas and provide advice

to the Council.

The MRC uses the Medical Research Foundation as it's independently managed fund raising arm. The MRC spent £579 M in 2007/2008 with 4000 staff members. The MRC supports around 3000 researchers in Hospitals, Universities and its own research centers.

Other entities such as the National Institute for Medical Research (NIMR) conduct research in the life sciences that are salient to health and supported by the MRC. The NIMR is a part of the British Medical Research Council, which is a national entity funded by the British government. It is charged with promoting research in medical and health sciences to improve the health of the British public. Researchers at the NIMR hold joint faculty appointments at the University College London (UCL) and supervise students and trainees who register through the UCL.

Research at the NMIR is structured around four primary research topics. These four areas of foci are divided into 15 specialized and interactive divisions. The four topics are: genetics and development which focus on the fundamental molecular and cell biology underlying embryo development; infections and immunity focusing on the molecular basis of pathogenesis and cellular immunological responses; neurosciences that researches neural functions; and structural biology to test the bio-molecular architecture and their function. The Institute employs about 240 scientists who are tenured (n = 60), on tenure track (n = 20), or are post-doctoral fellows. The NIMR employs 250 support staff. In addition, NIMR houses about 70 externally funded postdoctoral fellows and 100 graduate students.

The Japanese Model

The Japanese National Institute of Health Sciences (NIHS) conducts research with the specific aim of improving Japanese citizens' health and their environment. The NIHS traces its origin to 1987 when it operated as the Tokyo Drug Control Laboratory. It conducts its operations under the auspices of the Japanese Ministry of Health, Labor and Welfare. It is comprised of 21 divisions, including those under the Biological Safety Research Center.

The NIHS is the principal research enterprise in Japan. It houses several disciplinary divisions that espouse an international perspective and promotes international cooperation. The divisions include: drugs, biological chemistry, pharmacognosy, phytochemistry and narcotics, cellular and gene therapy products, medical devices, environmental chemistry, foods, food additives, biomedical food research, microbiology, organic chemistry, biochemistry and immunochemistry, biosignaling, safety information on drug, food and chemicals, medicinal safety science, cellular and molecular toxicology, pharmacology, pathology, genetics and mutagenesis, and risk assessment.

The Singaporean Model

Under the auspices of the Ministry of Health, the National Medical Research Council (NMRC) administers and manages the medical research strategy in Singapore. It was funded in 1994 to fund research conducted at healthcare institutions. It funds research through competitive awards granted to individual projects. Among the various responsibilities and priorities of the Council is the development of a national pool of clinician-scientists with skills in medical research. The Council also carries out the Singapore Ministry of Health's directive in sustaining translational and clinical research in areas where they have credible prospects.

As summarized on its Website, the "NMRC's role is ... in the leading, promotion, coordinating and funding of medical research in Singapore".

The NMRC has a successful track record in achieving its targeted goals and objectives. It has orchestrated interdisciplinary partnerships and international collaborations that facilitate research for its constituency. Through a robust outcomes assessment program, the NMRC sponsored research programs have been steered to commercialization.

The Council is led by a chair and a board that includes representatives from national stakeholders such as universities and leading medical and research institutions in Singapore. The NMRC lists among its task an admirable list of well developed priorities excerpted here directly from www.nmrc.gov.sg. The list calls for providing "guidance and advice to the NMRC in the implementation of strategies and priorities" developed by various national institutions. Specifically, the NMRC administers and assesses its key performance indicators by providing oversight to its funded research programs and manages salient funds and budgets to optimally achieve its goals.

Analysis of Medical and Health Research through Publications and Patents

There is general agreement that publications and patents strongly correlate with scientific research capacity, although publication and patent counts alone do not fully represent the quality or scope of research⁵. Several

⁵ Seminal research in the use of publications as a measure of scientific productivity includes A.J. Lotka, "The frequency distribution of scientific productivity," *Journal of the Washington Academy of Sciences*, vol 16 (1926); D. Price, *Little Science, Big Science*, (New York: Columbia university Press, 1963); J.R. Cole and S Cole, *Social Stratification in Science*, (Chicago: The University of Chicago Press, 1973); J. Gaston, *The reward system in British and American science*, (New York: John Wiley (1978); and M.F. Fox, "Publication productivity among scientists: a critical review," *Social Studies of Science*, vol 13, 1983.

Strategic Context

indicators are presented and discussed below. These include forward citations, which are the frequency at which publications and patents are cited by others and are an indicator of impact, and co-authoring relationships, which are an indicator of scientific collaboration. Together, these indicators provide measures of collaboration, globalization and impact of science and technology research in fields related to the KSA medical and health research program.

Global Publication Activity in Medical and Clinical Sciences

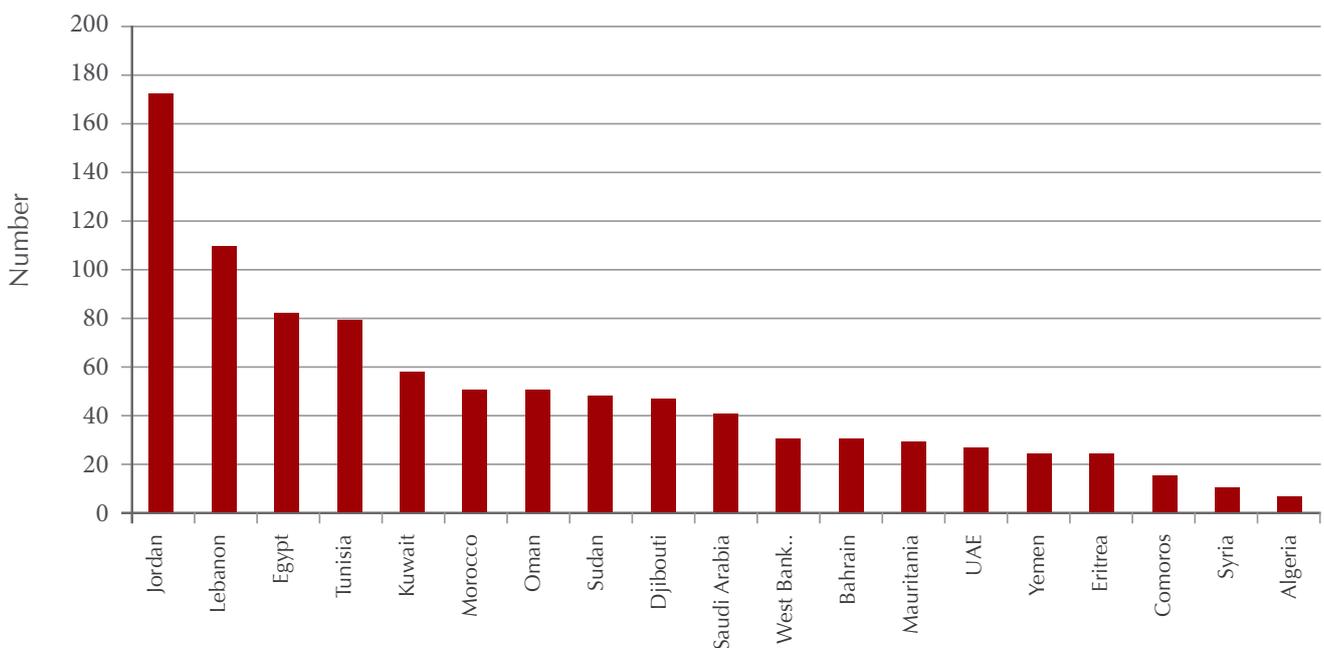
The Institute of Scientific Information (ISI) using essential science index for the years 1995 -2005 ranked Saudi Arabia 33rd amongst 100 nations in terms of number of publications over the indicated ten years. The USA ranked first with around 650,000 publications in clinical and medical sciences, with England, Japan and Germany

occupying distant 2nd, 3rd and 4th positions respectively. Among emerging countries, Turkey and India occupy 15th and 22nd positions with publications amounting to 30,000 and 16,000 respectively.

It is noteworthy that 31 countries are responsible for 98% of the world highly cited papers with the remaining 162 nations contributing less than 2%⁶.

Saudi Arabia commands a leading position among its regional peers with regard to total number of publications. However, publications normalized over GDP (articles per USD 1 billion in GDP) provides a different picture. Research performance of the Arab region does not match up to the global performance when performance is measured in terms of publication productivity.

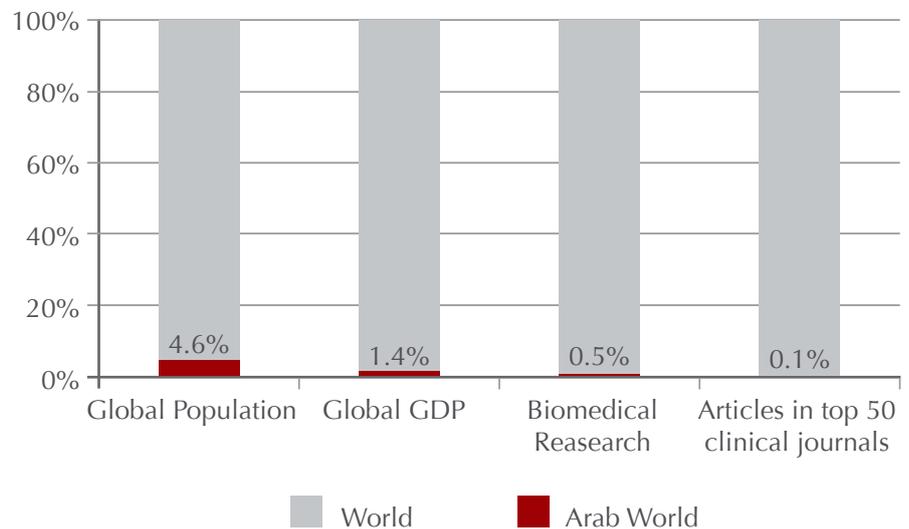
Number of Articles per USD 1 billion in GDP



⁶ Basic Sciences, Clinical Development and National Surveillance Peter S. Ringrose, President Bristol- Myer Squibb Pharmaceutical Research Institute



Comparing Productivity: Arab Region versus the World



KSA Publication Activity in Medical and Clinical Sciences

Saudi Arabia's total publication in the same time period was around 6,000 for the years 1995 -2005, counted using ISI essential science index. That level of performance puts Saudi Arabia as the leader among its Arab peers with considerable lead over its nearest peer Egypt (below 3,000) publications.

The top national institution publishing in the top 10 percentiles of high impact journal is the King Faisal Specialist Hospital and Research Center. However, a majority of publications attributed to Saudi institutions are published in Saudi or regional publications.

Top 20 (of 1287) Journals publishing Saudi Medical and Health Research

1. Saudi medical journal
2. Annals of Saudi medicine
3. Saudi journal of kidney diseases and transplantation: an official publication of the Saudi Center for Organ Transplantation, Saudi Arabia
4. Eastern Mediterranean health journal = La revue de sante de la Mediterranean oriental = al-Majallah al-sihhiyah li-sharq al-mutawassit
5. Journal of the Egyptian Society of Parasitology
6. Transplantation proceedings
7. The journal of contemporary dental practice

8. Spectrochimica acta. Part A, Molecular and bimolecular spectroscopy
9. West African journal of medicine
10. Middle East journal of anesthesiology
11. Journal of pharmaceutical and biomedical analysis
12. International journal of dermatology
13. Journal of hand surgery (Edinburgh, Scotland)
14. Journal of AAPOS: the official publication of the American Association for Pediatric Ophthalmology and Strabismus / American Association for Pediatric Ophthalmology and Strabismus
15. Ophthalmology
16. Pediatric Surgery International
17. Pharmacological research: the official journal of the Italian Pharmacological Society
18. International journal of gynecology and obstetrics: the official organ of the International Federation of Gynecology and Obstetrics
19. Journal of tropical pediatrics
20. Journal of obstetrics and gynecology: the journal of the Institute of Obstetrics and Gynecology

Interestingly however, the top journal for the Saudi national medical scientific output is the Saudi Medical Journal. This is followed by Annals of Saudi Medicine, Saudi Journal of Kidney Disease and Transplantation and the journal of the Egyptian Society of Parasitology.

A quick glance at the most publishing cities in Saudi Arabia indicates that the nation's capital has the lion share with more than 4,000 publications over the past ten years. Jeddah comes 2nd with approximately 800 publications whereas Dammam and Abha come 3rd and 4th, each with approximately 300 publications.

SWOT Analysis for KSA Medical and Health Research and Innovation Program

This section presents a SWOT (strengths, weaknesses, opportunities, and threats) analysis of Saudi Arabia's Medical and Health Research Program relative to achieving its vision. In a SWOT analysis, terms are defined as follows:

- **Strengths:** attributes of the organization that are helpful to achieving the objectives
- **Weaknesses:** attributes of the organization that are harmful to achieving the objectives
- **Opportunities:** external conditions that are helpful to achieving the objectives
- **Threats:** external conditions that are harmful to achieving the objectives

Strengths and weaknesses are internal to the organization while opportunities and threats are defined as external to the organization. For the purpose of this analysis, the "organization" is the NMHRS program, including KACST, KFSHRC, other public and private health service providers, universities and government agencies. The following table shows the main identified SWOT attributes.

Strategic Context

SWOT Analysis

| | Helpful | Harmful |
|----------|---|--|
| Internal | <p>Strengths:</p> <ul style="list-style-type: none"> ■ Existence of research funds from the government ■ Opening of many universities and research centers in Saudi Arabia with Medical collages ■ Existence of governmental graduate scholarship programs ■ Availability of clinical samples and demographics of the country. | <p>Weaknesses:</p> <ul style="list-style-type: none"> ■ Paucity of qualified local talent ■ Lack of effective collaborative research efforts ■ Lack of proper policies and procedures for acquisition and use of new technology ■ Delay in international recruitments in the Kingdom due to government policies and procedures ■ Difficulty in attracting international experts ■ Paucity of private sector grants for research ■ Limited incentives ■ Lack of a fair evaluation system for scholars/ researchers |
| External | <p>Opportunities:</p> <ul style="list-style-type: none"> ■ Development of new diagnostic modalities ■ Development of health/medical research industry ■ Possibility of attracting foreign investors to upcoming biomedical research parks at major universities and specialist hospitals ■ Opportunity to lead Arab and Muslim world in medical research | <p>Threats:</p> <ul style="list-style-type: none"> ■ Lack of biomedical research and development due to security, economic and political restrictions ■ Lack of sufficient educational programs to produce qualified workers in technical fields to work in health and medical research centers ■ Immobilization of initial funding ■ Insufficient commitment by private sector and health care providers |

Higher Strategy

This section provides the vision for the Kingdom's NMHR Program (Priorities), and defines the vision mission, values, and strategic goals for the program.

Vision

The NMHR Program will advance the health and wellbeing of people in Saudi Arabia by developing the requisite national manpower, expertise, and infrastructure for sustainable, high quality, cutting-edge and competitive research; by fostering and facilitating the performance of novel, interdisciplinary and collaborative research; and by effectively communicating to both policy-makers and the public, findings of research and significance of promotion of health, prevention of disease and delivery of healthcare.

Mission

The NMHR Program promotes research in the medical and health sciences to further health and wellbeing in Saudi Arabia.

Program Values and Culture

The NMHR Program values multidisciplinary and collaborative research that builds sustaining relationships among researchers who take advantage of cutting-edge technologies and creative thinking to meet the ever-changing needs of our nation's health and well-being. The NMHR Program also values scientific excellence and integrity. It promotes research endeavors that are mutually supportive and conducted in collegial environments that welcome diversity, creativity, and teamwork with the highest ethical standards of practice.



Program Strategic Goals

The strategic goals and tactical objectives developed by stakeholders and outlined here are aimed at meeting the aforementioned vision. It is expected that attainment of these strategic goals will require long-term commitment and collaborative effort from all stakeholders.

Strategic Goal #1: Development and retention of national manpower and expertise in medical and health sciences research

A possible mechanism to attain this goal may be the use of grants and contract funding to support career development for researchers engaged in individual-driven, institutional or multicenter-based basic, translational or clinical research. Such funding may also be used to provide grant support for senior, well-established researcher to allow for protected time devoted to research and mentoring, and for young investigators to receive appropriate mentoring and training. These proposed methods mirror the longstanding practice of the NIH in the US with its R, K, T and P type grant funding mechanisms.

The following tactical objectives identify actions that need to be taken to successfully accomplish strategic goal #1. These tactical objectives are selected based on present needs. They will be periodically assessed and updated depending on future needs, funding priorities, and outcomes of previously accomplished objectives.

Tactical Objectives:

1. Develop postgraduate training programs to create a locally competent talent capable of conducting novel medical and health sciences research.
2. Develop undergraduate and vocational training programs and on-the-job training opportunities to create a pool of technically skilled support staff and technicians who are committed to good laboratory practices.
3. Develop training programs and rules/regulation mandating compliance with professional research ethics.
4. Prepare competitive recruitment packages in order to attract, retain and nurture first-class researchers.

Tactical objectives 1 through 3 can be implemented through grants competitively awarded to universities and medical research centers based on

preannounced request for proposals (RFP). This approach is meritorious because it starts seeding a culture of applying for and operating under competitively awarded grants with clearly defined deliverables and benchmarks for assessment as outlined in the RFP. Instilling such culture among researchers early on will enable national universities, medical and health research centers to adapt to the notion of competition and peer review.

Strategic Goal #2: Development of infrastructure for sustainable, cutting-edge and competitive research in the medical and health sciences

This goal can be achieved by the creation of National Centers of Health Statistics. This national centre will collect, analyze and disseminate data pertaining to health statistics and burden of disease.

Tactical Objectives:

1. Establish a National Centre for Health Statistics.
2. Establish and manage financial systems capable of achieving the stated objectives.
3. Promote e-health programs to identify disease profile and future trends.
4. Establish infrastructure to facilitate and expedite acquisition of and access to resources.
5. Create infrastructure that supports and enables research including e-libraries, clinical research centers, integrated research IT capabilities and core facilities.
6. Develop mechanisms for private fund-raising for research through industry partnerships

Strategic Goal #3: Facilitate the performance of novel, competitively-funded and high quality research in the medical and health sciences

This goal can be realized by the establishment of centers of excellence dealing with the defined burden of disease highlighted previously. Priority centers may include National Centre for Diabetes, National Centre for Cardiovascular Diseases, National Centre for Asthma, National Centre for Cancer, National Centre for Communicable Diseases and National Centre for neurodegenerative diseases. These centers will perform intramural research in specified disciplines and will extramurally fund research at nationally recognized universities, research centers, medical centers and teaching hospitals, and other qualified organizations engaged in biomedical research or health sciences.

Tactical Objectives:

1. Provide leadership in medical research by identifying and developing national priorities, securing the requisite financial support, and developing requests for proposals (RFP) for competitive grants and contracts.
2. Develop fair proposal review and scoring protocols for merit-based decisions and awards.
3. Promote performance of basic and translational interdisciplinary research for better understanding and treatment of diseases pertinent to the KSA.
4. Increase national scientific discovery and productivity through dissemination of findings via publications in peer-reviewed and reputed journals.
5. Invest in high quality research through competitive awards.
6. Establish national mechanisms for capturing intellectual properties and accelerating their commercialization.
7. Develop mechanisms to encourage research partnerships and create new industries.
8. Establish and manage financial and administrative systems capable of achieving the stated tactical objectives.



Strategic Goal #4: Effective communication of research findings and significance of those findings to policy-makers and the public

This goal can be achieved through a designated corporate affairs unit within the proposed National Council for Medical and Health Sciences Research. In addition to addressing the tactical objectives outlined below, the unit may provide administrative support services that include human resource, financial, and facilities management, security and procurement, transportation and liaison with various governmental and private external entities.

Tactical Objectives:

1. Serve as a source of bio-data for informed decision-making in collaboration with the National Center for Health Statistics .
2. Expand the stakeholder pool on a national level.
3. Increase public awareness of medical and health sciences research and its value to the society.
4. Run public awareness campaigns to raise private funds from industry and philanthropists to support endowed chairmanships and named centers of excellence.

Selection Process

An initial list of technology areas in the related fields was developed by stakeholders, taking into account the program's strategic goals and the higher strategy. The program technology areas were selected based on selection criteria developed through stakeholders' workshops in alignment with the program's strategic goals, while also considering the program's mission.

Selected Priority Research Areas

Based on the detailed assessment of current prevalence and projected incidence of diseases, the following initial list of medical and health priority areas have been selected for strategic intervention:

- Non-Communicable Diseases
 - Cardiovascular Diseases
 - Diabetes
 - Cancer
 - Allergy and Asthma
 - Neurodegenerative Diseases
- Communicable Diseases
- Genetics
- Cell Therapy
- Disability
- Environmental Health

Program Structure

Most national medical and health research programs are based on models from Europe or North America. Key distinctions among these models derive from country specific organization, political structure, population, finance, level of development, and health priorities etc. For Saudi Arabia, stakeholders propose a program structure that takes into account the unique Saudi culture, Islamic and historic heritage, past track record

in scientific research, and existing capacity.

Stakeholders recommend the creation of a new administrative entity charged with supporting the implementation of the proposed strategic priorities. The new entity may be called the National Council for Medical and Health Research (NCMHR). Its primary role will be to provide administrative oversight and logistical support to the affiliated divisions and research performing institutions. It should be headed by a director whose performance is supervised by an advisory council. Members of the advisory council will be nationally and internationally recognized biomedical and clinical scientists as well as health professionals such as physicians, dentists, and public health specialists with keen interest and documented track record in research.

Recommended Organizational Structure for NCMHR



Program Structure

It is essential that the NCMHR, in coordination with the key stakeholders, will facilitate the establishment, management and continuous improvement of modern, cutting-edge research institutes in priority strategic areas

mentioned previously. The following diagram presents the current priorities as candidates for such research institutes. The institutes highlighted are of the highest priority.



The identification of disease imposing burden in terms of cost, care and patient education and development and application of technologies addressing those diseases are the major points of consideration for any National

Research Strategy. In order to take on these challenges, a clear model needs to be devised and adopted for each strategic priority.

Program Structure

Performance Indicators for Proposed Program

Performance indicators (measures) were defined by stakeholders for each of the tactical objectives outlined under program strategic goals. Major performance indicators included in the following strategic planning matrix:

Strategic Goal # 1

| Tactical Objective | Action Plans | Measurable Indicators | Assessments/ Outcomes |
|---|---|---|--|
| 1. To develop training programs to create a locally competent talent capable of conducting novel medical and health sciences research | <ol style="list-style-type: none"> 1. Create a culture of grant funded operations at national universities, medical and research centers 2. Prepare RFP for training program contract awards 3. Define competitive review/ award criteria | <ol style="list-style-type: none"> 1. Solicitation of 25 proposals from national universities, medical and research centers (at a modest rate of 1 per institution in the KSA as a starting measure) | <ol style="list-style-type: none"> 1. Preparation of skilled basic, translational and clinical science researchers as outlined in the RFP and contract deliverables for both PhD and postdoctoral level training |
| 2. To develop training programs and on-the- job training opportunities to create a pool of technically skilled support staff and technicians who are committed to good laboratory practices | <ol style="list-style-type: none"> 1. Create a culture of grant funded operations at national universities, medical and research centers 2. Prepare needed skilled technical research support staff | <ol style="list-style-type: none"> 1. Solicitation of 50 proposals from national universities, medical and research centers (at a modest rate of 2 per institution in the KSA as a starting measure) | <ol style="list-style-type: none"> 1. Preparation of skilled basic, translational and clinical science researchers as outlined in the RFP and contract deliverables for research technicians, research laboratory managers, and research assistants |
| 3. To develop training programs and rules/ regulation mandating compliance with professional research ethics | <ol style="list-style-type: none"> 1. National research code of conduct and practice | <ol style="list-style-type: none"> 1. Formation of a task force of senior experts 2. Promulgate codes, rules and standards salient to research practice in KSA and congruent with international norms | <ol style="list-style-type: none"> 1. Approval and adoption of #2 2. Implementation as a mandate through funding mechanisms |
| 4. To prepare competitive recruitment packages in order to attract, retain and nurture first-class researchers | <ol style="list-style-type: none"> 1. Prepare a national profile of medical and health researchers' credentials, capacity, and employment packages (including salaries and percent effort allocations) 2. Prepare comparative COLI adjusted benchmarks from international competitors 3. Based on results of #1&2 above, construct competitive differential packages based on rank and caliber | <ol style="list-style-type: none"> 1. Operational database for #1 and #2 2. Recruitment and retention packages | <ol style="list-style-type: none"> 1. Approval and adoption of #1 and #2 2. Securing the health of the national research enterprise 3. Ensuring a healthy pipeline of senior researchers |

Program Structure

Strategic Goal # 2

| Tactical Objective | Action Plans | Measurable Indicators | Assessments/ Outcomes |
|---|---|--|---|
| <p>1. To establish a National Center of Health Statistics for tracking, surveillance, and monitoring of diseases</p> | <p>1. Collect, compile and make available current national portfolio and database of diseases and public health profiles of the KSA population for further basic, translational and/or clinical research practices</p> | <p>1. Delivery of an operational and fully populated bio-bank database</p> <p>2. Presentation of findings at national meetings and conferences</p> | <p>1. Complete profile data accessible and available to researchers and policy-makers</p> <p>2. Profile data becomes a powerful mechanism to promote medical and health sciences research and promulgate effective health and well-being regulations in</p> |
| <p>2. To establish and manage financial systems capable of achieving the stated tactical objectives</p> | <p>1. Set up requisite administrative and operational infrastructure to deliver a seamless and efficient financial services that facilitate and NOT inhibit or impede research practices</p> | <p>1. Operation of an efficient financial support system</p> | <p>1. Service profile feedback from end users (researchers and grantees)</p> <p>2. Corrective measure as needed to improve negative findings of #1 above</p> |
| <p>3. To promote e-Health programs in order to identify disease profile and future trends</p> | | | |
| <p>4. To establish infrastructure to facilitate and expedite acquisition/ access to resources</p> | <p>1. Set up requisite administrative and operational infrastructure to deliver a seamless and efficient support services that facilitate and NOT inhibit or impede research practices</p> | <p>1. Operation of an efficient support services systems</p> | <p>1. Service profile feedback from end users (researchers and grantees)</p> <p>2. Corrective measure as needed to improve negative findings of #1 above</p> |

Program Structure

Strategic Goal # 2

| Tactical Objective | Action Plans | Measurable Indicators | Assessments/ Outcomes |
|--|---|--|--|
| <p>5. To create infrastructure that supports and enables research</p> | <p>1. Identify primary stakeholders and prominent researchers and hold orientation and national research promotion retreats to create venues for institutionalization, adaptation and promotion of research oriented cultures and practices within the eligible institutions</p> | <p>1. Establish a research and institutional outcomes/ assessment programs 2. Track grant fund recipients' performance through #1 above</p> | <p>1. Best practices, value-added and evidence-based research support practices as measured by the outputs of funded initiatives of SG#1 and SG#3</p> |
| <p>6. To develop mechanisms for private fund-raising for research through industry partnerships</p> | <p>1. Develop mechanisms for systemic implementation of private fund-raising and endowment-based development programs in support of the national medical and health sciences research 2. Identify potential individual and organizational donors 3. Develop an awareness mechanism to promote the NCMHSR among the potential donors 4. Set fund raising campaign targets</p> | <p>1. Lists of donors, their capabilities and past history in philanthropic funding</p> | <p>1. Amounts of funds raised per set targets</p> |

Program Structure

Strategic Goal # 3

| Tactical Objective | Action Plans | Measurable Indicators | Assessments/ Outcomes |
|---|---|--|---|
| <p>1. To provide leadership in medical research by identifying and developing national priorities; securing the requisite financial support; and developing requests for proposals (RFP) for competitive grant and contract funding schemes.</p> | <p>1. Provide opportunities and venues for researchers, national universities, medical and research centers to secure competitive extramural funding for their research</p> <p>2. Develop research priorities in novel and specific domains and disciplines and disseminate them through nationally announced RFPs</p> | <p>1. No of Infosem and Prosem sessions conducted to inform, educate and train researchers</p> <p>2. Track number of RFP</p> <p>3. Track number of applications in response to RFPs</p> <p>4. Quantify numbers of presentations, papers, and workshops submitted and accepted through peer- reviewed processes</p> | <p>1. No of accepted abstracts, posters, presentations, papers, and workshops</p> <p>2. Amount of extramural fund awarded through nationally competitive review process</p> |
| <p>2. To develop research funding review and scoring protocols for merit-based decisions and awards.</p> | <p>1. Assemble expert review panels and research review study groups from a pool of nationally funded senior researchers</p> <p>2. Conduct training and orientation workshops</p> <p>3. Develop research priorities</p> <p>4. Develop RFP development processes and standards</p> <p>5. Develop review and funding criteria and procedures</p> | <p>1. No. of panels, study groups, review sessions conducted</p> <p>2. No. of training workshops</p> | <p>1. Complete lists of review panels and study groups for each research priority area or focus topic</p> <p>2. Protocols and procedure for RFP development, grant application reviews and funding awards</p> <p>3. A systemic merit-based scoring system for #2 above</p> |
| <p>3. To promote performance of basic and translational interdisciplinary research for better understanding and treatment of diseases pertinent to the KSA</p> | <p>1. Make bio-data from I.A above readily available and accessible to researchers</p> <p>2. Publicize the availability of #1 above in cooperation with IV.D below</p> <p>3. Solicit grant proposals based on clearly communicated research priorities in area salient to medical and health issues identified in KSA</p> | <p>1. No of bio-data bank users</p> <p>2. No of issued RFPs</p> <p>3. No of applications received</p> <p>4. No of application reviewed and scored</p> | <p>1. No of accepted abstracts, posters, presentations, papers, and workshops</p> |

Program Structure

Strategic Goal # 3

| Tactical Objective | Action Plans | Measurable Indicators | Assessments/ Outcomes |
|---|---|---|--|
| 4. To increase national scientific discovery and productivity through promotion of and dissemination of findings by publication in peer-reviewed and reputable journals | <ol style="list-style-type: none"> 1. Provide guidelines and training workshops to researchers on types of publications deemed appropriate and acceptable to the NCMHSR 2. Develop publications and references on what the NCMHSR deems as "reputable" journals | <ol style="list-style-type: none"> 1. Track No of manuscripts submitted for publication 2. Track No of published papers | <ol style="list-style-type: none"> 1. No of published papers, abstracts and accepted presentations 2. No of meritorious acknowledgements of #1 above |
| 5. To invest in high quality research through competitive awards | <ol style="list-style-type: none"> 1. Develop RFP development processed and standards 2. Develop review and funding criteria and procedures | <ol style="list-style-type: none"> 1. No of RFPs 2. Review, award, and follow up procedures 3. Applications review and scoring system | <ol style="list-style-type: none"> 1. No of competitively reviewed and funded proposals |
| 6. To establish national mechanisms for capturing intellectual properties and their development | <ol style="list-style-type: none"> 1. Establish a IP/Technology Transfer Office in concert with I.A above 2. Develop procedures and salient policies for IP and TT initiatives | <ol style="list-style-type: none"> 1. Publication and dissemination of procedures and operating manuals. 2. Publication of salient rules and regulations 3. No of submitted applications | <ol style="list-style-type: none"> 1. No of captured IPs 2. No of TT agreements |
| 7. To develop mechanisms to encourage research partnerships and creating new industries | <ol style="list-style-type: none"> 1. Develop and set up cooperative agreements and collaboration opportunities with international research centers and institutes 2. Conduct joint symposia and conferences | <ol style="list-style-type: none"> 1. No of secured agreements 2. No of joint events | <ol style="list-style-type: none"> 1. Quantification of no's 1 and 2 in previous Column |
| 8. To develop and communicate in collaboration with SG#4 a high profile public awareness campaign | <ol style="list-style-type: none"> 1. Organize scientific and laymen-type meetings and publicize productivity through both scientific and public mass media | <ol style="list-style-type: none"> 1. No and type of venues planned and executed. 2. Develop assessment tools and conduct assessment surveys to measure success rates | <ol style="list-style-type: none"> 1. Independent assessment of outcomes for scientific media outlets by expert peer review processes 2. Independent assessment of outcomes for mass media publications and awareness campaigns by an outcomes |

Program Structure

Strategic Goal # 4

| Tactical Objective | Action Plans | Measurable Indicators | Assessments/ Outcomes |
|---|--|---|---|
| <p>1. Serving as source of bio- data for legislative informed decision- making in collaboration with the National Center for Health Statistics</p> | <p>1. Develop a mechanism to serve as a clearinghouse for bio-data in collaboration with I.A above</p> <p>2. Develop mechanism for systemic reporting of bio- data to policy and decision makers</p> <p>3. Add links and publish premiers on bio-data</p> | <p>1. Reports of requests of info and feedback on bio-data from legislatures and researchers</p> | <p>1. Provide evidence-based and informed-decision making capacity to legislatures</p> <p>2. Provide seminal data for researchers</p> |
| <p>2. Increasing public awareness of medical and health sciences research and its tangible value to society</p> | <p>1. Conduct awareness campaigns in concert with local media and at national events such as Al- Janadriyyah and other similar venues</p> | <p>1. No of events and assessment of efficacy</p> | <p>1. Direct contribution to the mission of the NCMHSR initiative in addressing health and wellbeing through awareness and prevention</p> <p>2. Public awareness and appreciation of the importance and relevance of research and its impact on their lives</p> |
| <p>3. Expanding the stakeholder pool on a national level</p> | <p>1. Identify new stakeholders based on an agreed upon definition and criteria</p> <p>2. Invite new stakeholders</p> | <p>1. No of new representatives from various national constituents</p> | <p>1. Enhanced public awareness of the NCMHSR and its activities</p> <p>2. Improved collaborations and access to research support and subjects</p> <p>3. Improved outcomes of RFPs</p> <p>4. Efficient operation of the NCMHSR activities</p> |
| <p>4. Developing public awareness campaigns for private fund raising from industry and/or philanthropy through endowed chairmanships and named centers of excellence</p> | | | |

Workshop Attendees

| # | Name | Institution |
|----|----------------------------|---|
| 1 | Dr. Futwan Al-Mohanna | KFSHRC |
| 2 | Dr. Brian Meyer | KFSHRC |
| 3 | Dr. Khalid Abu Khabar | KFSHRC |
| 4 | Dr. Mohammed Shoukri | KFSHRC |
| 5 | Dr. Essam Al-Yamani | KACST |
| 6 | Eng. Abdullah Alakel | KACST |
| 7 | Eng. Khalid Al-Odily | KACST |
| 8 | Dr. Mohamed Khalil | MOH |
| 9 | Dr. Sree Harahsa Nagaraja | KFU |
| 10 | Mr. Hajed Bin Hashan | FDA |
| 11 | Dr. Abdelmohsin Al-Rohaimi | FDA |
| 12 | Dr. Abdelaziz Al-Rashed | KSU |
| 13 | Mr. Hussam Fallatah | KACST |
| 14 | Dr. Osama Adnan | Um AlQura University |
| 15 | Dr. Faisal Abu Dahir | MOH |
| 16 | Dr. Mohamed Al-Qahtani | KAU |
| 17 | Mr. Bandar Dendi | KACST |
| 18 | Dr. Shaker Adra | KFSHRC |
| 19 | Mr. Saleh Al-Olayan | Al-Olayan Company |
| 20 | Mr. Mohamed Al-Omary | KACST |
| 21 | Dr. Jamal Al-Hashemi | KAU |
| 22 | Dr. Ali Al-Zahrani | Medical Services-Armed Forces |
| 23 | Dr. Kamel Metwally | KFU |
| 24 | Dr. Sherif Mansour | KFU |
| 25 | Dr. Ali Al-Hazmi | Health Sciences College |
| 26 | Eng. Mohamed Al-Mohanna | Consultant Office |
| 27 | Dr. Bikr Sadeq | KFSHRC-Jeddah |
| 28 | Dr. Sami Alabd Al-Wahhab | Saudi Commission for Health Specialties |

Workshop Attendees

| # | Name | Institution |
|----|--------------------------|-----------------------------------|
| 29 | Eng. Fraij Al-Aredhi | Information Technology Consultant |
| 30 | Dr. Adil Abu Zenadah | KAU |
| 31 | Dr. Atef Shibl | KSU |
| 32 | Dr. Mohamed Kebbah | Barakat Clinic |
| 33 | Dr. Maher Shehata | KACST |
| 34 | Mr. Othman Al-Hazzaa | KACST |
| 35 | Mr. Azzam Al-Quait | KACST |
| 36 | Mr. Sami Al-Yahya | KACST |
| 37 | Mr. Hadi Al-Asmari | KACST |
| 38 | Dr. Nasim Al-Quraishi | MOH |
| 39 | Dr. Afdal Assef | KFU |
| 40 | Dr. Mohamed Bahamad | KACST |
| 41 | Dr. Ahmed Al-Qahtani | KFSHRC |
| 42 | Dr. Abdelaziz Al-Maazim | KSU |
| 43 | Dr. Husain Al-Hazmy | KFU |
| 44 | Dr. Mohamed Al- Jomaa | National Guard Hospital |
| 45 | Mr. Mohamed Al-Turki | KFSHRC |
| 46 | Dr. Yassir Al-Ghamdi | MOH |
| 47 | Mr. Yassin Al-Saedi | KACST |
| 48 | Dr. Mohsin Al-Hazmi | Shura Coucil |
| 49 | Dr. Mamdooh Gari | KAU |
| 50 | Dr. Hasan Al Ayed | KACST |
| 51 | Dr. Sultan T. Al-Sedairy | KFSHRC |
| 52 | Dr. Sultan Al-Mubarak | KFSHRC |
| 53 | Dr. Muhanna Al-Muhanna | KACST |
| 54 | Dr. Mohamed Tantawi | MOH |
| 55 | Dr. Asem Al-Fadda | KSU |
| 56 | Dr. Abdallah Al-Ahdal | KACST |

Workshop Attendees

| # | Name | Institution |
|----|------------------------|---------------------------------|
| 57 | Dr. Meshref AL-Rowaili | Al-Juf University |
| 58 | Dr. Omar Al-Yahiya | MOH |
| 59 | Dr. Osama Al-Khamis | Al-Imam University |
| 60 | Dr. Mathieus Goosen | Al-Faisal University |
| 61 | Mr. Osama Mesbeh | Insecticide House |
| 62 | Mr. Saber Abdelrahman | Al-Jafel International Hospital |
| 63 | Mr. Wesam Al-Dlehi | |
| 64 | Mr. Izaj Askary | KACST |
| 65 | Mr. Faeq Khan | KACST |
| 66 | Dr. Abdellatif Faden | MOH |
| 67 | Ms. Afaf Al-Twajjri | King Saud Medical Complex |
| 68 | Ms. Dalal Al-Jebrin | Al-Riyadh University |
| 69 | Ms. Noura Al-Fares | Al-Riyadh University |
| 70 | Ms. Maha Al-Twajjri | King Saud Medical Complex |
| 71 | Ms. Mona Al-Hefdhi | Al-Faisal University |



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King Abdulaziz City for Science and Technology
Doc. No. 39P0001-PLN-0001-ER01