The role of biobanks in advancing the national biotechnology strategy in Saudi Arabia

Hisham A Badreldin[1,2], Lubna A Alnasser[3], Tariq Alqahtani[2], Abdulrahman Aljouie[4], Nadin Almosnid[5], Dalal Aldeghaither[5], Alaa Alshareeda[1], Sausan Alfaris[1], Alaa Zare[1] and Zisis Kozlakidis[6]

[1]Saudi Biobank, King Abdullah International Medical Research Center, Ministry of National Guard Health Affairs, Riyadh, Saudi Arabia. [2]College of Pharmacy, King Saud bin Abdulaziz University for Health Sciences, Riyadh, Saudi Arabia (Correspondence to Hisham Badreldin: Aldeenh@ksau-hs.edu.sa). [3]Population Health Department, King Abdullah International Medical Research Center, King Saud bin Abdulaziz University for Health Sciences, Riyadh, Saudi Arabia. [4]Data Management Department, King Abdullah International Medical Research Center, King Saud bin Abdulaziz University for Health Sciences, Riyadh, Saudi Arabia. [5]College of Science and Health Professions, King Saud bin Abdulaziz University for Health Sciences, King Abdullah International Medical Research Center, Riyadh, Saudi Arabia. [6]International Agency for Research on Cancer, World Health Organization, Lyon, France.

Abstract

Background: Saudi Arabia launched its national biotechnology strategy to position the country as a global biotechnology hub by 2040 and enhance biomanufacturing, medical innovation and self-sufficiency in vaccines and genomics.

Aim: To assess the role of biobanks in advancing the national biotechnology strategy, using the Saudi Biobank as a case study.

Methods: We collected operational data from the Saudi Biobank and reviewed literature on biobanks published between 2010 and 2024, guided by the 4 pillars of the Saudi national biobank strategy (vaccine localisation, biopharmaceutical manufacturing, genomics, agricultural biotechnology) and the 5 enabling factors (talent development, infrastructure, regional presence, regulatory excellence, strategic funding). We compared the Saudi data with the global biobanking market data, to illustrate the contributions of biobanks to other aspects of healthcare.

Results: By mid-2024, the Saudi Biobank had enrolled 53 338 participants and collected 589 461 biospecimens. It currently serves as a platform for genomic research, precision medicine, clinical trials, and advanced biotechnology, while also facilitating technology transfer and commercialisation.

Conclusion: The Saudi Biobank is considered one of the most advanced health initiatives in the Eastern Mediterranean Region. To enhance its impact, there is a need to strengthen its capacity through increased and sustained investments, improved data interoperability and data integration, standardised governance systems, increased national and international partnerships and collaborations, and other policy reforms.

Keywords: biobank, biotechnology, national biotechnology strategy, genomic research, vision 2030, Saudi Arabia

Citation: Badreldin HA, Alnasser LA, Alqahtani T, Aljouie A, Almosnid N, Aldeghaither D, et al. The role of biobanks in advancing the national biotechnology strategy in Saudi Arabia. East Mediterr Health J. 2025;31(11):649–656. https://doi.org/10.26719/2025.31.11.649.

Received: 05/03/2025; Accepted: 13/05/2025

Introduction

Saudi Arabia's Vision 2030 identifies biotechnology as a priority sector for economic diversification and health innovation. To advance these goals, the government launched the National Biotechnology Strategy (NBS) in 2024, with the aim of positioning the country as a global biotechnology hub by 2040 (1).

The NBS sets specific targets, including a 3% contribution of biotechnology to the non-oil Gross Domestic Product (GDP) by 2040, an estimated economic impact of 130 billion Saudi riyals (US$ 34.7 billion), and the creation of 11 000 high-quality jobs by 2030. It focuses on 4 domains: localisation of vaccine production, expansion of biopharmaceutical manufacturing, advancement of genomics and gene therapy research, and agricultural biotechnology to promote food security. These priorities are supported by 5 enabling factors: workforce development, investment in infrastructure, regional presence, regulatory excellence and strategic funding (2).

The Organisation for Economic Co-operation and Development (OECD) defines a biobank as "a collection of biological material and the associated data and information stored in an organised system, for a population or a large subset of a population" (3). In 2009, Time magazine identified biobanks as one of "10 ideas changing the world right now", emphasising their role in providing large-scale sample collections that enable scientific discovery (4).

This article examines the role of biobanks in advancing Saudi Arabia's biotechnology sector in alignment with the NBS, with particular attention to the Saudi Biobank at the King Abdullah International Medical Research Center (KAIMRC).

Methods

A combination of approaches was used, including a focused literature review, policy analysis and a case study. Operational data from the Saudi Biobank at

KAIMRC were accessed directly. The literature review covered publications from 2010–2024 identified using relevant predefined search terms. The NBS document was analysed to identify alignment opportunities with biobanking capabilities. A SWOT framework, combined with the WHO health system building blocks, was applied to evaluate the Saudi Biobank's position within the national biotechnology ecosystem. Global biobanking market data were used to provide comparative context.

Global distribution and market growth of biobanks

Biobanks are distributed across Europe (35.16%), North America (31.43%), Asia–Pacific (26.41%), Latin America (5%), and the Middle East and Africa (2%). The global biobanking market has shown significant growth and is projected to continue expanding. Valued at US$ 71 billion in 2022, the market is expected to reach US$ 83 billion by 2024, US$ 96 billion by 2026, US$ 115 billion by 2028, and US$ 135 billion by 2030, reflecting a compound annual growth rate (CAGR) of 8% (*5,6*).

Strategies for sustainable biobanks

Most biobanks operate within sustainable public or not-for-profit frameworks to advance scientific knowledge and improve health care rather than to generate direct revenue (*7–9*). Sustainability spans financial, operational, and social dimensions (*10*). To support long-term sustainability, biobanks should adopt diversified financing strategies that strengthen economic viability and, where appropriate, generate indirect income (*7–9*).

Revenue streams and market dynamics

Potential revenue streams include controlled data access and licensing, partnerships and collaborations, and commercialisation arising from discoveries. Biobanks can monetise de-identified data by selling or licensing controlled access to researchers, pharmaceutical companies and other organisations through partnerships, collaborations or secure data-sharing platforms (*11*). For example, the United Kingdom Biobank has implemented a structured access policy that allows qualified researchers to apply for use of its extensive dataset and samples (*11,12*). It has also partnered with major pharmaceutical companies to advance disease research, providing mutual benefits to the biobank and its partnering organisations. Additionally, biobanks may participate in the commercialisation of discoveries made using their resources. Where research using biobank samples identifies a novel biomarker or therapeutic target, the biobank can collaborate in developing a commercial product or service and may receive royalties or other forms of compensation (*13,14*).

The commercialisation process usually begins with discovery using biobank resources to identify new biomarkers or therapeutic targets, followed by protection of the resulting intellectual property through patents. These discoveries are then developed into commercial products or services through collaboration with pharmaceutical or biotechnology partners. The next stage involves marketing and distribution to health care providers, patients, or other sectors, after which revenue-sharing mechanisms allow the biobank to benefit through royalties or a percentage of the income generated (*15–17*).

Financial arrangements for biobanks are often complex and resource-intensive. Designing an optimal financing model for a national data and research infrastructure system requires careful assessment of the revenue and operating models. Managing a diverse range of biobanks and financial streams demands significant time, skilled management and accounting capacity, which adds to operational costs. Long-term sustainability is essential, yet unpredictable revenue flows can hinder strategic planning, expansion, and infrastructure upgrades. Biobanks must preserve samples and services over extended periods to maximise their value to the research community, while continually updating data systems and adopting improved laboratory and management practices (*6,12,18,19*).

Biobanks often rely on short-term, investigator-initiated funding, which weakens their sustainability, limits strategic oversight and reduces capacity for innovation. In countries such as the United States of America, research funders tend to prioritise new discoveries, while biobanking is often considered an enabling infrastructure and may not always align with funding priorities. As a result, many biobanks experience financial instability, which limits their ability to support large-scale, longitudinal or translational research.

To strengthen their strategic role, biobanks should be embedded within national policy frameworks that align with public health priorities while also supporting bottom-up, project-based growth. Sustained coordination requires dedicated resources, including permanent operational staff, quality assurance teams and strategic management capacity, as well as support for essential functions such as communication, outreach and travel. Long-term viability is best achieved through a stable core funding model, ideally public and potentially integrated into national health services. This can be complemented by industrial sponsorships or a tiered research infrastructure membership structure. Importantly, financial models must remain inclusive and avoid creating barriers for users, particularly small and medium-sized enterprises (SMEs) that may lack extensive resources but contribute significantly to innovation and application (*20–23*).

The biobanking sector is expanding rapidly, driven by advances in genomic research and precision medicine, particularly in relation to chronic diseases. As DNA sequencing becomes more affordable, demand for high-quality biospecimens and curated data will increase. Biobanks play a central role in personalised health care by providing diverse samples and clinic data that support biomarker discovery and targeted therapies for conditions like cancer, diabetes and cardiovascular

Table 1 Growth drivers, challenges and key actors in the biobanks market

Aspect	Insights
Growth drivers	Expansion of genomic research projects
	Enhanced research and development in precision medicine, particularly in oncology and gene therapy
	Large-scale use of population-based data for chronic disease research
	Research and monetisation of sample data as emerging drivers
Challenges	Persistent legal and ethical concerns
	Substantial operational costs
	Lack of standardisation and lengthy approval processes
	Limited public awareness of biobanking
Key actors	Research institutions: conducting projects using sample data
	Data custodians: providing access to critical datasets
	Service Facilitators: applying sample data and technologies to deliver enhanced services

disease. Table 1 identifies the key stakeholders needed to maximise the impact of biobank resources (*24*).

Case study: The Saudi Biobank

As of 2024, 8 biobanks were listed in Saudi Arabia (*25*). Additional initiatives have since been launched, including the National Biobank at the Public Health Authority (*26*). The Saudi Biobank was established and funded by KAIMRC, under the Ministry of National Guard Health Affairs (MNGHA). It was inaugurated with the ambitious goal of recruiting 200 000 participants to strengthen research capacity in genetic and environmental determinants of health (*27*). It was the first biobank in Saudi Arabia to obtain ISO 20387:2018 accreditation for biobanking.

The biobank operates through 2 recruitment modalities: a prospective population cohort and disease-specific biobanking. The population cohort recruits participants at random to enable investigation of genetic determinants of disease, while the disease-specific arm enrols individuals diagnosed with common chronic diseases that have a high prevalence in Saudi Arabia.

The Saudi Biobank is governed by a comprehensive ethical and regulatory framework that prioritises participant autonomy, confidentiality and accountability. Its policies are consistent with Islamic bioethical principles and international standards, including those of the International Society for Biological and Environmental Repositories and the Declaration of Helsinki (*28*).

Informed consent is central to participation. Individuals are required to provide written consent voluntarily after receiving clear information on the nature, purpose, the intended use of their samples and data, potential risks, and the possibility of future research applications. The biobank uses a broad consent model, allowing samples and data to be used in current and future studies provided they are approved by recognised ethics committees. This approach preserves scientific flexibility while upholding ethical integrity.

Robust safeguards protect data privacy and confidentiality. All operations comply with the Saudi Health Information Exchange Policy (SeHE) and the Personal Data Protection Law, which mandate secure storage, strict access controls, and anonymisation or pseudonymisation of identifiers to prevent misuse or unauthorised re-identification. Data access requests are subject to internal agreements and review by institutional ethics committees. Regulatory oversight is provided by institutional review boards and by the National Committee of Bioethics (NCBE), at the national level.

The Saudi Biobank is considered one of the most advanced initiatives in the Eastern Mediterranean Region, distinguished by its scale and affiliation with the KAIMRC and King Abdulaziz Medical City (KAMC). KAMC provides infrastructure that includes disease-specific cohorts, longitudinal sampling and linkage with clinical and genomic data. On a global scale, the Saudi Biobank is moving towards the operational standards of well-established models such as the United Kingdom Biobank, Biobank Graz in Europe and the All of Us programme in the United States of America. While these initiatives benefit from long-standing regulatory frameworks and sustained funding, the Saudi Biobank is uniquely positioned to leverage recent national investments in biotechnology, with strong links to public health policy, academic research, and biomanufacturing priorities.

By mid-2024, 53 338 participants had contributed 589 461 samples: serum (158 013), plasma (219 511), buffy coat (106 808) and red blood cells (105 129). And, 1897 pathology specimens, including breast and colon cancer samples, were collected. The biobank compiled clinical, outcomes and self-reported data, and plans to sequence most samples. With 78% of Saudi population under 40 years of age, the biobank has a unique opportunity to build diverse collections, reinforcing its value for

medical and scientific research (*29*). It supports large-scale epidemiologic and genomics research, localisation of biopharmaceutical technologies, and contributes to precision medicine, vaccine trials and research on consanguinity-related disorders. Its infrastructure also supports public-private partnerships, commercialisation pathways and cross-sector research and development.

To enhance clarity and policy relevance, this paper applies a dual analytical framework combining SWOT analysis with the WHO health system building blocks. This enables a structured assessment of the Saudi Biobank's role in supporting the NBS by identifying internal and external factors affecting performance and mapping them across 6 domains: service delivery, health workforce, health information systems, access to essential medicines, financing, and leadership and governance. This framework highlights the interplay between the current state of biobank development and the broader health care system. Saudi Arabia has strong public investment and policy support, but gaps persist in intersectoral coordination, data harmonisation and workforce specialisation. At the same time, opportunities such as public-private partnerships, workforce training initiatives, and regional expansion offer practical pathways to address these weaknesses.

Enabling genomic diversity studies

The Saudi Biobank is a strategic resource for genomic diversity research, addressing the underrepresentation of non-European populations in global genomics. As of June 2021, 86.3% of genomic studies had been conducted among individuals of European descent (*30*). Research communities have relied heavily on resources with relatively uniform access models, such as the United Kingdom Biobank, which comprises largely participants of European ancestry (*30*). This imbalance leaves a large proportion of the global population, with distinct genetic architecture and associated disease burden, under-examined and insufficiently addressed.

The Global Biobank Meta-analysis Initiative (GBMI) was established to connect biobanks internationally and enable larger, more diverse studies of genetic data, with greater representation of ancestral groups. It now includes 24 biobanks across 5 continents, with data from more than 2.2 million participants. Early findings from GBMI identified genetic variants showing stronger associations with disease when stratified by sex or ancestry (*31*). By assembling population panels and conducting genome-wide analyses, GBMI has advanced the identification of ancestry-informative markers that characterise specific populations and regions.

The Saudi Biobank's contribution to genomic diversity is of scientific and economic importance. By incorporating diverse genetic samples, it enriches global research, fosters international collaborations and attracts investment. Social and cultural factors in Saudi Arabia have produced a distinctive genetic profile, with a high prevalence of certain inherited conditions, such as sickle-cell anaemia (*32*). This underscores the need for context-specific screening and research priorities, as well as access to advanced technologies like CRISPR.

Economically, the emphasis on genomic diversity supports the development of precision medicine and personalised health care, stimulates innovation, and creates opportunities for the commercialisation and export of biotechnology (*33*).

Consanguinity, or marriage between close relatives, remains relatively common in Saudi Arabia and has important implications for genetic research and health care. Biobanks play a crucial role in investigating consanguinity-related disorders by collecting and storing genetic material from affected and unaffected individuals (*34*). Such collections enable researchers to examine genetic factors, estimate prevalence and identify potential therapeutic approaches. They facilitate large-scale genetic studies that deepen understanding of the genetic basis of diseases common in populations with high consanguinity rates, thereby contributing to the advancement of personalised medicine and the development of targeted public health strategies.

Fostering localisation of health technology and talent

The Saudi Biobank plays a critical role in fostering the localisation of health technologies and talent development in the country. Through partnerships with universities, research institutions, and industry stakeholders, it can facilitate the transfer of technologies, such as genomics and biomanufacturing. Collaborative research, licensing agreements and the creation of local innovation hubs are central to this process.

The biobank contributes to capacity-building through joint programmes with Saudi universities, providing students with training, and by offering internships and fellowships to develop expertise in biobanking and genomics. Collaborations with international biobanks and research centres enable knowledge exchange and technology transfer, while partnerships with domestic biotechnology companies strengthen local innovation in sample management and analysis.

The biobank can support start-ups and SMEs by granting access to anonymised datasets for artificial intelligence diagnostics and personalised medicine, mentoring entrepreneurs, and collaborating with incubators to provide laboratory resources and specialised support. By serving as a bridge between academia and industry, the biobank enhances innovation capacity and helps retain talent within the country (*33*).

Facilitating vaccine development

The Saudi Biobank enables researchers to investigate genetic factors that influence disease susceptibility, supporting the development of vaccines adapted to diverse genetic backgrounds. It provides resources to study pathogen variability within the Saudi population,

Table 2 **SWOT analysis of the Saudi Biobank mapped to WHO health system building blocks**

Building block	Strengths	Weaknesses	Opportunities	Threats
1. Service delivery	Structured, high-quality biospecimen storage	Limited integration across all hospitals and primary health care facilities	Potential linkage with national registries and electronic health record systems	Risk of underutilisation if not embedded in care pathways
2. Health workforce	Skilled technical teams, growing expertise	Shortage of specialised genomic biobanking staff	Academic partnerships to train new talent	Brain drain, competition from the private sector and international institutions
3. Information systems	Advanced IT infrastructure and in-house laboratory information management system	Data standardisation and interoperability issues	National unified health record initiatives	Data security and privacy concerns
4. Access to products and technologies	Availability of high-quality biosamples, devices and reagents	Reliance on imported biobanking kits and consumables	Potential for local biomanufacturing	Supply chain disruptions, regulatory delays
5. Financing	Government-backed funding	Limited private investment in early-stage biobanking	Incentives for public–private partnership, potential to attract venture capital and angel investors	Volatility in long-term public funding priorities
6. Governance	Supportive national policies (e.g. NBS, Vision 2030), internal steering committee	Fragmented policies across institutions	Development of a unified national biobanking regulatory framework	Bureaucratic barriers, delays in obtaining international accreditation

which is critical for broad-spectrum and targeted vaccine strategies.

During outbreaks, access to genetic and clinical data can accelerate vaccine development by clarifying host–pathogen interactions and supporting preclinical evaluation of safety and efficacy. These insights may inform the development of personalised vaccines, designed to improve effectiveness and reduce adverse reactions.

The biobank facilitates vaccine clinical trials by identifying participants on the basis of genetic profiles and supports longitudinal studies to monitor vaccine performance over time. Such studies contribute to the development of booster doses and the refinement of vaccine formulations (35).

Future opportunities

A thriving biobanking ecosystem in Saudi Arabia requires a multifaceted strategy. Key priorities include strengthening international collaboration with other biobanks and research institutions globally, and engaging the private sector through incentives and partnerships. A comprehensive regulatory framework will be essential to ensure ethical practice and data privacy. Investment in education and the recruitment of international experts can build local capacity and sustain competitiveness. The country's expanding education and research infrastructure already offers a foundation for skilled professionals and for addressing talent shortages in traditional biotechnology markets.

Establishing a national biobank network would facilitate large-scale genomic studies and enhance collaboration among institutions. Standardised protocols are necessary to ensure consistency and reliability in research outputs. Incorporating sustainable biobanking practices, such as energy-efficient storage and renewable energy solutions, could position Saudi Arabia as a leader in environmentally responsible biobanking. This initiative would complement the Open Access National Gateway to Research Infrastructure, recently established by the Research, Development, and Innovation Authority.

Robust cybersecurity measures will be required to safeguard sensitive genetic information, particularly as cloud-based systems become more widely integrated into biobanking. Demographic changes, including population ageing, will increase demand for health care services and create opportunities for innovative therapies and diagnostics tailored to older people. Securing private venture funding and improving investor literacy in biotechnology will be critical for long-term sectoral growth. Equally vital is the development of a strong talent pipeline through STEM education, international collaborations and industry–academia partnerships.

Promoting advanced research in genomics and personalised medicine, together with facilitating technology transfer and commercialisation, can drive innovation and support economic diversification. An integrated approach that includes governance, sustainability, security and talent development will be key to building a robust and globally competitive biobanking ecosystem.

Conclusion

To realise the potential of the Saudi National Biotechnology Strategy and Vision 2030, the biobanking

system must be strengthened through targeted policy reforms, sustained infrastructure investment and integration with research. Priorities include standardised governance, harmonised ethic frameworks and cross-institutional data sharing to support national and international collaboration. Infrastructure development should focus on next-generation biobanking platforms, automation and secure, interoperable data systems.

Research efforts need to be strategically aligned with national health priorities, with emphasis on population genomics, vaccine development and rare disease research. The global competition in biotechnology underscores the urgency for action. By leveraging its biobank assets, Saudi Arabia has the potential to drive innovation, attract investment and advance knowledge-based economic diversification, while establishing itself as a regional leader with global impact.

Acknowledgment

The authors would like to express their deepest appreciation to His Excellency. Prof. Bander Alknawy, CEO of the MNGHA and President of KSAU-HS for the unwavering support, trust and visionary leadership that have empowered our team and shaped the direction of Saudi Biobank Center. Also, we extend our sincere gratitude to Prof. Ahmed Alaskar, Executive Director of KAIMRC, for his unwavering support and steadfast commitment to advancing our work at the Saudi Biobank Center.

Funding: None.

Conflict of interest: None declared.

Rôle des biobanques dans la promotion de la stratégie nationale de biotechnologie en Arabie saoudite

Résumé

Contexte : L'Arabie saoudite a lancé sa stratégie nationale de biotechnologie afin de positionner le pays comme centre mondial de la biotechnologie à l'horizon 2040 et de renforcer la biofabrication, l'innovation médicale et l'autosuffisance en vaccins et en génomique.

Objectif : Évaluer le rôle des biobanques dans la promotion de la stratégie nationale de biotechnologie, en prenant la Biobanque saoudienne comme étude de cas.

Méthodes : Nous avons recueilli des données opérationnelles auprès de la Biobanque saoudienne et examiné la littérature sur les biobanques publiée entre 2010 et 2024, en nous appuyant sur les quatre piliers de la stratégie nationale saoudienne en matière de biobanque (localisation des vaccins, fabrication biopharmaceutique, génomique, biotechnologie agricole), ainsi que sur les cinq facteurs favorables (développement des talents, infrastructures, présence régionale, excellence réglementaire, financement stratégique). Nous avons comparé les données saoudiennes aux données du marché mondial des biobanques pour illustrer leurs contributions à d'autres aspects de la santé.

Résultats : À la mi-2024, la Biobanque saoudienne avait recruté 53 338 participants et recueilli 589 461 échantillons biologiques. Elle sert actuellement de plateforme pour la recherche génomique, la médecine de précision, les essais cliniques et la biotechnologie de pointe, tout en facilitant le transfert de technologie et la commercialisation.

Conclusion : La Biobanque saoudienne est considérée comme l'une des initiatives de santé les plus avancées dans la Région de la Méditerranée orientale. Pour améliorer son impact, il est nécessaire de renforcer ses capacités grâce à des investissements accrus et durables, à une meilleure interopérabilité et intégration des données, à des systèmes de gouvernance normalisés, à un renforcement des partenariats et collaborations aux niveaux national et international, ainsi qu'à d'autres réformes politiques.

دور البنوك الحيوية في النهوض بالاستراتيجية الوطنية للتقنية الحيوية في المملكة العربية السعودية

هشام بدر الدين، لبنى الناصر، طارق القحطاني، عبد الرحمن الجوعي، نادين المسند، دلال الدغيثر، آلاء الشريدة، سوسن الفارس، آلاء زارع، زيسيس كوزلاكيديس

الخلاصة

الخلفية: أطلقت المملكة العربية السعودية استراتيجيتها الوطنية للتقنية الحيوية حتى تتحول إلى تجمع عالمي رائد للتقنية الحيوية بحلول عام 2040، ولتعزيز التصنيع الحيوي والابتكار الطبي والاكتفاء الذاتي في اللقاحات وعلم الجينوم.

الأهداف: هدفت هذه الدراسة الى تقييم دور البنوك الحيوية في النهوض بالاستراتيجية الوطنية للتقنية الحيوية، وذلك باستخدام البنك الحيوي السعوديكدراسة حالة.

طرق البحث: جمعنا بيانات تشغيلية من البنك الحيوي السعودي، واستعرضنا المصنفات المنشورة حول البنوك الحيوية بين عامي 2010 و2024، مسترشدين في ذلك بالركائز الأربع للاستراتيجية الوطنية للبنك الحيوي السعودي (توطين اللقاحات، وتصنيع المستحضرات الصيدلانية الحيوية، وعلم الجينوم، والتكنولوجيا الحيوية الزراعية)، و5 عوامل تمكين (تنمية المواهب، والبنية الأساسية، والوجود الإقليمي، والتميز التنظيمي، والتمويل الاستراتيجي). وقد قارَنَّا بيانات المملكة مع بيانات سوق البنوك الحيوية العالمية، لتوضيح مساهمات البنوك الحيوية في الجوانب الأخرى للرعاية الصحية.

النتائج: حتى منتصف عام 2024، سجَّل البنك الحيوي السعودي 53338 مشاركًا وجمع 589461 عينة حيوية. ويُعد المركز حاليًّا منصة لبحوث الجينوم والطب الدقيق والتجارب السريرية والتقنية الحيوية المتقدمة، مع تسهيل نقل التقنية وإعدادها للاستغلال التجاري.

الاستنتاجات: يُعد البنك الحيوي السعودي من المبادرات الصحية الأكثر تقدمًا في إقليم شرق المتوسط. ولتعزيز تأثيره، هناك حاجة إلى تعزيز قدرته من خلال زيادة الاستثمارات واستدامتها، وتحسين قابلية البيانات للتبادل وتكاملها، ووجود نظم حوكمة موحدة، وزيادة الشراكات وعلاقات التعاون الوطنية والدولية، وغير ذلك من الإصلاحات في مجال السياسات.

References

1. Gulf Center for Disease Prevention and Control. Riyadh: Gulf Health Council; 2021. https://gulfcdc.org/en/Pages/About-Us.
2. Lund H, Tang L, Poulsen I, la Cour K, Bjerrum M, Nielsen CV, et al. Lack of systematicity in research prioritisation processes — a scoping review of evidence syntheses. Syst Rev. 2022;11(1):277. doi:10.1186/s13643-022-02149-2.
3. Alfawaz R, Alhumud R, Amato-Gauci AJ, Penttinen P. Public health priorities for the Gulf states. Int J Health Plann Manage. 2024;39(5):1603–1611. doi:10.1002/hpm.3797.
4. Rice ZS, Liamputtong P. Cultural determinants of health, cross-cultural research and global public health. In: Handbook of social sciences and global public health. Cham: Springer International Publishing; 2023. p. 1–14. doi:10.1007/978-3-031-25110-8_44.
5. Rudan I, Yoshida S, Chan KY, Sridhar D, Wazny K, Nair H, et al. Setting health research priorities using the CHNRI method: VII. A review of the first 50 applications of the CHNRI method. J Glob Health. 2017;7(1):011004. DOI:10.7189/jogh.07.011004.
6. Yoshida S. Approaches, tools and methods used for setting priorities in health research in the 21st century. J Glob Health. 2016;6(1):0100507. doi:10.7189/jogh.06.010507.
7. Al Salman J, Al Dabal L, Bassetti M, Alfouzan WA, Al Maslamani M, Alraddadi B, et al. Promoting cross-regional collaboration in antimicrobial stewardship: findings of an infectious diseases working group survey in Arab countries of the Middle East. J Infect Public Health. 2021;14(7). 978–984. doi:10.1016/j.jiph.2021.04.009.
8. Ababneh MA, Nasser SA, Rababa'h AM. A systematic review of Antimicrobial Stewardship Program implementation in Middle Eastern countries. Vol. 105, International Journal of Infectious Diseases. 2021;105:746–752. doi:10.1016/j.ijid.2021.03.035.
9. Hashad N, Perumal D, Stewart D, Tonna AP. Mapping hospital antimicrobial stewardship programmes in the Gulf Cooperation Council states against international standards: a systematic review. J Hosp Infect. 2020;106:404 –418. doi:10.1016/j.jhin.2020.09.004.
10. Rawson T, Doohan P, Hauck K, Murray KA, Ferguson N. Climate change and communicable diseases in the Gulf Cooperation Council (GCC) countries. Epidemics. 2023;42:100667. doi:10.1016/j.epidem.2023.100667.
11. World Health Organization. Assessing national capacity for the prevention and control of noncommunicable diseases: report of the 2021 global survey. Geneva: WHO; 2023. https://www.who.int/publications/i/item/9789240071698.
12. Alpen Capital. GCC Healthcare Industry. 2023. https://alpencapital.com/research/2023/gcc-healthcare-report-mar20.pdf.
13. World Bank Group. Gulf economic update: the health and economic burden of non-communicable diseases in the GCC. Washington, DC: World Bank; 2023. https://www.worldbank.org/en/country/gcc/publication/gulf-economic-update-the-health-and-economic-burden-of-non-communicable-diseases-in-the-gcc.
14. Mair JL, Salamanca-Sanabria A, Augsburger M, Frese BF, Abend S, Jakob R, et al. Effective behavior change techniques in digital health interventions for the prevention or management of noncommunicable diseases: an umbrella review. Ann Behav Med. 2023;57. doi:10.1093/abm/kaad041.
15. So VHT, Channon AA, Ali MM, Merdad L, Al Sabahi S, Al Suwaidi H, et al. Uptake of breast and cervical cancer screening in four Gulf Cooperation Council countries. Eur J Cancer Prev. 2019;28(5). doi:10.1097/CEJ.0000000000000466.
16. Alessy SA, Alqahtani SA, Vignat J, Abuhmaidan A, Basmi AEL, Al Lawati N, et al. The current and future cancer burden in the Gulf Cooperation Council (GCC) countries. Cancer Med. 2024. doi:10.1002/cam4.70141
17. Khoja T, Rawaf S, Qidwai W, Rawaf D, Nanji K, Hamad A. Health care in Gulf Cooperation Council countries: a review of challenges and opportunities. Cureus. 2017;9(8):e1586. DOI:10.7759/cureus.1586.
18. Duda-Sikuła M, Kurpas D. Barriers and facilitators in the implementation of prevention strategies for chronic disease patients—best practice guidelines and policies: systematic review. J Pers Med. 2023;13(2):288. DOI:10.3390/jpm13020288.
19. Monshi SS, Halpern MT. Factors associated with smoking cessation and smoking cessation interventions in the Gulf Cooperation Council countries. Saudi Med J. 2019;40(2):119–125. DOI:10.15537/smj.2019.2.23904.

20. Monshi SS, Ibrahim J. Implementation of tobacco control measures in the Gulf Cooperation Council countries, 2008–2020. Subst Abuse Treat Prev Policy. 2021;16(1). doi:10.1186/s13011-021-00393-8.

21. Osabi LA, van de Klundert J, Alhurishi SA, Cramm JM. A theory-informed systematic review to understand physical activity among women in Gulf Cooperation Council countries. BMC Public Health. 2023;23(1). doi:10.1186/s12889-023-15725-5.

22. Al-Mohannadi AS, Farooq A, Burnett A, Van Der Walt M, Al-Kuwari MG. Impact of climatic conditions on physical activity: a 2-year cohort study in the Arabian gulf region. J Phys Act Health. 2016;13(9):929–937. doi:10.1123/jpah.2015-0593.

23. Buchowski MS, Choi L, Majchrzak KM, Acra S, Matthews CE, Chen KY. Seasonal changes in amount and patterns of physical activity in women. J Phys Act Health. 2009;6(2):252–261. DOI:10.1123/jpah.6.2.252.

24. Aqeel M, Guo J, Lin L, Gelfand S, Delp E, Bhadra A, et al. Temporal physical activity patterns are associated with obesity in U.S. adults. Prev Med (Baltim). 2021;148:106538. DOI:10.1016/j.ypmed.2021.106538.

25. Al-Madani HMN. Fatal crashes in GCC countries: comparative analysis with EU countries for three decades. In: WIT Trans Built Environ. 2013;134:471–482. doi:10.2495/SAFE130421.

26. Fisa R, Musukuma M, Sampa M, Musonda P, Young T. Effects of interventions for preventing road traffic crashes: an overview of systematic reviews. BMC Public Health. 2022;22:53. DOI:10.1186/s12889-021-12253-y.

27. Phillips RO, Ulleberg P, Vaa T. Meta-analysis of the effect of road safety campaigns on accidents. Accid Anal Prev. 2011;43(3):1204–1218. doi:10.1016/j.aap.2011.01.002.

28. Staton C, Vissoci J, Gong E, Toomey N, Wafula R, Abdelgadir J, et al. Erratum: Road traffic injury prevention initiatives: A systematic review and meta summary of effectiveness in low and middle income countries. PLoS One 2016;11(1):e0144971. DOI: 10.1371/journal.pone.0144971.

29. Statistical Centre for the Cooperation Council for the Arab Countries of the Gulf (GCC-STAT). Features and prospects of economic performance in GCC, 2023. Muscat: GCC-STAT;2024. https://gccstat.org/images/gccstat/docman/publications/GCC%20English%2014oct.pdf.

30. Mehmood A, Maung Z, Consunji RJ, El-Menyar A, Peralta R, Al-Thani H, et al. Work related injuries in Qatar: a framework for prevention and control. J Occup Med Toxicol. 2018;13:29. doi:10.1186/s12995-018-0211-z.

31. Geoffrion S, Hills DJ, Ross HM, Pich J, Hill AT, Dalsbø TK, et al. Education and training for preventing and minimizing workplace aggression directed toward healthcare workers. Cochrane database of systematic reviews. 2020;8(8):CD011860. doi:10.1002/14651858.CD011860.pub2.

32. United States Federal Highway Administration. Safety culture. 2024. https://highways.dot.gov/safety/zero-deaths/safety-culture

33. Benzaman B, Ward NJ, Schell WJ. The influence of inferred traffic safety culture on traffic safety performance in U.S. States (1994–2014). J Safety Res. 2022;80:311–319 . doi:10.1016/j.jsr.2021.12.014.

34. Paichadze N, Pandey V, Bari I, Monclús J, Hyder AA. Socio-cultural context of road safety (SOCCR). Inj Prev. 2022;28:A14–A15. doi:10.1136/injuryprev-2022-safety2022.44.